CAUGHT on CAMERA

A Community Monitoring Project in the Wimmera Region

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The Victorian National Parks Association (VNPA) helps shape the agenda for creating and managing national parks, conservation reserves and other important natural areas across land and sea in Victoria.

The VNPA works with all levels of government, the scientific community and the general community to achieve long-term, best practice environmental outcomes.

The VNPA is also Victoria's largest bushwalking club and provides a range of information, education and activity programs to encourage Victorians to get active for nature.

NATUREWATCH

The VNPA's NatureWatch program is a community-based biodiversity monitoring program that informs, educates and engages the community in conservation monitoring and management practices. It actively builds links between community members, scientists and land managers, and develops scientifically based, practical projects that contribute to a better understanding of species and ecosystems, and the management of natural areas.

PROJECT PARTNERS

Hindmarsh Landcare Network

The Hindmarsh Landcare Network (HLN) is an example of local people taking action and achieving success. The network is based on strong community connections and recognises the work and contribution of past groups and volunteers.

It brings local Landcare groups together to improve and protect the natural environment of the West Wimmera and Southern Mallee. It also gives individual Landcare groups and communities a united voice and helps develop local projects, increase investment for environmental action and accelerate the level of work on private land.

Eco Insights

Eco Insights is a small private company that conducts contract work to help conserve biodiversity and improve the ways in which communities work together in the landscape to achieve multiple objectives in an ecologically sustainable way. It specialises in designing and analysing surveys of vertebrate fauna to meet these objectives.

ACKNOWLEDGEMENTS

VNPA: Caitlin Griffith, Ann Williamson, John Kotsiaris, Amy O'Dell, Luke Johnson, Christine Connelly, Michael Longmore, Matt Ruchel, Emily Clough, Heath Rickard.

Hindmarsh Landcare Network: Katy Marriot, Iestyn Hosking, Chris Lindorff.

Eco Insights: Richard Loyn.

Department of Environment and Primary Industries: Steffen Schultz.

Parks Victoria: Stuart Lardner.

Arthur Rylah Institute for Environmental Research: Matt Bruce, Peter Menkhorst.

Trust for Nature: Lindsay Smith, Sue Smith, Snape Reserve Committee of Management.

Local landholders: Mick Gawith, Sue Gawith, June Gawith, Bernie Fox, Sue Hayman-Fox, Phil Henseleit, Karen Werner.

Project supported by the Australian Government's Caring for our Country Community Action Grants.

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CONTENTS

SUMMARY

In 2013, the VNPA Caught on Camera project was trialled in the Wimmera region of north-west Victoria, as a partnership between the VNPA and the Hindmarsh Landcare Network. This project was originally proposed as a way to celebrate 60 years of the VNPA and 15 years of Hindmarsh Landcare Network and to acknowledge the successes of the annual Project Hindmarsh planting weekend.

Project Hindmarsh was established to restore fragmented vegetation links between the Little and Big deserts on public and private land. The project has been very effective, yet there is no evidence to show whether wildlife are using the habitat links. The Caught on Camera project provided an opportunity to explore the value of revegetation on private land and develop the relationship between the VNPA, HLN and the local community further.

A community training weekend was held in April, with more than 20 attendees including local HLN staff and volunteers, VNPA volunteers, local community members, landholders, land managers and scientists. The project was designed with input from HLN and our consultant scientists, to address the question "what wildlife species are using revegetated areas?"

Local landholders welcomed the monitoring activities, and cameras were set up on their land in revegetated areas, cleared land and remnant vegetation. Volunteers and

The Caught on Camera planning committee with representatives from the VNPA, Hindmarsh Landcare Network, Eco Insights, local landholders and volunteers.

HLN staff set-up and moved the cameras every three weeks, covering five properties. Altogether 3467 survey photos were taken from 629 camera days, resulting in 2976 photos of fauna. They featured three native mammal species, four introduced mammal species and 11 native bird species.

Data are not yet sufficient for statistical analysis or definitive conclusions. However, this report highlights some preliminary observations. As expected, our cameras took the most photos of common species such as Western Grey Kangaroos and introduced European Hares. Interestingly, Common Brushtail Possums (which are not so common in the region) were found in remnant vegetation and revegetation, and Short-beaked Echidnas were found in revegetation in one study area (Snape Reserve).

The greatest diversity recorded by the cameras was in birds. Species photographed were Emu, Mallefowl, Painted Button-quail, Common Bronzewing, White-browed Babbler, Australian Magpie, Grey Currawong, Willie Wagtail, Raven, White-winged Chough and Southern Scrub-robin. Many of these were recorded to be using revegetated areas.

VNPA and HLN volunteers dedicated many hours to identifying fauna species in the photos. A selection of the photos was presented to a delighted community at the annual Project Hindmarsh weekend and via the VNPA Facebook page.

The Caught on Camera project is running again in 2014, with a view to setting up long-term monitoring (> 10 years) to explore the value of revegetation for wildlife in the Wimmera region. The value of revegetation can be expected to increase over time as planted shrubs and trees grow and habitat structural and floristic diversity develops.

1.0 INTRODUCTION

The VNPA Caught on Camera project involves working with local community groups and volunteers to establish and carry out long-term wildlife monitoring, using motion-sensing cameras. This project is presently running in three locations: Wombat State Forest, Bunyip State Park and the Wimmera region. In Wombat State Forest and Bunyip State Park the project is looking at the effects of fire on wildlife, whereas in the Wimmera we are studying the effects of revegetation efforts on wildlife.

Motion-sensing cameras

Monitoring wildlife can be highly labour-intensive. Motion-sensing cameras offer the opportunity to gather data on selected animal groups (e.g. small mammals, arboreal mammals, some ground-foraging birds) with much less labour than methods such as live trapping.

It is possible to set up camera traps (each 'trap' with a motion-sensing camera and a tasty bait mix of oats, golden syrup and peanut butter) at multiple monitoring locations and rotate them over regular time periods, maximising the data collected. The method is also much less stressful for wildlife than methods where animals are caught and handled, and can supply data on the presence of certain species that are unlikely to be caught in traditional traps.

However, it's important to note that motion-sensing cameras cannot provide much data on the population sizes of particular fauna. While camera monitoring provides clear evidence of the presence of some species, and their relative use of different habitats, it cannot give comprehensive information about how many individuals there are in an area.

Camera monitoring gives us exciting images of animals behaving in natural ways that we might otherwise have difficulty observing. This forms a great community education resource, and images on the different species being 'caught on camera' in the local area can be regularly presented back to the community.

Project stages

Over April to July 2013, the Caught on Camera project was trialled at five different properties in the Wimmera region in partnership with the Hindmarsh Landcare Network. The project was run as a trial in the first year and is intended to be developed further to run long-term. We expect to set up long-term annual monitoring and to extend the project to include more properties in the region.

Community training

Community volunteers were involved in establishing the project and setting up and taking down camera traps at the project sites. A community weekend event, held over 18-21 April 2013, involved:

- Informing community members of the project objectives and context.
- Training community members in camera monitoring methodology.
- Establishing opportunities for volunteer involvement.

Background

The Wimmera in western Victoria is a highly productive region for agriculture, especially cereal crops. It has been extensively cleared, with native vegetation now confined to small isolated remnant patches between two extensive areas of native vegetation on less productive (sandy) soils: the Little Desert in the south and the Big Desert in the north.

Landholders and local communities have made impressive efforts in recent years to protect remnant vegetation, restore degraded vegetation and extend it through revegetation.

This study aims to begin formally documenting the use of revegetated areas by wildlife, especially native and introduced mammals.

The project compares three different habitat types:

1. Revegetation: areas that have been planted out as part of Hindmarsh Landcare Network activities.
2. Cleared land: areas that have been cleared or heavily

Richard Loyn from Eco Insights takes volunteers through the methods used in the Caught on Camera project.

degraded (i.e. sites that could be contenders for future revegetation).

3. Remnant vegetation: areas that support reasonably intact remnant native vegetation (i.e. sites that resemble what the vegetation would have been like before clearing for agriculture).

We've chosen cleared land and remnant vegetation as matched benchmarks for the revegetation on each property. This comparison is not expected to be perfect, as the reality is more complex than suggested by this design. In particular, existing remnant vegetation represents a biased sample of what was present originally (as it is generally on less productive sites) and the value of remnant patches has been reduced by impacts associated with clearing and habitat fragmentation. It was impractical to set camera traps in completely cleared sites on working farms among crops or domestic stock, so cleared sites had to be selected where agricultural activities had ceased for varying periods of time. These include home paddocks (with grazing animals removed temporarily) and abandoned paddocks with varying degrees of natural revegetation.

This report details the Caught on Camera monitoring activities carried out in the Project Hindmarsh area of the Wimmera region, and the results of the 2013 trial.

2.0 METHODS

Site selection

We selected five properties (study areas) where there was a reasonable chance of finding examples of each habitat type (revegetation, cleared land and remnant vegetation) on similar soils and landforms in or near the property, and ~500m distance from each other.

We did this by first writing to interested landholders who had contributed to the work of the Hindmarsh Landcare Network, describing the study objectives and explaining criteria for site selection (Appendix 1). Field inspections were then made by Hindmarsh Landcare Network staff, VNPA and Eco Insights. Locations of the study areas are shown in Figure 1.

At one study area (Gumbinnen) there is little remnant vegetation on the property, but a substantial area on public land exists nearby (Glenlee Flora Reserve). Hence the remnant vegetation site was established in the flora reserve, and selected to give as close a match as possible in terms of soil and aspect.

The properties were in a range of environments, from the dry sandy soils supporting mallee eucalypts in the north-west (Mali Dunes) to the higher rainfall areas with more loamy soils supporting Yellow Box and other eucalypts in the south-east (Snape Reserve). All of the properties have been or continue to be working farms, used mainly for grazing sheep or cattle and in some cases also for cereal cropping. Two of them (Mali Dunes and Snape Reserve) are now used mainly for conservation purposes, with plans to extend revegetation over much of the previously cleared land.

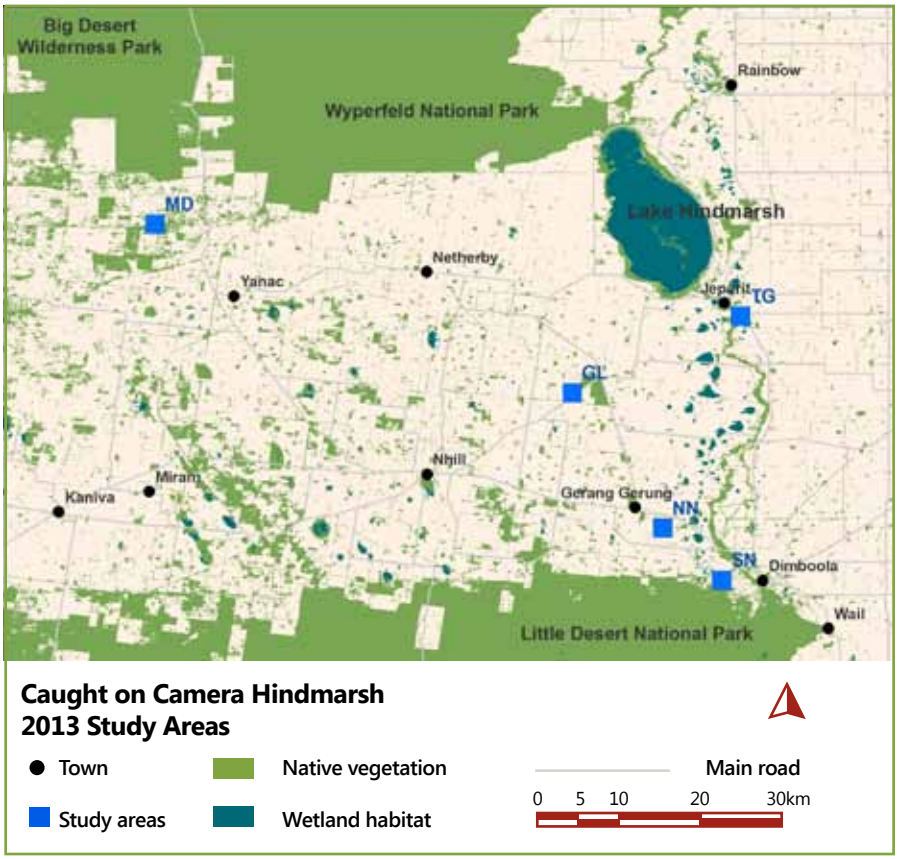

Figure 1. Locations of the five study areas across the Wimmera region – Mali Dunes (MD), Tarrangaw (TG), Snape Reserve (SN), Gumbinnen (GL) and Never Never (NN).

We selected three sites in each study area, representing each of the three habitat types (revegetation, cleared land and remnant vegetation) as shown schematically in Figure 2. The revegetation site was selected first and the cleared land and remnant vegetation sites were then chosen to be as close a match as possible in soil and aspect. Such matching is never perfect, and in this study particular challenges were encountered at Gumbinnen (as mentioned above) and at Tarrangaw, where the revegetation had been established on a sand dune (partly to stabilise that dune) with no directly comparable sites on the property.

At Tarrangaw, the revegetation sites selected were on the lower slopes of the dune, where the sandy soil resembles the sandy loam that prevailed at sites later selected to represent cleared farmland (home paddock with horses temporarily removed) and remnant vegetation (Black Box woodland (*Eucalyptus largiflorens)* with scattered understorey of Tangled Lignum *(Muehlenbeckia cunninghamii)*. The revegetation at Tarrangaw

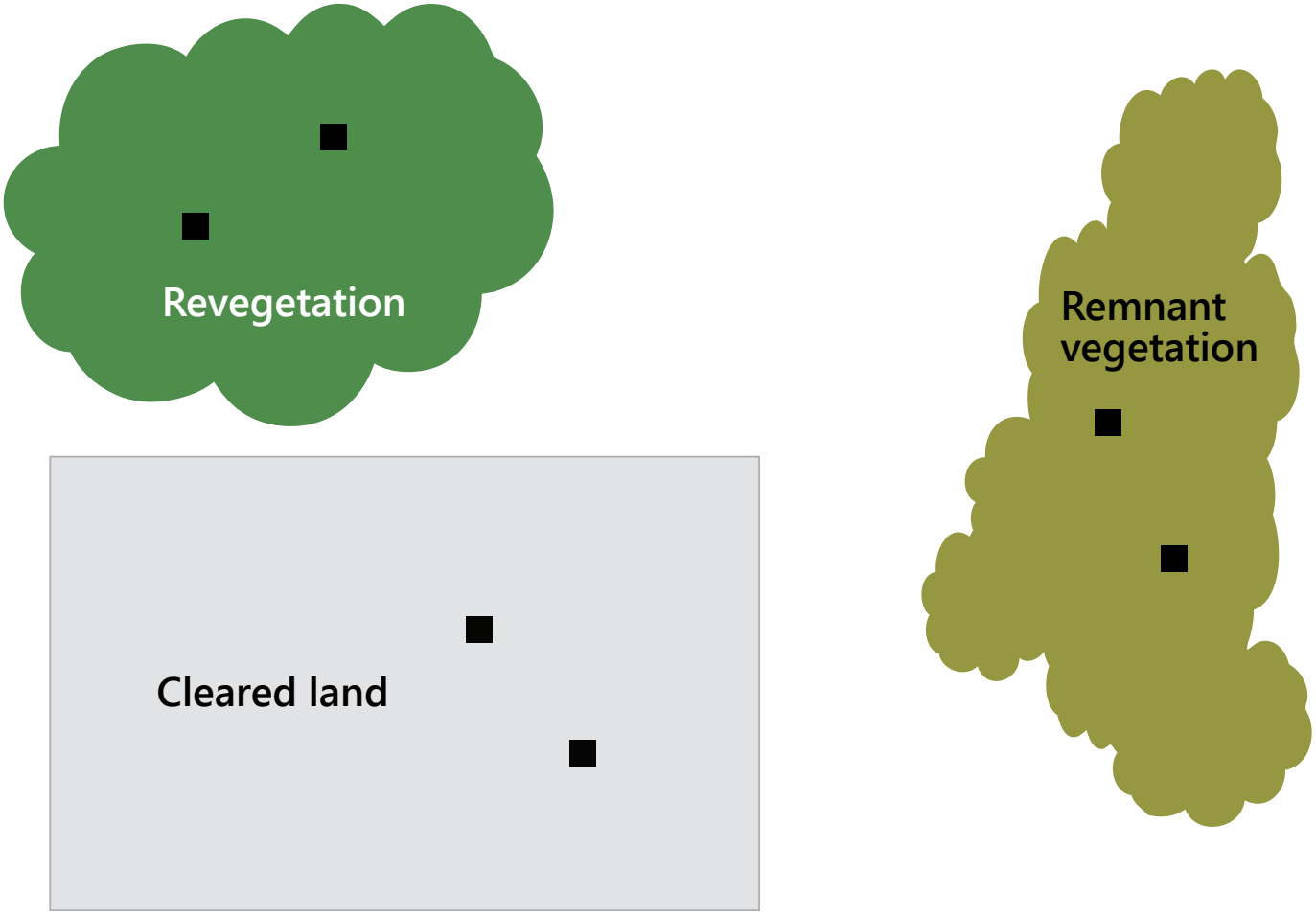

Figure 2. Schematic example of site set-up, showing camera trap locations (■) in the three sites (each representing a habitat type) in a hypothetical study area.

is much younger than at other sites (1-3 years old, compared with 5+ years generally), and would not be expected to show its potential value for some years.

Using this site selection procedure, we selected a total of 15 sites for this pilot study, arranged in five study areas (properties) with each of three habitat types represented in each study area (in or near each property).

Camera methodology

Two camera 'traps' were set in each of the three habitat types at each site, ~100m apart (see Figure 2), and left in operation for about three weeks, next to bait stations that would be expected to attract mammals. The camera traps each contained a digital camera that is triggered when a passive infrared sensor detects a moving heat source, such as an animal. The units used were Reconyx HC500 Hyperfire Semi-Covert IR (Reconyx Inc., Wisconsin, USA), with a 3.1 megapixel camera with Lo-GlowTM infrared night-time flash, contained within a weatherproof housing. These units are powered by six AA batteries and operate day and night, with the trigger mechanism set to take three photos at a minimum time interval of 15 seconds. Camera traps were fixed to a tree trunk or stake about 50cm above the ground with wire and secured with a cable-lock and security housing to prevent damage and theft. Camera settings were checked on site before fixing the cameras to the supports.

Volunteers place a camera to monitor a paddock at the Gawith's property, Tarrangaw.

We used bait stations to attract animals to the area sensed by the camera unit. They were placed 2m directly in front of the camera, roughly in the centre of the field of view. This distance allows the detection of small mammals and their identification in the resulting digital image. Bait stations consist of a bait-holding cage fixed to a stake so that the bottom of the cage is about 20cm off the ground. Placing the bait above ground encourages small mammals to stretch upwards or climb the stake, showing key morphometric features such as feet, ears and tail. Standard mammal survey bait was used in this study, consisting of a mixture of rolled oats, golden syrup and peanut butter.

NatureWatch coordinator Caitlin Griffith explains the workings of a monitoring camera.

The area encompassing the cameras' field of view and to a little beyond the bait cage was cleared of low vegetation and other obstructions to ensure animals were not obscured in photos and to reduce the likelihood of moving vegetation (particularly if warmed by the sun) causing 'false triggers' of the camera. These protocols were based on experience and recommendations reported by Nelson and Scroggie (2009).

Habitat assessments

Basic habitat data were collected from each site, in a standard format (Appendix 2). Key structural features were scored on a scale from 0 (absent) to 5 (very prevalent), compared with expectations from broad experience in the Wimmera. Practice sessions helped ensure that this subjective measure was estimated consistently by all assessors. Separate assessments were done for each of the two camera locations and averaged to give a mean value for the site. The metrics referred to areas of about 1ha centred on each camera location. Notes were made on any special features of each site.

Photographs of the general habitat were taken from the locations where camera traps were installed, using digital cameras. These were taken horizontally in at least four directions (facing north, east, south and west). VNPA will retain these photos to help interpret any changes in land use if the sites are reassessed in the future.

Data analysis

Data were tabulated and summary statistics obtained. Further analysis is possible but is considered unlikely to be particularly informative until additional sites can be assessed and a longer time period covered for existing sites. The current project is a pilot study that provides mainly qualitative data at this stage and will help inform more detailed work in the future.

3.0 RESULTS

Fauna images

Altogether 3467 survey photos were taken from 629 camera-days of camera trapping, and 2339 photos of animals obtained. These totals include repeat photos of the same individuals in some cases, and we investigated various approaches to make allowance for this potential source of distortion. However, these repeats did not alter the general picture provided by the raw data.

More photographs were obtained at Mali Dunes (MD), Tarrangaw (TG) and Snape Reserve (SN) than at Gumbinnen (GL) or Never Never (NN) (Table 1). Numbers of animals per photograph were also high at Mali Dunes (except on the cleared site), and similar between other sites, suggesting that the results were due to differences in animal abundance rather than any tendency to get more repeat photos or false triggers at some sites than at others.

Mammals

The vast majority of images were of native Western Grey Kangaroos, introduced lagomorphs (hares or rabbits) and native Common Brushtail Possums (Table 2). The possums were mainly at Tarrangaw while the other species were widely distributed. The lagomorphs were mainly European Hares; European Rabbits were identified less often, and only at two sites (Mali Dunes and Never Never). The next most common mammals were two introduced carnivores: House Cat and Red Fox. No small mammals were recorded. Short-beaked Echidnas were recorded in the revegetation at Snape Reserve (three images, probably of one individual).

Birds

Birds featured in many of the images, the most commonly photographed species being White-winged Chough (mainly at Tarrangaw and Snape Reserve) and Australian Magpie (mainly at Mali Dunes and Never Never) (Table 2). Malleefowl were recorded at Mali Dunes (12 images in remnant vegetation). Other species recorded were Willie Wagtail, White-browed Babbler, Common Bronzewing, Painted Button-quail, Southern Scrub-robin, Grey Currawong,

A curious Malleefowl inspects a camera in remnant vegetation at Bernie Fox and Sue Hayman-Fox's property, Mali Dunes.

TABLE 1: NUMBERS OF SURVEY PHOTOS AND ANIMAL PHOTOS RECORDED BY EACH CAMERA. STUDY AREAS ARE MALI DUNES (MD), TARRANGAW (TG), SNAPE RESERVE (SN), GUMBINNEN (GL) AND NEVER NEVER (NN).

Study area	Habitat type	Camera A/B	Days	Survey photos	Animal photos	Animal photos per survey photos (%)
GL	Cleared	A	19	9	4	44
GL	Cleared	B	19	18	12	67
GL	Remnant	A	22	12	9	75
GL	Remnant	B	22	42	34	81
GL	Revegetation	A	19	30	24	80
GL	Revegetation	B	20	42	23	55
MD	Cleared	A	20	789	230	29
MD	Cleared	B	20	510	395	77
MD	Remnant	A	21	24	17	71
MD	Remnant	B	21	53	44	83
MD	Revegetation	A	21	183	139	76
MD	Revegetation	B	21	519	432	83
NN	Cleared	A	22	21	20	95
NN	Cleared	B	22	9	6	67
NN	Remnant	A	22	18	18	100
NN	Remnant	B	22	30	21	70
NN	Revegetation	A	22	27	19	70
NN	Revegetation	B	22	33	22	67
SN	Cleared	A	21	126	108	86
SN	Cleared	B	21	102	82	80
SN	Remnant	A	21	96	70	73
SN	Remnant	B	21	96	62	65
SN	Revegetation	A	21	84	60	71
SN	Revegetation	B	21	15	10	67
TG	Cleared	A	21	87	66	76
TG	Cleared	B	21	75	47	63
TG	Remnant	A	21	57	53	93
TG	Remnant	B	21	162	149	92
TG	Revegetation	A	21	114	95	83
TG	Revegetation	B	21	84	95	81
TOTAL			629	3467	2339	67

Raven sp. and Emu, plus ten images of unidentified small birds (Table 2). Multiple images of Emu and Painted Button-quail at Snape Reserve undoubtedly refer to the same individual birds or groups of birds. All the species recorded do much of their foraging from the ground, where they may be detected readily by camera traps.

Differences between habitat types

Several differences were apparent between the three habitat types examined (Table 3).

Kangaroos were most often photographed on cleared land and least often in remnant vegetation. Common Brushtail Possums and White-winged Choughs were found mainly in remnant vegetation (at Tarrangaw) and in revegetation (at Snape Reserve).

Lagomorphs (hares and rabbits) were most often photographed in revegetation, although European Hares were encountered quite often in all habitat types.

Australian Magpies were found most often on cleared land and least often in revegetation (as expected).

Common Bronzewings were recorded only in revegetation, and White-browed Babblers in revegetation and remnant vegetation.

The few records of Malleefowl and Southern Scrub-robin were all in remnant vegetation at Mali Dunes.

TABLE 2: NUMBERS OF IMAGES OF MAMMAL AND BIRD SPECIES AT EACH OF THE FIVE STUDY AREAS, I.E. GUMBINNEN (GL), MALI DUNES (MD), NEVER NEVER (NN), TARRANGAW (TG) AND SNAPE RESERVE (SN).

Site:	GL	MD	NN	TG	SN	Total
Short-beaked Echidna	0	0	0	0	3	3
European Hare #	48	28	51	89	32	248
European Rabbit #	0	17	18	0	0	35
Western Grey Kangaroo	42	1336	32	437	303	2150
Red Fox	4	3	0	27	7	41
Common Brushtail Possum	9	0	0	194	6	209
Cat	0	24	0	37	0	61
Unidentified bird species	2	0	1	3	4	10
Emu	0	1	0	0	133	134
Malleefowl	0	12	0	0	0	12
Painted Button-quail	0	0	0	0	42	42
Common Bronzewing	3	0	0	0	0	3
White-browed Babbler	2	2	0	0	0	4
Australian Magpie	0	39	37	3	7	86
Grey Currawong	0	0	0	0	6	6
Willie Wagtail	3	0	0	4	0	7
Raven sp.	0	0	0	0	3	3
White-winged Chough	3	0	0	116	68	187
Southern Scrub-robin	0	3	0	0	0	3
Total mammals	103	1408	101	516	351	2479
Native mammals	51	1336	32	363	309	2091
Introduced mammals	52	72	69	153	42	388
Total birds	13	57	38	126	263	497

Totals for rabbits and hares include some images that could not be definitely assigned to one or other species. However, the overall proportions reflect the images that were positively identified (~70%).

Incidental fauna records

Many bird species and a few mammal and reptile species were observed incidentally in the course of this work, although the camera trapping was the primary survey method. Some of the more notable records observed by various volunteers are listed below:

- Black Wallaby *(Wallabia bicolor)*: one seen in remnant Yellow Box and Buloke woodland at Snape Reserve, inland of its usual range.
- Australian Bustard *(Ardeotis australis)*: one seen sheltering under a mallee eucalypt in a partly cleared part of Mali Dunes. This species is extremely rare in Victoria but a small population has remained in this region.
- Malleefowl *(Leipoa ocellata)*:

A Red Fox sneaks past the camera in remnant vegetation at Snape Reserve.

one seen crossing a fence from remnant mallee into revegetation at Mali Dunes, showing that this species uses a greater range of habitats than was revealed by the camera trapping.

- Gilbert's Whistler *(Pachycephala inornata)*: one heard calling in revegetation at Gumbinnen, along with two more common species, Rufous Whistler *(P. rufiventris)* and Golden Whistler *(P. pectoralis)*. This species is uncommon in Victoria, confined mainly to woodlands in the north, and its ecological requirements are not well known.
- Brown Treecreeper *(Climacteris picumnus)*: common in the Glenlee Flora Reserve (near Gumbinnen) and a few in remnant vegetation elsewhere, but not seen in revegetation. This species is one of several

TABLE 3: NUMBERS OF IMAGES OF MAMMAL AND BIRD SPECIES IN THE THREE HABITAT TYPES ACROSS FIVE STUDY AREAS.

Habitat type:	Cleared	Remnant	Reveg	Total
Short-beaked Echidna	0	0	3	3
European Hare	61	67	120	248
European Rabbit	1	21	13	35
Western Grey Kangaroo	976	178	728	1892
Red Fox	28	9	4	41
Common Brushtail Possum	6	194	9	209
Cat	18	12	31	61
Unidentified bird species	0	4	6	10
Emu	133	1	0	134
Malleefowl	0	12	0	12
Painted Button-quail	0	0	42	42
Common Bronzewing	0	0	3	3
White-browed Babbler	0	2	2	4
Australian Magpie	53	27	6	86
Grey Currawong	0	3	3	6
Willie Wagtail	7	0	0	7
Raven sp.	0	3	0	3
White-winged Chough	0	116	71	187
Southern Scrub-robin	0	3	0	3
Total mammals	1090	481	908	2479
Native mammals	982	372	737	2091
Introduced mammals	108	109	171	388
Average total birds	193	171	133	497

An Emu wanders past a camera at Snape Reserve.

woodland birds that have declined substantially in Victoria.

- Diamond Firetail *(Stagonopleura guttata)*: common in remnant woodland and nearby habitats at Snape Reserve. This species is one of several woodland birds that have declined substantially in Victoria. Several other woodland birds were observed in the same area while appearing to be scarce at other sites – e.g. Varied Sittella *(Daphoenositta chrysoptera)* and White-browed Babbler *(Pomatostomus superciliosus)*.

This photo puts into perspective just how large the European Hare really is.

Habitat assessments

Habitat data are summarised for the three habitat types in Table 4. Scores for the cover of trees and shrubs were generally almost as high in revegetation as in remnant vegetation (Table 4). Indeed, the cover of mallee eucalypts in revegetation at Mali Dunes exceeded that in remnant vegetation, where cover of mature mallee trees tended to be sparse (presumably as a product of their immaturity as well as previous land use history).

Wattles, paperbarks and tea-tree were more prevalent in revegetation than in remnant vegetation (Table 4), perhaps reflecting their ease of propagation, or a natural stage in the successional process.

TABLE 4: AVERAGE SCORES FOR THE PREVALENCE OF KEY HABITAT FEATURES IN THREE HABITAT TYPES. SCORES VARIED FROM 0 (ABSENT) TO 5 (VERY PREVALENT). EACH AVERAGE VALUE IS POOLED ACROSS THE FIVE STUDY AREAS. FOR THE 'TOTAL AVERAGE' THE AVERAGE IS POOLED ACROSS ALL HABITAT TYPES AND STUDY AREAS.

Habitat type:	Cleared	Remnant	Reveg	Total average
Mallee Eucalypts	0.00	0.44	0.88	0.44
Other Eucalypts	0.25	2.56	2.19	1.67
Tree Hollows	0.00	1.63	0.00	0.54
Callitris pine	0.25	0.63	0.25	0.38
Casuarina	0.25	1.25	0.75	0.75
Tall Shrubs (>2m tall)	0.38	2.19	1.81	1.46
Medium Shrubs (1-2m tall)	0.00	1.50	0.75	0.75
Low Shrubs (<1m tall)	0.75	2.00	1.94	1.56
Bare Ground	2.13	2.00	2.75	2.29
Moss	0.00	3.17	0.50	1.22
Lichen crust	1.17	4.67	2.75	2.86
Leaf Litter	0.25	3.38	1.38	1.67
Sticks & other woody debris	0.25	3.50	0.88	1.54
Mistletoe	0.00	1.38	0.00	0.46
Broombush	0.00	1.06	0.00	0.35
Wattles	0.00	0.88	1.94	0.94
Melaleuca (paperbark)	0.00	0.13	0.25	0.13
Leptospermum (te-atree)	0.00	0.00	0.13	0.04
Grasstrees	0.00	0.00	0.13	0.04
Lignum	0.25	0.38	0.00	0.21
Spinifex	0.00	0.00	0.25	0.08
Other native grasses	1.00	1.00	0.63	0.88
Pasture grasses	3.25	0.50	3.13	2.29
Other weeds (eg thistles)	0.13	0.00	0.25	0.13

Hollows were virtually absent from revegetation (and cleared land), although scattered hollow-bearing trees were observed off-site in both those habitat types.

Several other characteristics were markedly less prevalent in revegetation than remnant vegetation, including moss, leaf litter, sticks and woody debris, callitris pines, mistletoe, broombush (only at Mali Dunes) and lignum (only at Tarrangaw and Gumbinnen) (Table 4).

The cover of introduced pasture grasses was as high in revegetation as in cleared land, and markedly greater in revegetation than in remnant vegetation (Table 4), suggesting it takes many years for new plantings to out-compete pasture grasses that become established once a property has been used for grazing.

The same could be said of other weeds such as thistles, but their prevalence was generally low (Table 4).

Revegetation structure varied greatly between properties. This was mainly due to the low cover of trees and shrubs at Tarrangaw, where plantings were very young (1-3 years old). Clearly vegetation structure will develop over time, and this project documents a single point of time in a long successional process.

4.0 DISCUSSION

When landholders embark on revegetation projects, they do not expect instantaneous results, and do not expect the benefits to apply solely to the parcels of land they are revegetating. Rather, they are working to achieve a vision of an ecologically more valuable landscape for future generations.

The current project documents one small step in that process, describing selected elements of the vertebrate fauna (ground-dwelling mammals and some birds) on revegetated areas of land a few years after trees were planted, and comparing them with the twin benchmarks of cleared land (the starting point) and remnant vegetation (a yardstick for what they could have been in the past, and what they could look like in the future).

We should not despair if the fauna has not yet responded as positively as some may hope. The oldest example of revegetation in this project was ~10 years old and the youngest was only 1-3 years old. In all cases, it can be expected that further habitat values will develop over time.

Nevertheless, the project revealed some encouraging signs, including the following:

- Western Grey Kangaroos made substantial use of revegetation, despite being less easily detected there than in cleared land (as discussed further below).
- Common Brushtail Possums were also found in revegetation, although less often than in remnant vegetation. This is despite their need for tree hollows, which are not expected to develop in planted trees for many decades.
- Echidnas, Common Bronzewings and Painted Button-quail were only detected in revegetation, mostly in low numbers. These woodland species would be expected in remnant vegetation, but are clearly making use of the new habitats offered by revegetation. Common Bronzewings and Painted Button-quail are both known to feed on the seed of wattles, and these plants are well represented in the revegetation.
- White-winged Choughs and White-browed Babblers were both found feeding in revegetation as well as in remnant vegetation. Both are woodland species whose habitats were greatly reduced by agricultural clearing in the Wimmera.

It should be noted that camera trapping is not an effective survey tool for bird species that forage from substrates other than the ground, and this includes a high proportion of the local bird fauna (Emison et al. 1987).

Observational methods would be needed to generate information on bird species more generally. The project also provides only a single snapshot in time and does not explore possible additional effects of seasonality. This can make it difficult to detect species that have modified movement patterns throughout the year, for example due to migratory or breeding behaviour.

Large animals (and effects of conspicuousness)

Large animals such as Emus and Western Grey Kangaroos were sometimes photographed at greater distances in cleared sites than in other habitats, making them more likely to be recorded and exaggerating their apparent preference for cleared land.

Observations show that both species feed extensively in cleared farmland and treed habitats, and also rely on treed habitats for daytime shelter: this pattern is well-known for these species throughout their broad range. Hence they favour mosaics of open and treed habitats, and the current revegetation program is likely to favour these species by providing more of the treed habitats, which are much less represented in the Wimmera landscape than they were before European settlement.

The current results support this proposition for Western Grey Kangaroos (which were frequently recorded in revegetation, despite their lower levels of conspicuousness in that habitat) but not for Emus. The value of revegetation for Emus (and many other species) can be expected to increase as the trees grow and mature over time.

The Hindmarsh Caught on Camera trial was a real team effort involving scientists, local land owners, Hindmarsh Landcare Network, the VNPA and of course our wonderful volunteers.

Small mammals

The lack of small mammals came as a surprise, as at least three species are known to be well represented in the region (Menkhorst 1995): the House Mouse in cleared farmland, and native Mitchell's Hopping-Mouse and Silky Mouse on sand dunes in the mallee (including Mali Dunes; Mammal Survey Group unpublished data 2011 & 2012).

Rodents such as these can undergo extreme fluctuations in number and it is possible that the survey coincided with one of the times when their numbers were temporarily low in these locations. However, we doubt this because the fieldwork followed a period with reasonable rains that should have benefited these species. It is also possible that the types of habitat being targeted for revegetation (and hence for site selection in this project) are not favoured by those species.

The project had to avoid extensive cultivated cropland favoured by the House Mouse for logistical reasons, and our focus on selecting sites comparable to the revegetation may have reduced our chances of sampling specific natural habitats favoured by Mitchell's Hopping-Mouse or Silky Mouse. Sites favoured by those species at Mali Dunes include two large dune areas (Big Dune and Pine T) with dense regeneration following chain clearing up to 1995. Both species appeared common there from 2004 but Silky Mouse declined in recent years (A. Williamson pers. obs.). Both sites are on deeper sands than the current surveys.

A third possibility is that the bait mix used may have proved unattractive to small mammals. Possible reasons for this option include an abundance of natural food, or the deterrent effect of ants (which were extremely numerous at many of the sites). The Mammal Survey Group (unpublished data) noted that they recorded native mice by camera trapping on warm nights, and their camera trapping was done without using baits. In future work in this landscape, it may be worth experimenting with different baits or bait station set-ups to make sure that we are effectively sampling any small mammals that are present.

Further project development

This is the third NatureWatch project to trial the use of automated motion-sensing cameras as a community research tool under the Caught on Camera program. Following this one year trial, and based on the outcomes in the VNPA's Caught on Camera four year plan, we recommend that the project continue to be developed. Project development should consider the likelihood of obtaining useful new information for scientific and practical purposes, the value to local landholders and land managers and the level of interest and value to volunteers.

We also recommend that a strategic 10-year monitoring plan for the Wimmera region Caught on Camera project be developed. From results of the current pilot project, this plan should include early investigation of improved methods for detecting small mammals such as native rodents.

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APPENDIX

Appendix 1. Study objectives and criteria for site selection, as distributed to landholders March 2013. Responses were used to inform site selection and associated fieldwork in April 2013.

Objectives:

The main objective of this project is to discover what mammals (and other wildlife if possible) are using revegetated sites on selected Hindmarsh Landcare Network sites in the Victorian Wimmera. An important supplement to this objective is to compare the occurrence of mammals on these sites with two 'benchmark' sets of sites representing remnant native vegetation and cleared land. These comparisons will allow us to make a start at answering two questions of great strategic and practical significance for conservation management:

1. Do revegetated sites support a mammal fauna resembling that of remnant vegetation in this region (and if not, how do they differ)?
2. Do revegetated sites support a richer mammal fauna than cleared sites where no revegetation has been undertaken? This gives an indication of the short-term beneficial effects of revegetation, even if the desired state has not yet been realised.

If either question is answered in the negative, we also need to know which species and guilds do or do not make use of the revegetated sites? What does this tell us about the habitat features that are present or may be missing from the revegetated sites? Can it be expected that those features will develop over time (e.g. large trees; hollows) or are there actions we can take to accelerate the process (e.g. nest boxes, controlling feral bees or introduced mammals)? Answers to these questions can provide an important guide to adaptive management.

Several secondary questions can also be anticipated, although it is unlikely that they can be addressed initially. One is the temporal question: how long does it take for revegetation to become useful for certain mammal species? It may be possible to get some indication by examining a 'chronosequence', if some comparable sites have been revegetated at different times in the past. Or we may need to be patient and rely on future monitoring over time to tell us more. There is also a large set of questions about the landscape context: is it more useful to revegetate a few large areas or many small areas? Which vegetation types are in greatest need of revegetation? Is it better to build on existing remnant vegetation or establish new blocks of vegetation that may be used as stepping stones to link patches of remnant vegetation? If some of these questions have special importance in the current context, we should consider ways to address them.

Study design:

Based on these questions, we suggest the following study design. On each area, at least three sites will be selected, each of ~2 ha. One contains an area where substantial revegetation efforts have been made (preferably several years ago, with a known history). Another consists of remnant vegetation on landform and soils that resemble those of the revegetated site. The third consists of cleared land, again with similar landform and soils. It does not matter if the revegetated and cleared sites each have a scatter of old trees, preferably at similar density, and we will need to quantify variables of this sort for subsequent analysis. The sites should be more than 500m from each other if possible.

Similar clusters of 3+ sites will be established on other areas. Landforms and soils should be consistent within each cluster but can vary between areas (and will undoubtedly do so, from sand to clay). Hopefully it will be possible to survey 8-15 clusters over the course of the project. Data will be analysed to answer the questions posed above and assess the need for further sites or monitoring over time.

If an area contains more than one potential revegetation site, such sites can be identified along with comparable remnant sites, for possible inclusion at

a later stage of the study. It is important to maintain the balance between revegetation and remnant sites as far as possible (i.e. aim for equal numbers of each of these two types of site). It may be less important to maintain the balance with cleared sites, as we do not expect to learn as much new information from those sites (though we must keep an open mind and may be surprised!). With limited numbers of cameras for each field session, we will only deploy them at a subset of the cleared sites.

Site selection:

Ideally we would select sites at random from maps showing the three potential classes of site (revegetation, remnant & cleared). However, such maps may not be available and the real situation is likely to be much more complex, with some revegetation efforts carried out within remnant vegetation as well as in cleared land. If that proves to be the norm, we may have to redefine our benchmarks, research questions and design. However, based on the design above we suggest the following protocol for site selection: In each area (e.g. a property):

1. Identify the areas that have been subject to revegetation. If the areas are extensive, select up to five patches of ~2ha that could be suitable for study and label them with numbers (RV1, RV2, etc.) on a map or aerial photo. If the areas are small and scattered, can sites be found with substantial areas of revegetation (>2 ha, any shape) that have been established several years ago? If so, number them as above and label on a map or aerial photo.
2. Are there patches of remnant vegetation on comparable landforms and soils? If so, label them RM1, RM2, etc. on the same map or aerial photo. RM1 should have similar landform and soils to RV1 (and so on), but need not be close to it.
3. Are there areas of cleared land on comparable landforms and soils? If so, label them C1, C2 etc. on the same map or aerial photo.

Send the list and map to Caitlin, with any comments (e.g. about the value of including particular sites, or features that may make them unsuitable). We will use the numbering system to make a provisional random selection, but will talk about alternative decisions in the field of course. All sites should be at least 500m from other sites where possible. Sites should not be selected if vehicle access is likely to be difficult or other avoidable issues could arise, especially with respect to safety.

Appendix 2. Form used for collecting basic habitat data from each site for the VNPA Caught on Camera project in the Wimmera region, April-May 2013.

VNPA NatureWatch Caught on Camera Hindmarsh - Habitat Assessment

Site no.: ..... Location (coords): .....

Date: ..... Assessor: .....

Weather: ..... Phone: .....

Landform (circle relevant): DUNE RIDGE SWALE OTHER .....

Soil (e.g. whites sand, sand loam): .....

Dominant Vegetation: ..... Main Tree Species: .....

Main Tall Shrub Species (>2m): .....

Main Low Shrub or Ground Cover Species: .....

Tree Size and Form: .....

General Characteristics of Vegetation (Score 0 = absent to 5 = very prevalent)

Characteristic	Score
Mallee Eucalypts	
Other Eucalypts	
Tree Hollows	
Callitris	
Casuarina	
Tall Shrubs (>2m tall)	
Medium Shrubs (1-2m tall)	
Low Shrubs (<1m tall)	
Bare Ground	
Moss	
Crust	
Leaf Litter	
Sticks & other woody debris	

Characteristic	Score
Mistletoe	
Broombush	
Wattles	
Melaleuca (paperbark)	
Leptospermum (teatree)	
Grasstrees	
Lignum	
Spinifex	
Other native grasses	
Pasture grasses	
Other weeds (eg thistles)	

Comments:

Photographs (5 in total) – Stand at tree marked 150m, use handheld cameras provided and take the photos listed below: it is important to take the photos in this order

1 – Photo of completed data sheet

2 – Horizontal photograph of landscape facing N

3 – Horizontal photograph of landscape facing E

4 – Horizontal photograph of landscape facing S

5 – Horizontal photograph of landscape facing W

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