



CENTRE FOR  
INVASIVE SPECIES SOLUTIONS

# FACILITATING COMMUNITY ADOPTION OF DIGITAL RESOURCES (FERALSCAN)

FINAL REPORT FOR PROJECT P01-E-002

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We are a not-for-profit, member-based organisation formed to address the impact of invasive plants and animals across Australia.

We acknowledge the Traditional Custodians of the lands on which we meet and work and pay our respects to Elders — past, present and emerging.

We acknowledge all Aboriginal and Torres Strait Islander peoples and their continuing connection to country, culture and community.

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Cover image: Peter West holding a tablet displaying the FeralScan app.

# **FACILITATING COMMUNITY ADOPTION OF DIGITAL RESOURCES: DELIVERING SCIENCE-BASED COMMUNITY ENGAGEMENT, DATA COLLECTION AND CUSTOMISED PEST CONTROL TOOLKITS TO PEST MANAGEMENT STAKEHOLDERS (FERALSCAN)**

**FINAL PROJECT REPORT FOR P01-E-002**

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# EXECUTIVE SUMMARY

The main output of this project, FeralScan, has delivered a free, purpose-built, national pest animal surveillance, monitoring, recording and management resource. It was developed for farmers, land managers, communities, landholder groups, local government, pest control professionals and biosecurity groups, and is currently used by such groups Australia-wide.

The project facilitated the adoption of FeralScan by community user groups and government stakeholders across all states and territories, designed and implemented enhanced alert notification and communication services, and improved private group functionality.

The project has achieved significant outcomes, providing training to major stakeholder groups across Australia, consulting user groups, co-designing improvements to FeralScan with users, and facilitating adoption by biosecurity stakeholders.

## LAUNCHING A NATIONAL PEST ANIMAL INFORMATION DATABASE

The project has delivered a national database containing 316,855 records of introduced pest animal species recorded by farmers, landholders, community groups and professional pest controllers. The largest datasets exist for wild dogs, rabbits, foxes, feral deer and feral pigs. A total of 250,000 new reports were entered during the 5-year project, equating to approximately 50,000 new records per year.

Reporting highlights include:

- **153,753 wild dog reports** from farmers, landholders, pest controllers and biosecurity groups (including sightings, reports of attacks and control activities)
- **54,661 rabbit reports** from landholders, pest controllers (including warrens mapped and treated)
- **39,152 fox reports** from landholders and general public (including fox sightings in urban/rural areas, and sodium fluoroacetate (1080) baiting in agricultural/rural areas)
- **23,240 myna bird reports** from urban and semi-rural landowners (including nesting sites in urban areas)
- **12,689 feral pig reports** across agricultural and cropping regions, including professional pest controllers (including pig damage and control)
- **9,681 feral cat reports** from communities Australia-wide (including sightings and control activities)
- **9,452 feral deer species reports** (in two years) from farmers, landholder groups, and pest controllers, within rural and peri-urban areas across Australia.

## GROWING A NATIONAL COMMUNITY OF FERALS SCAN USERS

The project has fostered a national community of FeralScan users, with 40,422 registered users across all states and territories. The 5-year project drew 34,053 new users to the platform, averaging 6,810 new users per year. It is important to highlight that the number of registered users has nearly doubled in the past 12 months alone, showing high growth and demand for FeralScan in the final year of the project.

The FeralScan platform now supports 623 private landholder, community and biosecurity groups. The number of groups has increased steadily throughout the project. Most of the groups are in NSW, Vic, Qld, WA and SA. With 457 new private groups created during this project, FeralScan has onboarded approximately 90 new groups each year.

## **DELIVERING NATIONAL STAKEHOLDER TRAINING**

During this project we delivered a large-scale community and biosecurity group training program, by delivering 312 workshops, webinars, information sessions, field days and training events to major stakeholder groups across Australia. The events focused on PestSmart resources, Glovebox Guides, FeralScan and camera-trap training, and providing community support.

## **DESIGNING EFFECTIVE REAL-TIME ALERT TECHNOLOGY**

The project has designed effective real-time alert notifications and communication technology for FeralScan users. Alerts have been deployed 36,307 times, reaching 155,654 users. These are purpose-built and customised alert notifications (consisting of 1,261 different, individually created services). Alert notifications offer a rapid method of communicating incidents and important pest animal information (such as local wild dog attacks) to landholders and pest controllers, to help them work together to reduce the negative impacts of pests.

## **INCREASING DATA-SHARING WITH STAKEHOLDERS**

The FeralScan platform now shares data with the Australian Government through the Atlas of Living Australia (ALA) which will allow ALA and its clients (across government, industry, research and community) to access FeralScan data. No data is shared with ALA where it has been considered sensitive or private. Data-sharing has also been established with local government authorities, regional biosecurity groups and state governments around Australia. This involves a range of methods to ensure important pest animal data is shared with organisations that can assist communities with pest animal management.

## **DEVELOPING INTERACTIVE AND USER-FRIENDLY INTERFACES**

FeralScan users can access interactive dashboards that present summary data across a series of line graphs, tables and charts. The project has also been involved in production of 22 new videos providing instruction and guidance, promoting FeralScan and accompanying resources such as PestSmart. The videos were produced in collaboration with local, regional, state and national partners. These include new 'farmer-teaching-farmer' style videos.

New prototype maps were created of national wild dog and feral deer management programs, to provide an interactive and informative way of showcasing successful pest management programs across Australia. These can assist with communicating the benefits of pest management to communities and the Australian public.

The FeralScan platform connects people to PestSmart resources and a range of practical technologies which can:

1. be extended to connect more effectively with PestSmart
2. be expanded to connect with future information systems such as WeedScan
3. host datasets from emerging technologies (e.g. GPS tags/collars such as CERES wildlife tags)
4. quickly support communities and agencies to build datasets about feral pig and feral deer populations and reduce the risk of foot-and-mouth disease (FMD) in these populations in the event it is introduced to Australia.



# INTRODUCTION

The rapid growth in digital mobile technology has untapped potential to enhance biosecurity and productivity of agricultural systems, and to maximise industry, community and environmental benefits for landholders and the community.

Australian communities face many challenges associated with invasive species. A clear understanding of the distribution of pest animals, and current problems caused by pests, can guide future management interventions. Decision makers often rely heavily upon accurate and timely information about pest species to inform management decisions.

This project aimed to maximise the benefits of the proven community-centred FeralScan pest surveillance, detection, mapping, and response technologies (with mobile apps), to become the centrepiece for community engagement for CISS, and enhance this by supporting the adoption of innovative community networking resources to ensure community and landholder needs remain front and centre of our organisations business.

It was specifically designed to support landholders, community groups, pest controllers and biosecurity organisations with monitoring and recording information about pest species, and to promote collaborations between stakeholders through local pest animal management. It aims to build capacity among land managers and pest controllers, supporting users to identify and define the scale of the problem themselves, and to use the information they have recorded to guide pest control.

The project focused on (1) connecting communities, (2) addressing community and landholder needs, and (3) facilitating community adoption, and (4) using client-based services to deliver customised pest control support and resources tailored specifically to client needs.

This project also aimed to build on the successes of the four (4) major outputs from the previous Invasive Animals Cooperative Research Centre, including the PestSmart resource hub and social media engagement tools; next generation FeralScan for community-centred pest surveillance, mapping and alert technology; delivery of custom-built regional mapping and community engagement; and social / behavioural science community engagement approaches.

The project's anticipated outcomes were to:

1. protect communities and the environment from growing threats from wild dogs, rabbits, feral pigs, foxes, feral cats and feral deer, and new/emerging pest threats (scope to be determined by the Steering Committee)
2. provide land managers and communities of land managers Australia-wide with ready access to the latest information about pests in their local area, locally applicable pest control technology, local services and support, pest management resources, and access to relevant funding opportunities
3. facilitate timely access to relevant pest control support and expertise
4. provide local and regional management authorities with community-driven participation in Biosecurity programs, through community surveillance and local action.

This project will focus on landholder, community groups' and regional stakeholder needs with development and delivery of customised local client-focused resource toolkits, locally relevant pest mapping resources, and community networking tools for users to connect with each other, services, pest controllers or support.

Landholders, farmers, local government, landcare groups, pest control professionals and regional bodies are increasingly required to connect with services, support agencies and the community.

Users will be able to connect through a community networking portal, and benefit from an integrated PestSmart and FeralScan engagement platform. This will target web-based and mobile device customer services.

This will address demand for (1) locally relevant mapping products, (2) locally relevant information resources such as practical extension resources, field manuals, control advice and toolkits, and (3) connection to local services, support agencies, contractors, etc. The project's new facilitator role will build on the achievements of the current FeralScan project and implement a new client-focused data service, customised pest control resource delivery service and investigate sustainable funding models.

## PROJECT TEAM

The project team consisted of:

- Peter West – Project Coordinator, NSW Department of Primary Industries
- Emma Sawyers – NSW engagement specialist, NSW Department of Primary Industries (part-time)
- Michael Newton – NewtonGreen Technologies (consulting ICT provider)
- Ian McDonald and Frank Exon –communications support, CISS
- Richard Price – Research Director, CISS.

## PROJECT OBJECTIVES

1. **Enhance existing web- and app-based pest surveillance, detection and alert systems** for farmers and regional management organisations with interactive pest mapping services, client-based products and marketing. This will build on the highly successful FeralScan system, incorporating new incursion detection and response services, community networking tools and real-time data-sharing with all regional and state management authorities.
2. **Package and deliver customised pest control resource toolkits** tailored to community groups, local government organisations, landholder associations, regional NRM bodies and pest management agencies. This will be developed using a client-based support system to define and address user needs.
3. **Develop a client-focused system for data access, data-sharing, pest control support and accessing local/regional services.**
4. **Facilitate collaboration through regional, business and local government partnerships.** Participate in strategy development discussions on streamlining regional, state and national biosecurity information systems.
5. **Integrate FeralScan with the PestSmart digital platform** (see Methods).
6. **Develop podcasts, webinars and farmer-teaching-farmer training** for mobile device users, delivered through online services and sharable across platforms and management agencies.
7. **Build public and stakeholder investment in surveillance, reporting and response** through regionally marketed web- and app-based pest mapping technology via FeralScan.
8. **Support the development and adoption of new community networking resources** to connect land managers to services, supporting organisations, pest control practitioners, regional organisations and provide access to the latest pest control technologies, advice and extension services.

# METHODS

This project was designed to maximise uptake of CISS digital resources and mobile technologies, and maximise the benefits of the FeralScan and PestSmart platforms as the centrepiece for CISS stakeholder engagement. The project implemented the following methodology:

1. **Work with the Steering Committee/domain reference group**, including internal and external (end user) members during the project term.
2. **Contribute to the CISS Engagement Strategy and Monitoring & Evaluation Strategy** which will be prepared by CISS staff.
3. **Employ a National Digital Resources Facilitator**. This will be a community engagement facilitator working with digital resources extension, development and management of new innovative community networking resources, managing customised resources for pest mapping within FeralScan, and management of a customer service centre for customised resource toolkits for user groups.
4. **Provide expert input to the development of a Digital Integration Plan**. Participate in processes to set project priorities and complete strategic assessment of biosecurity information systems and weed mapping systems, including opportunities for FeralScan to add value to biosecurity information systems (including Atlas of Living Australia).
5. **Support end-user adoption of new innovative community networking digital engagement resources**. Building on an integrated PestSmart and FeralScan platform to (1) connect users to people, services and support, (2) provide customised resources directly into the hands of farmers, community groups, local government and regional stakeholders, and (3) provide a revenue stream to fund ongoing management, maintenance and development of eight services for clients.
6. **Develop client-focused resource toolkits**. Develop a suite of customised e-extension materials for groups based on their precise needs and local area. This will also include a FeralScan Guidebook. These toolkits will be published on the PestSmart website.
7. **Implement a Training Program**. Deliver essential training to farmers, community groups, local government and regional stakeholders using methods such as Podcasts, webinars, farmer-teaching-farmer video clips and digital technologies, tailored to the needs of the user group.
8. **Establish pest animal data-sharing, data access and data service agreements with local and regional stakeholders**. Continue to provide structured access to community developed pest data tailored to client needs, such as regional NRM groups accessing regional pest datasets.
9. **Pilot community developed data collection and data-sharing for weeds**. Explore opportunities for broadening the program to include weed data collected across platforms with key stakeholders and local clients, including a trial application (such as the Hudson pear) to be negotiated with NSW LLS. This will use community networking resources and web- and app-based surveillance and mapping tools for priority invasive weeds (such as Weeds of National Significance).
10. **Explore sustainable long-term funding arrangements for all stakeholders**. Providing a means to define client needs and tailor information and pest control toolkit delivery to clients at local, community and regional scales.
11. **Prepare a final report for submission to CISS**. A draft of the report will be sent to the Steering Committee/domain reference group for comment prior to submission.

## INVOLVING COMMUNITIES IN THE FERALS SCAN DESIGN

This project aimed to implement the following strategy to ensure landholders, farmers, community groups, professional pest controllers and biosecurity groups were involved in the design and development process for the FeralScan resource.

Workshops, webinars, and information training sessions were held with communities, pest controllers and biosecurity groups all over Australia. These events aimed to address the following objectives:

1. **Community consultation:** to undertake regular consultation with FeralScan user groups throughout the project to ensure the FeralScan resource is developed to meet project and end-user expectations.
2. **Prototype testing and field trial:** to assess the benefits of FeralScan versions with user groups, as it is developed, and obtain user feedback to confirm that refinements address user needs and preferences.
3. **Road-testing and refinement:** to trial upgrades of FeralScan to ensure users benefit from changes as they are implemented.
4. **Continuous improvement:** to adopt a philosophy to continuously improve the FeralScan resource to benefit end users (including farmers, landholder groups, community organisations, pest control professionals and biosecurity groups).

# RESULTS

## What FeralScan provides to users

FeralScan was created during the term of the Invasive Animals CRC and it has developed to be Australia's largest and most popular community platform for recording invasive animals information. It consists of an interactive website and mobile phone app which allows people to record information about a wide range of introduced pest animal species in their local area. It can be used by anyone anywhere, including people in areas that have no mobile phone coverage.

FeralScan can be used to record information about wild dogs, rabbits, feral deer species (fallow, sambar, chital, red, rusa and hog deer), house mouse, cane toads, feral cats, feral pigs, foxes, feral goats, feral camels, feral donkeys, feral buffalo, pest birds (including myna birds and starlings) as well as new pests such as corn snakes and red-eared slider turtles.

People can record a range of information, including the precise location of pest species they have observed or detected, enter details about their observation, add images, and provide a recommendation on what to do based on this information (such as further monitoring or use of specific control methods).

Information can be record such as:

1. **Sightings of animals**, including evidence of pest animals (e.g. animal sign, audible calls, tracks, scats and other traces).
2. **Damage caused by animals**, including categories of damage and quantified levels of damage (e.g. '6 sheep mauled').
3. **Control of animals**, including categories of control and specific details (e.g. 'baiting with 1080' and 'bait placed').
4. **Photographs** of any of the above.
5. **Notes and comments** to accompany an entry.

Information that is recorded is managed by the individual user and information management protocols, ensuring that information is managed appropriately, people have confidence in the platform and that it meets their expectations.

All information entered by users is accessible via a series of interactive, species-specific website maps which provide users with information about their region or local area.

People can join private groups where the information they record can be viewed by other members, and where they can view information from others in their private group. Alert notifications notify people within these private groups to important information, such as pest animal sightings, impacts or control that is of significance to the group.

The FeralScan web platform offers users an interactive dashboard from which to view their own summary data or data entered by members of their private group. This information is displayed with simple, user-friendly charts and tables.

Where FeralScan can provide significant benefit, is when private groups consist of all land managers across a district, ensuring that everybody is able to work together to record information about pest animals, and share this information to guide pest management decisions at the landscape scale.

Information recorded by users is readily shared with local authorities, including biosecurity groups and government agencies, to support land managers undertaking or coordinating pest control efforts.



Figure 1. The FeralScan pest reporting platform has been designed for multiple user devices.

## FERALSCAN APP DESIGN AND CONFIGURATION

The FeralScan Pest Mapping app was designed for simplicity and enables users to record information about pest animals in their local area. It was designed to cater for novice users through to professional pest controllers. The app is available from the Apple and Google Play stores for mobile devices. It has been configured to operate on a range of devices, of varying ages.

The app has been updated more than 40+ times for both Apple and Android devices, to reflect changes requested by FeralScan users throughout Australia and to meet evolving mobile device specifications.

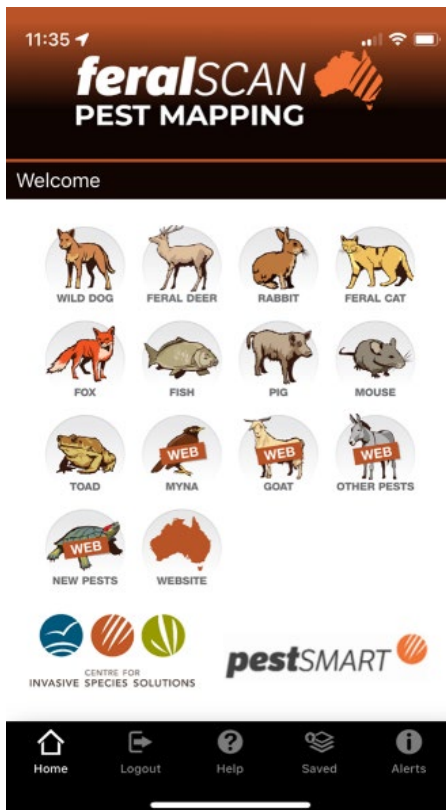


Figure 2. The FeralScan Pest Mapping app homepage

## NAVIGATING THE APP

The FeralScan Pest Mapping app was designed by landholders for the use of landholders and the broader community. The app can be installed on most mobile device types, and it can be used in areas with or without phone reception/network connection to record information about introduced pest animals.

Features of the app include a home page with visual species-selector buttons, followed by an interface where the user can choose to record a sighting, an impact or a control action based on the species selected on the home page. The app uses the inbuilt GPS receiver in a mobile device to calculate the user's current location, enabling the user to obtain precise location data to accompany their observation; users can choose an alternative location using a small interactive map. The user can login or logout, view and upload saved records (collected while out of service range) and receive and view alerts (automatic notifications) that they have subscribed to receive. Users can also learn about the pest species (which can assist in identification) or follow links to further information.

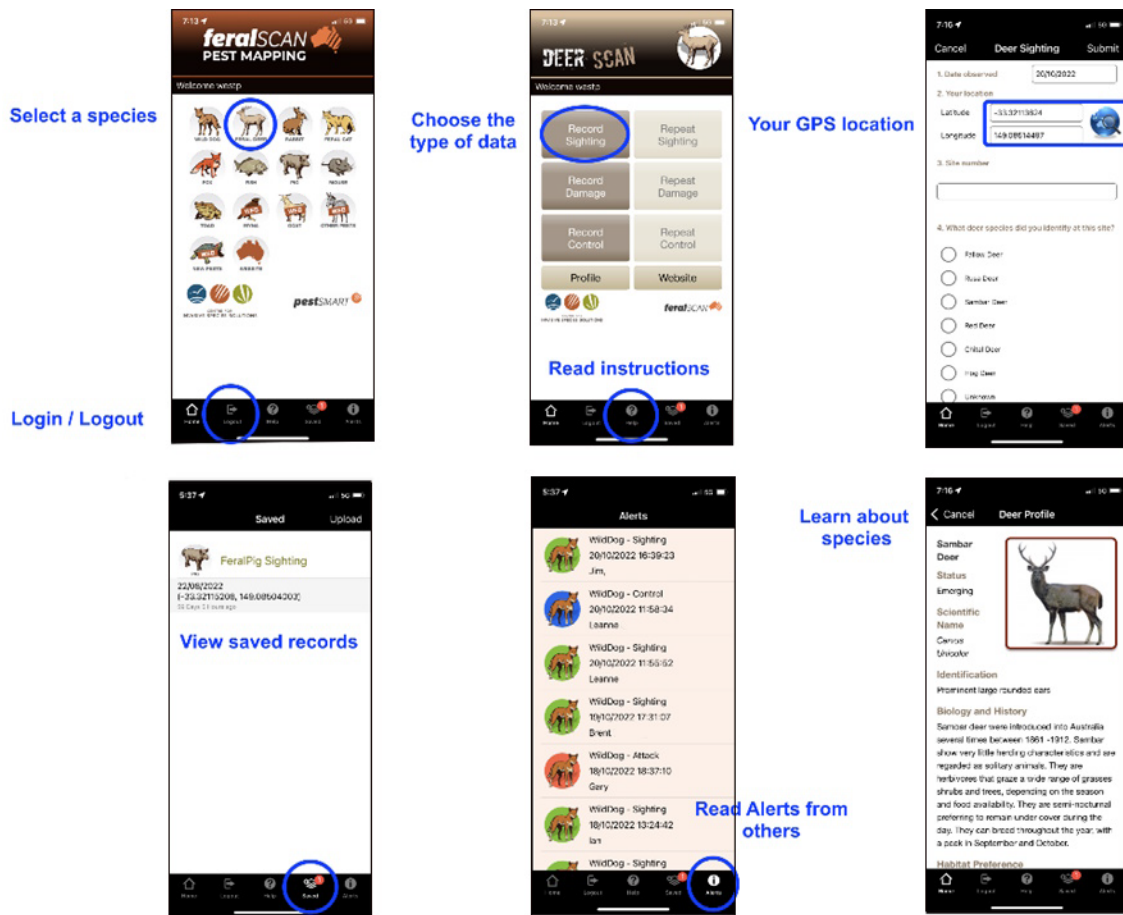


Figure 3. App pages demonstrating the user features of the FeralScan Pest Mapping app

App users do not need to log in to use the app. If they are not logged in, they will be prompted to enter an email address at the time of submitting a record. App users can navigate between species via the home page, and can navigate to the live website and live maps from all sections of the app.

App users need to be logged in to receive alert notifications.

### USE WITHOUT MOBILE RECEPTION

The app has been designed to save and store information recorded by users who are operating the system in areas without a network or mobile reception, including Wi-Fi. Stored or saved records can be uploaded by the user at their convenience when they have a restored internet or network connection. User feedback now reveals a strong preference towards automatic syncing rather than manual upload, and future updates of the app should incorporate this specification.

### USER-FRIENDLY DESIGN PRINCIPLES

Farmers, pest controllers and landholder groups have been involved in the design of the FeralScan app from day one. The most important priority outlined by users throughout the entire project has been to ensure that the FeralScan app is easy and fast to use. The priority for the project has been to codesign the app, road test various components as they are developed, in partnership with farmers and community users, and adopt a continuous improvement approach to app design.

A stepwise procedure has been implemented to reflect user requirements.



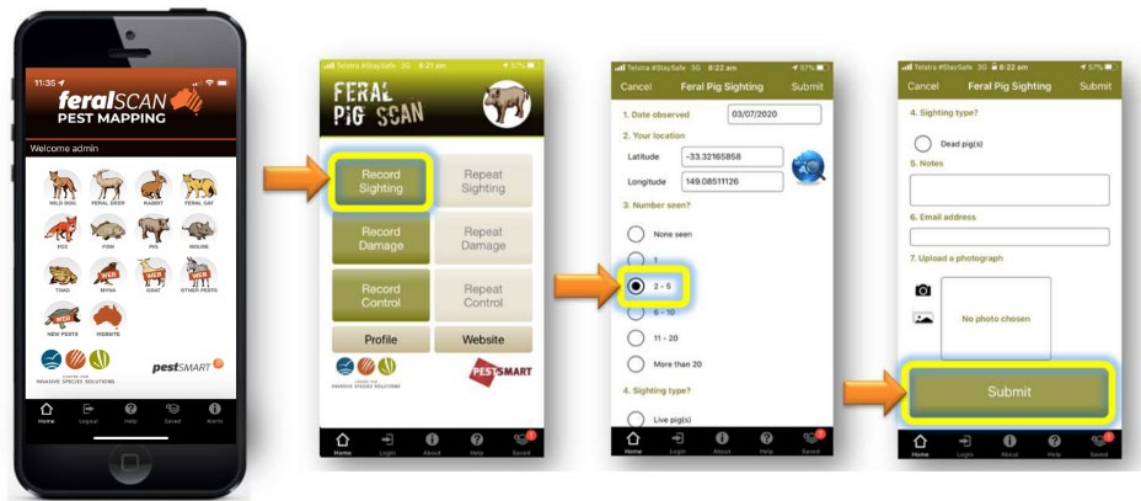


Figure 4. A user pathway for recording a pest animal sighting on the FeralScan Pest Mapping app

## MANAGING INFORMATION RECORDED BY USERS

Information recorded into FeralScan by landholders and communities belongs to those individuals. The FeralScan software hosts this information for users and shares it with important stakeholders.

Managing this information securely is necessary to protect the privacy of FeralScan users. FeralScan manages information recorded about pest animals in the following ways:

- Information is stored, managed and handled, but it is not shared with any third parties or private groups.
- Information is stored, managed and handled, then shared with any groups that use it, or it is associated or linked to, such as a landholder association or private community group.
- Information is stored, managed and handled, then shared with local government and biosecurity organisations if it is deemed important for those organisations to be made aware of that information. Some examples include:
  - wild dog attacks on livestock
  - feral deer in new locations
  - feral pigs in protected areas
  - foxes in high conservation areas
  - cane toads in new areas
- A combination of the above.

It is important to understand that there are over 620 private user groups registered to use FeralScan for recording, storing, accessing and analysing information. It is equally important to recognise that there are at least an additional 100 organisations around Australia that are end users of information recorded in their local area/jurisdiction.

Ensuring that information is managed in ways that meet the expectations of all users must remain a priority for this platform beyond this project.

## SAFELY MANAGING PRIVATE DATA

Privacy and data security are a priority for FeralScan users, so the wide range of information they provide is managed carefully and responsibly to protect the identity and location of all FeralScan users. Private information collected and stored by the app includes:

- Information about a pest animal species, the location of that species, the number of animals, photographs (and metadata), a control technique being used (including restricted chemicals such as 1080), the location of pest control equipment, the location of pest monitoring equipment such as wildlife cameras, and a range of other equipment/devices
- Information about the user who records the observation, usually including their name, their property name and location, their contact email address and mobile phone number.

FeralScan currently shares data recorded by users with biosecurity organisations and government agencies. It is expected that all information shared with biosecurity organisations and government agencies is also managed in accordance with the FeralScan protocols. The project adheres to the same privacy policy and disclaimer as PestSmart, which can be found on the PestSmart website, <https://pestsmart.org.au/privacy-policy/>.

## PROTECTING SENSITIVE SPECIES DATA

FeralScan manages data for some species that are considered sensitive by users and user groups. All data associated with those species is categorised as 'sensitive' and is treated with accordingly.

For example, all information recorded about feral deer or feral pigs across Australia is managed so that the information recorded by users is not shared with the general public. The information is restricted so that only a small amount of detail can be identified about entries, and the location is restricted so that the precise property, locality or district cannot be identified by the general public. Figures 7 and 8 show feral pig and deer data on the live websites.

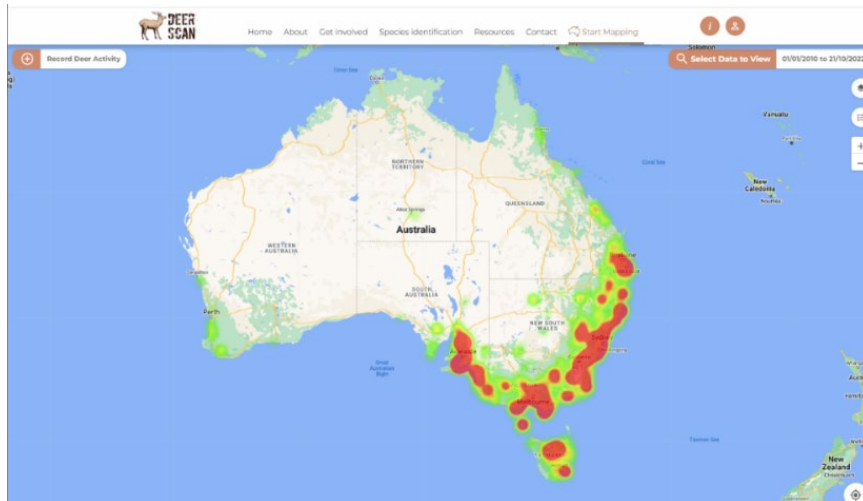


Figure 5. Live website shows feral deer activity up to 21 October 2022.

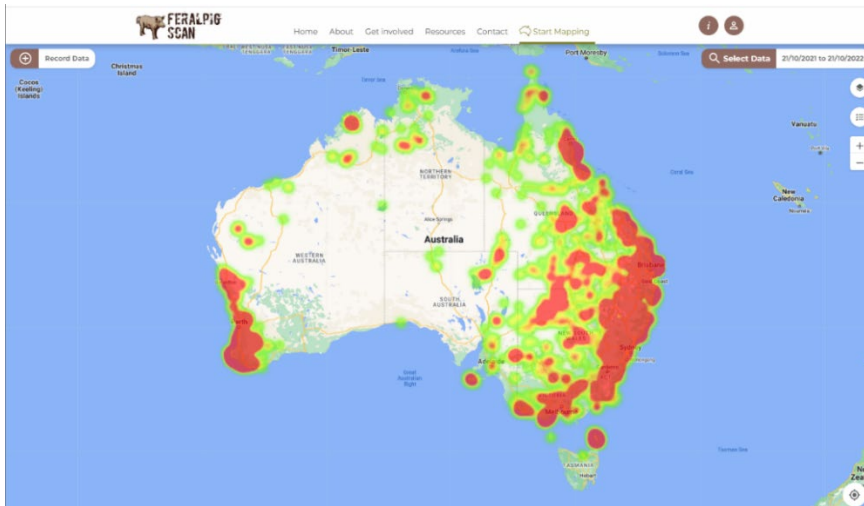


Figure 6. Live website shows feral pig activity up to 21 October 2022.

To maintain the confidence of FeralScan users that their data is safely managed, FeralScan has adopted a set of standards for managing pest species data and all associated images. Similar information about feral goats and new incursion species is managed in a way to reduce public access to detailed information.

### IMAGE MANAGEMENT

FeralScan allows people that are recording information about pest animals and to also submit one photograph to accompany their observation or record. To ensure that all images are suitable to be viewed by end users, all photos that are submitted to the system are inspected and tagged to define who can view those images and in what circumstances. Upon submission, images are reclassified as:

1. Being suitable to display to the individual contributor and all users of the platform.
2. Being suitable to the individual user and to any private community or organisational group only.
3. Being unsuitable for any user. Images classified with this category are only visible to the FeralScan administrator. Example – images depicting identifiable people or children.

The classification of photos according to these categories does not override any existing data management/privacy settings. For instance, photos that are classified as being suitable to display to all users are not necessarily visible to all users, if the data type is classified as private.

Deer photos from records
Deer Records _ Private Gallery (visible to group members)
Deer _ Admin only (not visible to anyone else)
Default_Deer

Figure 7. Options for image classification for managing submitted images

FeralScan now hosts an improved database for handling large quantities of images, such as camera-trap images of wild dogs, and wildlife monitoring cameras becoming more regularly used by people Australia-wide.



Figure 8. Example images submitted by app users

## PLATFORM TECHNOLOGY

### TECHNOLOGY

FeralScan is a responsive web application developed in Visual Studio using C#, React, Redux, ServiceStack and HangFire. It is backed by a Microsoft SQL Server 2019 database which is hosted on the Internet Information Services (IIS) server on a Windows Server 2019 machine. The mapping component was implemented using the Google Maps JavaScript API.

### HOSTING

The FeralScan web application is hosted on a 64-bit Windows Server 2019 virtual machine in Microsoft Azure (Standard E2s v3). The Microsoft SQL Server 2019 database is hosted on a separate Standard E2s v3 instance on Azure. The web application and database are backed up daily in Azure.

### COMPATIBILITY

The FeralScan web application is compatible with all modern browsers including Microsoft Edge, Apple Safari, Google Chrome and Mozilla Firefox. It performs well on all devices including desktops, Android phones and tablets, iPhones and iPads.

### FERALSCAN IOS AND ANDROID REPORTING APPS

The FeralScan platform is supported by two apps, an Apple version and Google version. Each app allows sighting, damage and control information to be reported either online or offline, and 40+ versions have been released.

## FURTHER ENHANCEMENTS

User requirements were progressively discovered over the course of beta-testing throughout the 5 year project using a range of user feedback, community consultation, agency consultation and surveys., and professional pest controllers often have slightly different requirements for recording data than landholders and the general public. Similarly, biosecurity professionals and government organisations often have slightly different requirements for data collection, handling, storage and analysis.

User feedback reveals the need to accommodate for a wider range of user requirements in terms of information collection, storage and sharing. Future updates of the app should incorporate these specifications.

## **RESPONDING TO EMERGING USER REQUIREMENTS**

Throughout the project, over 40 upgrades of the FeralScan platform (website and mobile apps) were implemented to directly address the needs of users and user groups. These needs were not identified at project inception, as many emerged as more organisations expressed interest in using the platform for new activities or projects. Some of the key upgrades are summarised here.

### **IN-APP NOTIFICATIONS FOR USERS IN THE FIELD**

The FeralScan app has been developed to include in-app notifications to share information with app users that would otherwise only be sent via email notifications. The main purpose for this functionality upgrade was to enable professional pest controllers and landholders to receive alerts while they are moving about or working their property. In-app notifications can be deployed to all app users and can be customised to send notifications about events or news.

### **PEST TOOLKITS TAILORED TO USER NEEDS**

The FeralScan software was updated to provide tailored information toolkits to recipients of in-app and email notifications. This allows us to tailor the information provided to users based on their location, circumstances and requirements. This provides an individualised, client-focused service to FeralScan users.

### **PROVIDING USERS ACCESS TO DATA**

The software was upgraded to provide arrangements by which clients or end users can request access to their data managed within the FeralScan platform. This was implemented as a direct consequence of demand and formalised a process of requesting data.

### **EASY REPEAT RECORD FEATURE**

The FeralScan apps (Apple and Android) were upgraded to enable pest control professionals (and landholders) to be able to record pest animal information repeatedly. App users requested functionality that would enable them to record the same information repeatedly but at new locations. For example, users expressed interest in a faster method of recording data such as rabbit warrens, baiting for wild dogs or foxes, fumigating rabbit warrens, etc. To address this, the apps were modified to include a 'repeat record' button. This enables a user to duplicate the details of a previous record, and record these at a new location (with new coordinates). This is suitable for users undertaking 1080 baiting activities who are time-poor and often constantly moving.

### **EXTENDING THE RANGE OF FERALS SCAN**

Modifications were implemented to the mapping interface to allow use of FeralScan on Christmas Island, Norfolk Island and several other Australia islands.

### **DNA SAMPLING RECORDS**

The FeralScan platform received a minor upgrade to allow people undertaking pest animal control to document DNA sampling activities and enter sample labels to accompany these records. For example, professional wild dog controllers who often collect tissue samples for DNA analysis can record sample or vial numbers when recording information about wild dogs, which is then disseminated to relevant DNA collection projects.

### **DETAILED RECORDINGS FOR EXOTIC ANIMAL DISEASE PREPAREDNESS**

Several government organisations have recently begun collecting more information about feral pig and deer populations across their jurisdiction in response to an increased potential risk of FMD. Similarly, there are more organisations now directly contracting professional pest controllers to control feral pigs, and many have requested changes to the FeralScan app to allow them to record more detailed information for disease prevention and preparedness. The FeralScan app is currently being upgraded to address this requirement.

## CO-DESIGNING THE PLATFORMS WITH USERS

The aim of this project was to develop a user-friendly resource to maximise adoption by community user groups and government biosecurity stakeholders across Australia. By gathering input and feedback from users, we successfully co-designed and co-created the FeralScan web and app platforms with usability in mind.

We sought input and feedback from communities and agencies in NSW, Qld, Vic, WA, SA, Tas, ACT and NT, as well as communities living on several offshore islands. These groups consisted of landholders, landholder associations, community groups, professional pest controllers, local government organisations, regional biosecurity groups, state government departments, pest control businesses and representatives from industry groups (such as NSW Farmers, Meat & Livestock Australia and Australian Wool Innovation [AWI]).

Some of the user preferences documented throughout the course of the project are detailed below.

### USER REQUIREMENTS FOR THE APP

FeralScan users reported that they required features that enabled them to:

1. quickly and easily record species-based information
2. record information about the occurrence of animals as determined by sightings of animals, evidence left by animals, such as animal sign (e.g. tracks, dung or rub marks) or photographs of animals captured from wildlife monitoring cameras
3. record information about damage caused by pest animals, including a measure of the magnitude of damage (e.g. the number of sheep killed and mauled by wild dogs)
4. record control actions undertaken by the user to reduce the damage caused by pests
5. use the app with simple and streamlined step-wise sequences, and shortcuts
6. upload photos to accompany records of pest animals
7. use the app with poor or absent phone service or network connection
8. record information without providing extensive details about the user or the pest observation
9. record information against an account for which the user can access all records themselves
10. add notes or comments to any individual record
11. specify whether the record is publicly visible or hidden (and managed privately)
12. share records in private groups regardless of privacy settings
13. moderate photographs before distribution to private groups or other stakeholders (such as government support staff)
14. filter and query data by various parameters
15. enter records retrospectively, including back-dating observations.



*Figure 9. Northern NSW wild dog management facilitator Dave Worsley demonstrates using the FeralScan App for recording wild dog control.*

#### **USER REQUIREMENTS FOR THE WEBSITE AND MAPS**

FeralScan users reported that they required website and map features that enabled them to:

1. use the interactive website to record information
2. add photographs by the website
3. log in and edit, delete or export user records
4. share information recorded by people using the app with others
5. view that information on a centralised platform (website)
6. be contacted by local support in the form of government and biosecurity organisations
7. add special layers of information for local areas
8. view an interactive live dashboard of summary data for an individual user, a user group or a jurisdiction
9. export data for an individual user, a user group or a jurisdiction
10. view all users in a private group and all data they have recorded
11. adjust the map to display new records
12. view which notifications relate to a user or group
13. receive tailored information about local and regional government support
14. receive tailored information about pest animal management relative to a user's location
15. seek support from the FeralScan Coordinator through the app and website.

A range of additional functionality requirements have been documented throughout the project to guide future upgrades of FeralScan.



*Figure 10. Professional pest controllers in Western Australia met with Peter West at a dedicated training program at Wooramel Station.*

## **ENHANCING THE PLATFORM SURVEILLANCE AND ALERT SYSTEMS**

### **DELIVERING ALERT NOTIFICATIONS TO COMMUNITIES AND PEST CONTROLLERS**

The FeralScan platform has been configured with specialised software to communicate information about pest data to nominated user groups. These are referred to as ‘alert notifications’, and they are sent via email notification and/or directly through the FeralScan app. Users can specify how they receive these notifications, through either channel or both.

This project has developed and delivered automatic alert notifications to user groups Australia-wide, including:

- individual farmers and landowners
- landholder groups, such as wild dog control associations or landcare groups
- local government organisations
- collaborations of local government and regional organisations
- regional biosecurity authorities
- state/territory government authorities
- research specialists – such as RHDV research staff.

The set-up and administration of alert notifications is a manual task of the Project Coordinator.



Alert notifications are defined by the following parameters:

1. location/area of interest/project area or administration area
2. species
3. the type of information about a species
4. the intended recipients of the notification such as a registered group.

The notifications rely on a mosaic of 566 administration boundaries and precise details about the location of users and user groups (Fig. 11 shows one such project area).

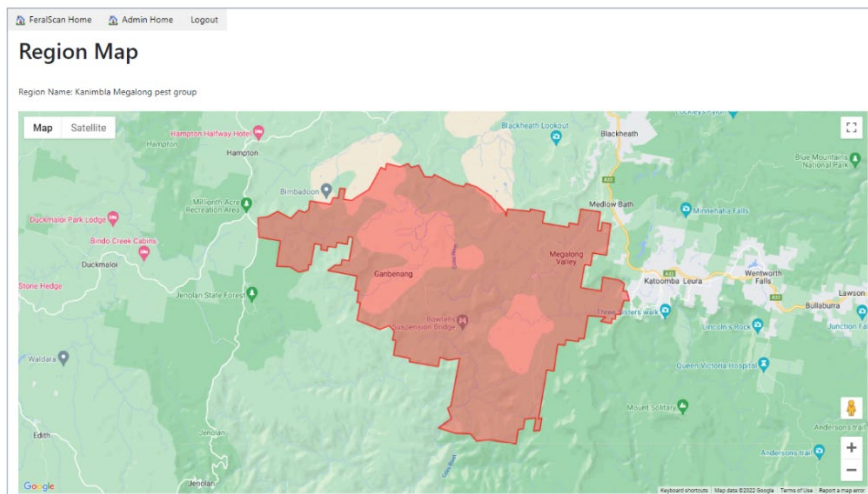


Figure 11. Project area for feral pig control in Megalong Valley, NSW

## DeerScan- New sighting record

[Click here to view this record on the map](#)

Click [HERE](#) to view the image.

### Created by:

Name:

Email:

Phone:

Username:

### Record details:

Summary: Deer species: Sambar Deer

Number seen: None seen

Sighting type: Sign (track / scat)

Age: Unknown

Sex: Unknown

Comments: Track around inside of deer proof fence

### Location details:

Date: 17 Oct 2022

Latitude: -37.

Longitude: 145.

Image: Yes

Type: Public



Figure 12. An example email notification about feral deer sighting deployed to staff at Manningham City Council (Vic). Note: private or sensitive data has been deleted.

Throughout this project, the FeralScan software has deployed 36,307 individual alert notifications to users Australia-wide. These notifications have alerted people on 155,654 occasions about significant pest data for their local area.

A total of 1,261 individual alert notifications have been configured for FeralScan users, detailed in Table 2.

*Table 1. Number of alerts configured and distributed to FeralScan users, by pest groups.*

Pest groups	Number of alerts
Wild dogs	685
Feral deer	223
Feral pigs	163
Cane toads	41
Rabbits	37
Foxes	31
New pests (red-eared slider turtles, corn snakes etc.)	20
Feral cats	19
Feral goats	17
Myna	8
Pest fish species	6
Donkeys, camels and buffalo	6
Starlings	3
The house mouse	2

#### *IN-APP ALERT NOTIFICATIONS*

FeralScan alert notifications are also deployed to mobile device users through the in-app notifications to the mobile app. This ensures that notifications reach farmers and landholder groups, pest controllers, landholder associations, local government organisations, biosecurity agencies and pest management stakeholders in a timely manner.

One of the benefits of in-app notifications is the rapid communication of pest data between community and pest controllers or decision makers. For instance, the notifications can immediately alert community end users and professional pest controllers to information recorded by people in their local area or management jurisdiction.

For professional pest controllers who are contracted to work in a region, this often enables them to respond in a timely manner to information they have received from the landholders they are contracted to support and protect.

An example of how the in-app alerts appear when deployed to a user's mobile phone is shown in Fig 19. Users can also elect to view detailed information by selecting an individual alert in the app alerts tab. This can reveal the photograph and the location of the record on a map.

This notification capability was developed in early 2022 and will greatly enhance the capacity of FeralScan to promptly alert users about important pest animal data.

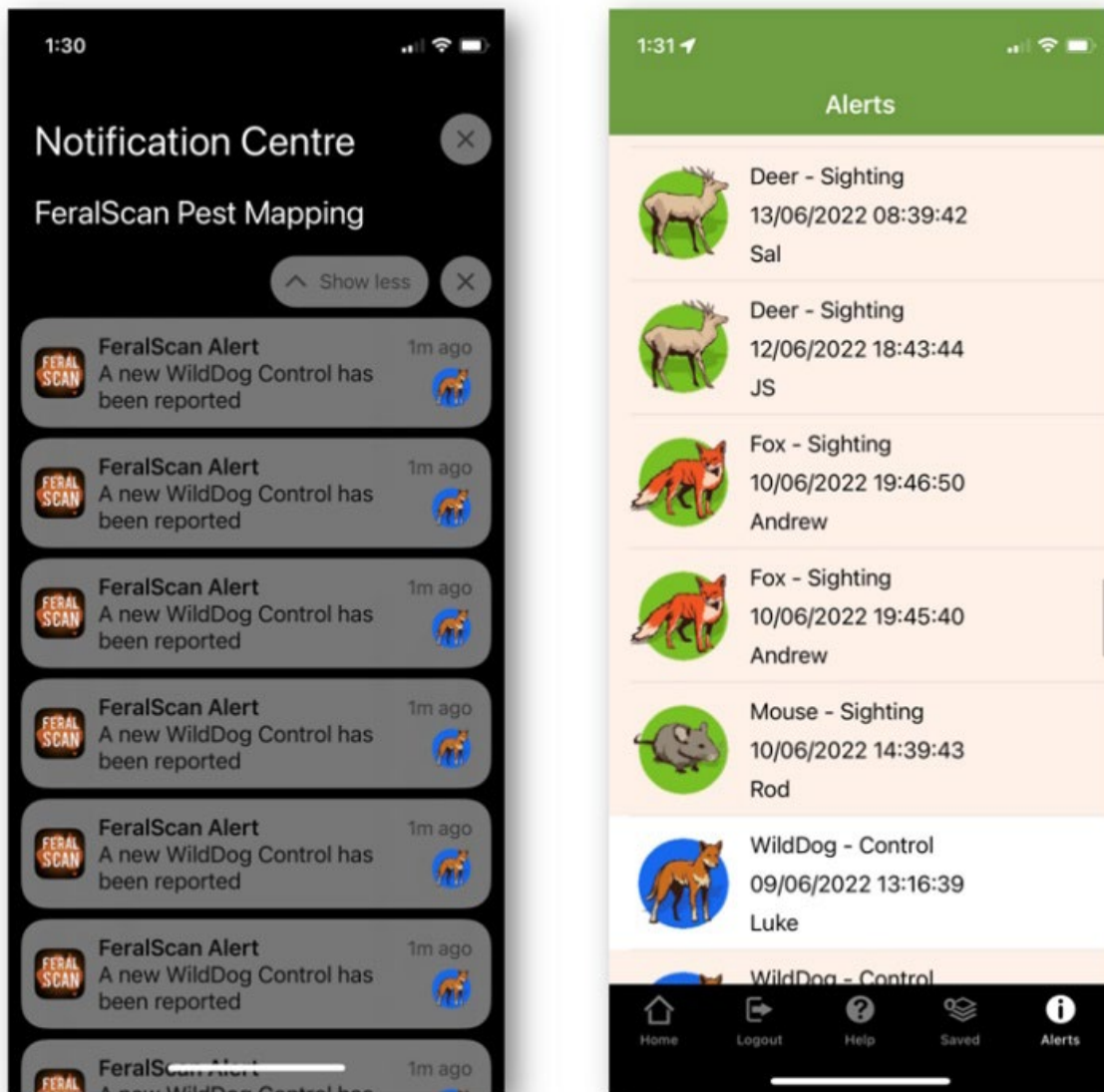


Figure 13. How FeralScan alerts appear as banner notifications on a mobile device (left) and in the app alerts tab (right)

## DASHBOARDS TAILORED TO USERS AND USER GROUPS

At the request of user groups, the FeralScan resource has been developed to provide an interactive dashboard containing summary data for users and user groups.

Each dashboard contains a timeline of records (sightings, damage and control) entered by users in FeralScan. This can be adjusted to display a narrow or wide date range as required. Each dashboard also contains a tally of priority information per species. For instance, for wild dogs the dashboard displays the number of wild dogs observed, and related categories, as well as tallies of wild dog damage data and wild dog control data. The dashboard provides charts of information recorded that for each individual in a private group.

Dashboards (as shown in Fig. 14) are available to approximately 510 registered private user groups in FeralScan. Dashboards are available to all wild dog control groups using FeralScan.

### Sighting and Damage



### Control

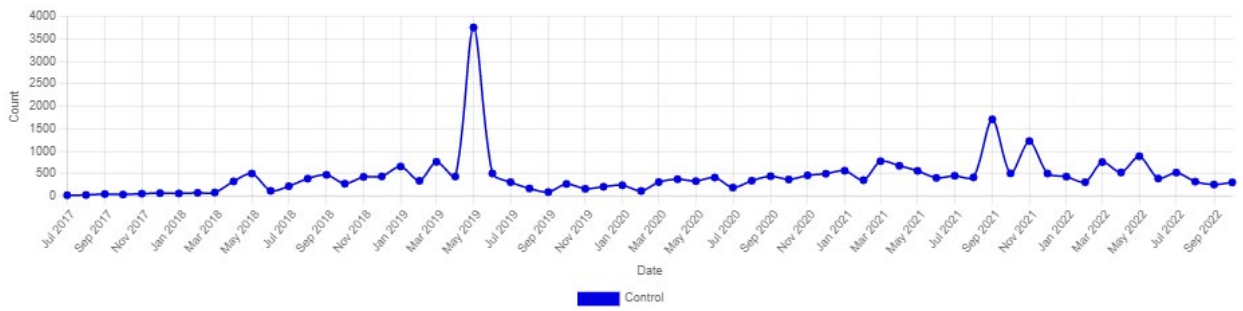


Figure 14. A WildDogScan dashboard summarising the reporting activities of professional wild dog controllers in the Carnarvon Rangelands Biosecurity Group (WA)

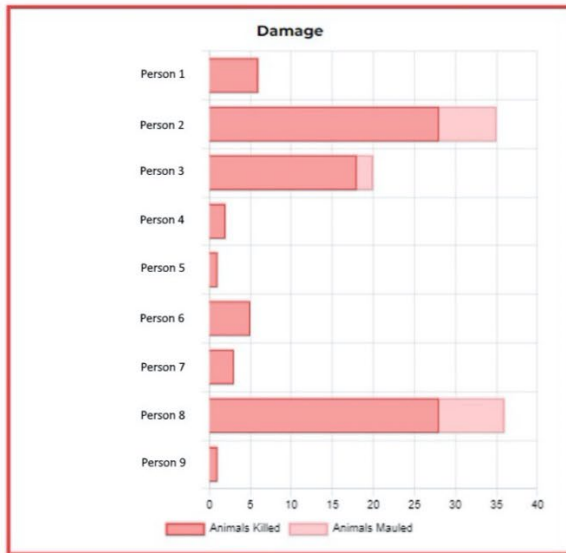
Sighting Type	This Period	YTD
<b>Number of sighting records</b>	<b>3871</b>	<b>340</b>
<b>Number of wild dogs observed</b>	<b>490</b>	<b>157</b>
Live dogs observed	215	23
Dead dogs observed	173	123
<b>Sign (track/scat)</b>	<b>102</b>	<b>11</b>

\* Note, this does not reflect all observations and wild dog activity.



Damage Type	This Period	YTD
<b>Number of damage records</b>	<b>117</b>	<b>14</b>
<b>Number of animals killed</b>	<b>92</b>	<b>9</b>
Cattle killed	1	0
Calves killed	4	1
Goat killed	18	3
Goat kids killed	1	0
Lambs killed	12	0
Poultry killed	1	0
Sheep killed	55	5
<b>Number of animals mauled</b>	<b>17</b>	<b>0</b>
Calves mauled	6	0
Goat mauled	1	0
Lambs mauled	3	0
Sheep mauled	7	0

\* Note, this does not reflect total damage caused by wild dogs



Control Type	This Period	YTD
<b>Number of control records</b>	<b>28446</b>	<b>4742</b>
<b>Number of dogs destroyed</b>	<b>2437</b>	<b>518</b>
Wild dogs trapped:	2158	458
Wild dogs shot:	279	60
<b>Number of baits laid</b>	<b>14241</b>	<b>1784</b>
1080 ground bait laid:	14196	1779
PAPP ground bait laid:	18	1
Canid Pest Ejector laid:	27	4
<b>Number of traps set</b>	<b>3405</b>	<b>497</b>
Cage trap set:	26	0
Padded-jaw trap set:	3379	497

\* Note, this does not reflect all control activities for wild dogs

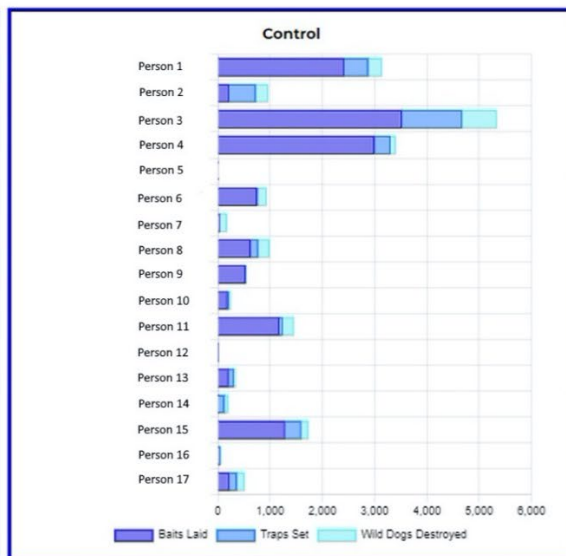


Figure 15. Example dashboard showing sighting data, damage data and control data for wild dogs reported by licensed pest management technicians during a reporting period in the Carnarvon Rangelands Biosecurity Association area of WA

## **DISTRIBUTING TAILORED INFORMATION TO USER GROUPS**

### **PESTSMART GLOVEBOX GUIDES AND LOCALLY RELEVANT INFORMATION**

One of the priorities of this project has been to deliver tailored information (toolkits) to people that are using the FeralScan platform. This includes information that might be important for their local area, details about local authorities that they can seek support from, or relevant information about the control of pest animals relative to their local circumstances.

The primary reason for this is to provide a valued service to FeralScan users, and to avoid the trap of providing generalised information to individual users which then places the burden on citizen scientists to assess whether it is relevant to their local pest initiatives.

This project now delivers a toolkit of relevant information through the existing purpose-built alert notifications. These are delivered through email and in-app notifications to users and user groups.

Alert notifications now distribute information about:

- existing PestSmart resources, such as Glovebox Guides and baiting or trapping guides, so users receive the latest information from CISS and PestSmart.
- contact information for local biosecurity organisations, so users can get in touch with organisations for further assistance.
- practical resources such as deer identification guides, local pest control guides, and links to other websites such as state government.

The FeralScan platform currently manages 1,261 purpose-built alert notifications for users and user groups. The priority hereafter will be to continue to improve these tailored information services, to ensure that FeralScan users continue to receive support that is relevant to their local pest situation and personal circumstances. This type of customised delivery of information can also be considered with any future upgrades of the PestSmart website.



## CREATING USER-FOCUSED DATA-SHARING AND DATA ACCESS

### SHARING DATA WITH COMMUNITIES, GOVERNMENT AND LANDHOLDER AND BIOSECURITY GROUPS

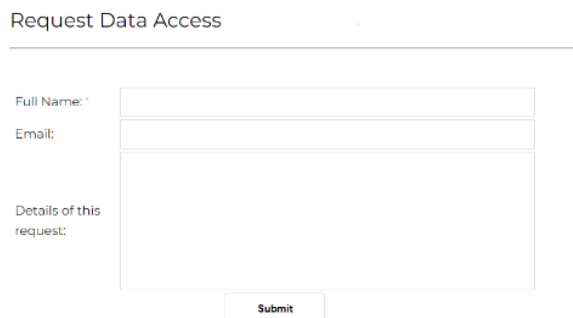
Four approaches have been taken for sharing information from the FeralScan platform with users and third parties:

1. **Data-sharing via real-time email notifications.** The FeralScan program currently provides 1,281 individually developed real-time notifications to share data with end users.
2. **Data-sharing with individuals through ‘purpose-built’ data-access arrangements.** This includes secure login access to portions of the FeralScan dataset for individual administrative areas. This is provided to 631 people across Australia.
3. **Automatic data-sharing through configuration of secure web API's.** Examples of this include the automatic provision of data to ALA (details below) or to the NSW DPI BioMap application, which shares and updates all NSW data daily through a secure web API.
4. **Supplying exported data for individual users and organisations on demand.** This is provided by the Project Coordinator in response to direct requests for access to data. An example of this is the provision of data to researchers as a one-off.

### NEXT STEPS: NEW DATA ACCESS REQUEST PORTAL

Establishing long-term data-sharing arrangements with biosecurity and government organisations will require formalised agreements with all parties accessing FeralScan data, including licenced access arrangements.

FeralScan now offers clients the opportunity to request access to data for their jurisdiction through an online request form. The purpose of this to formalise arrangements for requesting and providing data to clients.



Request Data Access

Full Name: \*

Email:

Details of this request:

Submit

Figure 17. ‘Request Data Access’ contact form fields in FeralScan

## FACILITATING COLLABORATIONS THROUGH REGIONAL, BUSINESS AND LOCAL PARTNERSHIPS

### SHARING DATA WITH THE AUSTRALIAN GOVERNMENT VIA THE ATLAS OF LIVING AUSTRALIA

The FeralScan platform has been configured to share non-sensitive data with ALA through secure web API (uploaded once per day) at the request of CISS and the Department of Agriculture, Fisheries and Forestry. Over 111,000 pest animal occurrence records are currently shared with ALA, allowing its users and partners to access non-sensitive FeralScan records. This represents approximately 32% of all FeralScan data and photographs.



Sharing of data from FeralScan with the ALA forms a basis of an important partnership between these distinct data management platforms. FeralScan data can be viewed live on ALA via:

- [biocache.ala.org.au/occurrences/search?q=data\\_resource\\_uid%3AAdr19813](http://biocache.ala.org.au/occurrences/search?q=data_resource_uid%3AAdr19813)
- [collections.ala.org.au/dataResource/show/dr19813](http://collections.ala.org.au/dataResource/show/dr19813).

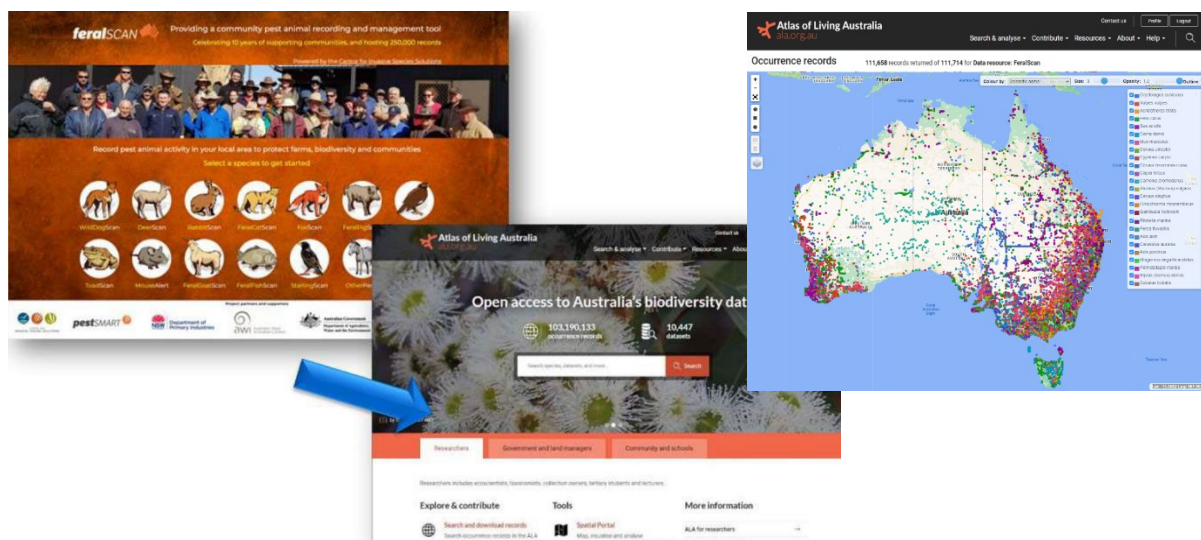


Figure 18. The Atlas of Living Australia receives non-sensitive FeralScan data (updated daily).

Occurrence information is shared for the species listed in the table contained in [Appendix 6](#). No information is shared about the control or impacts of pest animals, as reported by FeralScan users. No information is shared about FeralScan users. No information is shared about new pest species in the wild (such as red-eared slider turtles).

**Note: only non-sensitive species data is shared with ALA. No wild dog data is shared with ALA at this stage.**

## SHARING DATA WITH STATE/TERRITORY GOVERNMENTS AND BIOSECURITY AUTHORITIES

The FeralScan platform has been configured to share data with government and biosecurity organisations throughout Australia. The main data-sharing arrangements for states and some regions are outlined below.

### NSW

FeralScan shares data with NSW DPI, NSW LLS and local government organisations across the state. Data is shared with the NSW BioMap program and NSW MyLLS system, through daily-database sharing. These organisations also receive data via alert notifications and data access logins granted to individual staff members.

FeralScan data is available to supply to other government organisations if requested.

### INSTITUTIONALISING FERALS SCAN WITHIN NSW LOCAL LAND SERVICES

Data is shared with NSW LLS staff across the state through a secure web API (uploaded once per day). Over 111,000 pest animal occurrence records are currently shared with the Information and Communication Technology branch of NSW LLS, ultimately allowing all NSW LLS staff to access FeralScan records.

NSW LLS staff can view FeralScan data via the MyLLS system, which covers all business areas of NSW LLS. Part of the application uses a data feed from FeralScan which can assist LLS staff with several essential tasks, including view and interrogate FeralScan records to:

- assess pest species distribution over time (used in conjunction with the existing pest species distribution reference layers)
- inform risk assessments/risk management
- identify priority areas for establishment of new activities and programs
- justify staff effort and resource use
- assess the efficiency and effectiveness of existing programs
- inform compliance actions
- generate local, regional and statewide metric reports
- complement existing systems to detect and respond to 'alert species'.

Data shared with NSW LLS represents approximately 32% of all FeralScan data and photographs. Continuation of the FeralScan program is vitally important for this particular organisation.

## **SA**

FeralScan shares data with the SA state government, nine landscape boards and local government authorities across the state. FeralScan was also configured for 21 local area planning regions. This includes provisions of alert notifications (via email) to landholders or pastoralists within those regions, and sharing of relevant pest data with the state government for management planning. These organisations also receive data through alert notifications and data access logins granted to individual staff members.

## **WA**

FeralScan shares data with the WA Department of Primary Industries and Regional Development (DPIRD) and WA-based regional/recognised biosecurity organisations including:

- Carnarvon Rangelands Biosecurity Association
- Northern Biosecurity Group
- Eastern Wheatbelt Biosecurity Group
- Central Wheatbelt Biosecurity Association
- Kimberley Rangelands Biosecurity Association
- Pilbara Regional Biosecurity Group
- Meekatharra Rangelands Biosecurity Association
- Goldfields Nullarbor Rangelands Biosecurity Association
- Esperance Biosecurity Association
- Southern Biosecurity Group
- Blackwood Biosecurity Group.

This enables regional groups to monitor wild dog activity, as well as outcomes of licenced pest management technicians across the regions. This includes provision of wild dog attack alert notifications (via email) to relevant biosecurity and government staff, and data-sharing with DPIRD. This has been supported by the WA Government Royalties for Regions Program, and Australian Wool

Innovation (AWI). These organisations also receive data through alert notifications and data access logins granted to individual staff members.

## **QLD**

FeralScan datasets are shared with several Queensland government departments, and is recently being supplied to support the Queensland Statewide Pest Distribution Survey. Data is also shared with a number of local/regional councils, such as Sunshine Coast Regional Council and regional council collaborations. The opportunity still exists for real-time data-sharing of FeralScan data with Biosecurity Queensland.

## **VIC**

FeralScan shares some wild dog, feral pig, feral deer and rabbit data with Victorian state government departments, as well as local government organisations across the state. The opportunity still exists for real-time data-sharing of FeralScan data with the Victorian Biodiversity Atlas (VBA).

## **TAS**

FeralScan shares data about deer species with several Tasmanian government organisations, as well as information about feral pigs and deer on many islands. It also shares some information about feral cats with a few local government organisations in Tas. The opportunity still exists for real-time data-sharing of FeralScan data with the Natural Values Atlas or any other systems.

## **NT**

FeralScan data is shared with a number of local and regional councils in NT. FeralScan datasets are available to supply to the government if requested.

## **SHARING DATA WITH LOCAL GOVERNMENT AUTHORITIES**

### **ACT**

Wild dog, feral deer and pest fish data is shared with ACT government representatives. FeralScan datasets are available to supply to the government if requested.

## **BUILDING PUBLIC AND STAKEHOLDER INVESTMENT IN PEST REPORTING**

### **REPRESENTING FERALSCAN, CISS AND NSW DPI AT COMMUNITY EVENTS**

It is important to recognise that this project has involved considerable investment in engaging with communities, landholder groups, professional pest controllers and biosecurity organisations to promote community use of FeralScan, PestSmart and NSW DPI information resources.

The Project Coordinator represented FeralScan, CISS and NSW DPI at many events throughout the project (see Appendix 10). These events were held across all jurisdictions and involved representatives from as many organisations and communities as possible. Periods of state-wide lockdowns due to COVID-19 resulted in a shift to online events and webinars.

During these events, partnerships and relationships were developed and a wide range of information resources were distributed to participants, including over 2,500 copies of each CISS Glovebox Guide to managing different pest animals.

The events were invaluable for developing FeralScan as a community-led program.




Figure 19. Example images from events and displays where FeralScan was promoted to the community by the project coordinator

## PROMOTING AND INCREASING UPTAKE OF FERALS SCAN AT EVENTS

One of the objectives of this project has been to raise awareness about pest animals and promote the FeralScan and PestSmart resources.

To promote the use of the FeralScan resource, and to encourage people to record and report information about pest animals, several printed and digital resources were disseminated at events to local coordinators, landcare groups, local government organisations, biosecurity groups, state government agencies and community representatives.



**DEERSCAN feralSCAN**

Have you seen feral deer in your local area?

Feral deer impact farmland and native species

**HELP REDUCE THE PROBLEMS CAUSED BY FERAL DEER**

Record sightings, impacts and control.  
Keep authorities informed.  
Numbers are growing in most regions.  
For control visit [pestSMART.org.au](http://pestSMART.org.au)

Download the free App

[www.deerscan.org.au](http://www.deerscan.org.au)

Contact FeralScan: [feralscan@feralscan.org.au](mailto:feralscan@feralscan.org.au) 02 6391 3887 | 0407 622 191

FeralScan supporters:

Australian Government Department of Agriculture, Water and the Environment  
New South Wales Department of Primary Industries  
CSIRO  
National Feral Deer Action Plan



**DEERSCAN feralSCAN**

Have you seen feral deer in your local area?

Feral deer damage crops and orchards, compete with native animals, browse gardens and native vegetation, cause diseases, and are a serious fire risk.

Their numbers are growing in most regions of Australia.

**HELP REDUCE THE PROBLEMS CAUSED BY FERAL DEER IN YOUR LOCAL AREA.**

Record sightings, evidence, impacts and control of feral deer.  
Connect with organisations, support and resources.  
Stay informed about feral deer in your local area.  
Information you enter will be kept secure, and can help guide local feral deer control programs.

For information on deer control visit [www.pestSMART.org.au](http://www.pestSMART.org.au)  
Download the App, or visit [www.deerscan.org.au](http://www.deerscan.org.au)

Contact FeralScan: [feralscan@feralscan.org.au](mailto:feralscan@feralscan.org.au) 02 6391 3887 | 0407 622 191

FeralScan supporters:

Australian Government Department of Agriculture, Water and the Environment  
New South Wales Department of Primary Industries  
CSIRO  
National Feral Deer Action Plan



**DeerScan mobile app instructions**

Step-by-step instruction to help you record information about wild deer using the FeralScan App.

1. Select deer
2. Select data type
3. Answer the questions
4. Submit report

Download the App **FREE** from the app stores, for more information visit the website [www.deerscan.org.au](http://www.deerscan.org.au)

FeralScan - Contact [feralscan@feralscan.org.au](mailto:feralscan@feralscan.org.au) | Telephone - 0407 622 191



**FERAL DEER SCAN**

Record sightings, impacts and control of feral deer.

Download the App, or visit [www.deerscan.org.au](http://www.deerscan.org.au)

Figure 20. Example of promotional materials – showing a DeerScan banner, poster, instruction sheet and card

## DEVELOPING CROSS-PLATFORM TRAINING RESOURCES

### WORKSHOPS, WEBINARS AND GROUP TRAINING TO PROMOTE ADOPTION

This project implemented an Australia-wide training program aimed at assisting people to use the FeralScan resource, and to play a role in its design and development.

In total, 312 events were coordinated including a series of face-to-face workshops, online webinars, information sessions, group training activities, and informal community training events. The Project Coordinator attended field days, workshops community group meetings, association AGMs, agricultural shows and pest control planning days.

The objectives of these events were:

1. Meet with people including farmers, land owners, community groups, professional pest controllers, biosecurity group representatives, and the general public, to hear about the issues affecting them with pest animals.
2. Assist people to learn about the FeralScan resource and consider what it may offer to them in their local circumstances.
3. Support people to adopt and use the FeralScan resource in the best possible way.
4. Develop networks and working partnerships with landholders, community groups and pest management stakeholders.
5. Build trust and rapport with groups, and develop professional relationships.
6. Train people in how to guide others with the use of FeralScan.
7. Involve the community and pest control stakeholders in the design of FeralScan, to meet their requirements and expectations.
8. Enable end users to influence how FeralScan could be applied/adopted to provide the best possible benefits.
9. Involve professional pest animal controllers and biosecurity authorities in the design and development of the FeralScan resource – to meet their needs.
10. Support users to connect with PestSmart resources, including the range of practical Glovebox Guides to managing pest animals.
11. Assist people to connect with local organisations and support.
12. Advocate for a collaborative landscape approach to monitoring, recording and managing pest animal species.
13. Distribute and disseminate practical resources from CISS and partners, directly into the hands of communities.

Workshops, online webinars, information sessions, and training activities were delivered in all states and territories. Events were usually coordinated in partnership with local organisations and biosecurity groups, or supported by local or state government agencies.

A full list of the workshops, online webinars, information sessions, field days and training activities is outlined in [Appendix 10](#).

### **INDUSTRY SUPPORT RESULTED IN SIGNIFICANT BENEFITS**

Industry support from Australian Wool Innovation (AWI) was instrumental in the successful delivery of multiple face-to-face professional training events in WA, western NSW and northern NSW. The training programs provided an immediate and lasting benefit to professional pest animal controllers in those jurisdictions, as they continue to use FeralScan extensively in their activities.

Support from the NSW Farmers Association was also highly beneficial in delivering a series of workshops throughout western NSW in 2021. Those workshop training events led to the formation of five new private landholder groups in FeralScan, and supported professional pest controllers to be more targeted with their control activities.

The events also provided an excellent opportunity to disseminate and distribute practical resources from CISS. In total, 2,500 copies of each of the PestSmart Glovebox Guides to managing pest animals were distributed to landholders and communities throughout the project.

## TRAINING RESOURCES AND FARMER-TEACHING-FARMER VIDEOS

Throughout this project, 22 videos providing instruction, guidance and promotion of FeralScan and related resources (such as PestSmart) were produced in collaboration with local, regional, state and national partners. Links to these training videos are provided below, including the new farmer-teaching-farmer format videos.

- FeralScan 10-year anniversary: [youtube.com/watch?v=DkESf1CLOZk](https://youtube.com/watch?v=DkESf1CLOZk)
- Keeping Cold Country Koalas safe from pests: [youtube.com/watch?v=vOMV1Ok5F\\_g](https://youtube.com/watch?v=vOMV1Ok5F_g)
- Using FeralScan – South Australian Arid Lands: [youtube.com/watch?v=LWp-TGIH750](https://youtube.com/watch?v=LWp-TGIH750)
- Using DeerScan to record sightings of feral deer: [youtube.com/watch?v=mIYWA0\\_AX0o](https://youtube.com/watch?v=mIYWA0_AX0o)
- Monitoring feral deer in cape Liptrap: [youtube.com/watch?v=gXLjrcnf-zM](https://youtube.com/watch?v=gXLjrcnf-zM)
- Cape Liptrap – impacts of feral deer to the environment: [youtube.com/watch?v=c17Wf-gAa3A](https://youtube.com/watch?v=c17Wf-gAa3A)
- Feral deer webinar North Coast LLS: [youtube.com/watch?v=jkHDNPu24kl](https://youtube.com/watch?v=jkHDNPu24kl)
- Managing feral deer in Western NSW: [youtube.com/watch?v=B-v1dylys2k](https://youtube.com/watch?v=B-v1dylys2k)
- How to set up camera traps for wildlife monitoring: [youtube.com/watch?v=KLVC6cXNx\\_U](https://youtube.com/watch?v=KLVC6cXNx_U)
- Feral deer – What you should be looking for and reporting: [youtube.com/watch?v=KWS5zUoHcjc](https://youtube.com/watch?v=KWS5zUoHcjc)
- Feral deer – issues, impacts and what you can do: [youtube.com/watch?v=efZE\\_abl704](https://youtube.com/watch?v=efZE_abl704)
- Feral deer – How to report activity through the FeralScan app: [youtube.com/watch?v=EZQ1q25JWio](https://youtube.com/watch?v=EZQ1q25JWio)
- How to report feral deer: [youtube.com/watch?v=C5MfumJZsLQ](https://youtube.com/watch?v=C5MfumJZsLQ)
- Menangle Fox Campaign: [youtube.com/watch?v=I55bF7\\_Sqvk](https://youtube.com/watch?v=I55bF7_Sqvk)
- The rise of a new invasive species – the feral deer: [youtube.com/watch?v=l-tKEg-zBbU](https://youtube.com/watch?v=l-tKEg-zBbU)
- Tasmanian Wilderness – Under threat from feral deer: [youtube.com/watch?v=ZM32WrpA7uU](https://youtube.com/watch?v=ZM32WrpA7uU)
- Feral animals in Sydney – Learn to use FeralScan: [youtube.com/watch?v=vj4ukR\\_PkUc](https://youtube.com/watch?v=vj4ukR_PkUc)
- Virtual Citizen Science – Bellarine Catchment Network: [youtube.com/watch?v=qLdV00mbm-w&t=403s](https://youtube.com/watch?v=qLdV00mbm-w&t=403s)
- Friends of the Royal National Park – FoxScan webinar: [youtube.com/watch?v=O\\_jUTxNXNQ0](https://youtube.com/watch?v=O_jUTxNXNQ0)
- The Blockies Guide – managing pests: [youtube.com/watch?v=cccBjN3h\\_Jo](https://youtube.com/watch?v=cccBjN3h_Jo)
- Northern Beaches Fox Management webinar: [youtube.com/watch?v=zFc0Z7eRCuY](https://youtube.com/watch?v=zFc0Z7eRCuY)
- How much are feral pigs impacting your bottom line: [youtube.com/watch?v=eN1NALX\\_giM](https://youtube.com/watch?v=eN1NALX_giM)

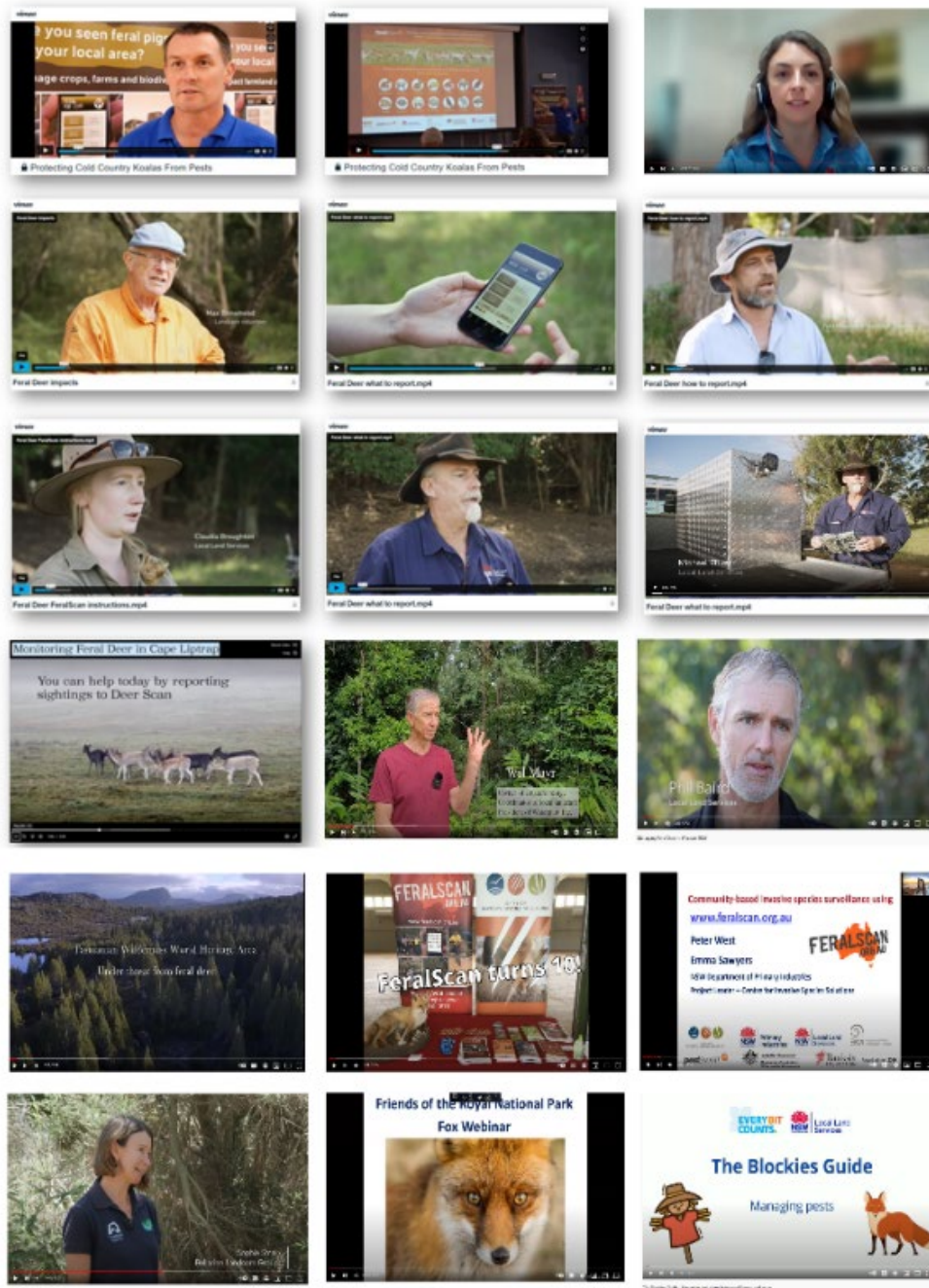


Figure 21. Example of digital videos produced to promote FeralScan to various communities around Australia



## ADDITIONAL OUTPUTS

### PROTOTYPE MAPS FOR WILD DOG AND FERAL DEER MANAGEMENT PROGRAMS

During this project, an additional opportunity emerged to develop a new communication platform which will also extend beyond the life of the current project. In partnership with the National Wild Dog Action Plan, and its Management Coordinator, the FeralScan platform has been extended to provide an interactive and informative map to highlight wild dog management programs across Australia.

The purpose of this new interactive map will be to allow people to learn about wild dog management programs around Australia, what they are achieving, and help people to learn more about those programs as success stories.

The online map has not been launched but is expected to be available within the next 4-5 weeks. This output will be reliant on gathering detailed information about wild dog management programs and converting this data into an interactive map. The interactive map will be accessible from both the WildDogScan and the National Wild Dog Action Plan websites.

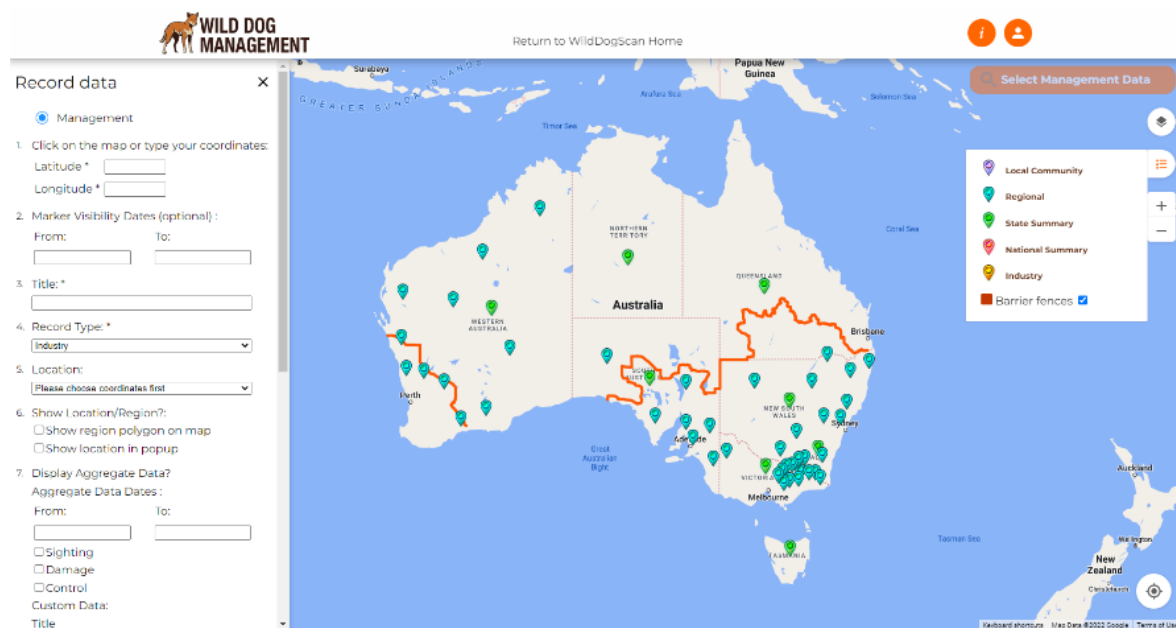


Figure 22. Prototype map for wild dog management programs

Simultaneously, the same opportunity has emerged to produce an interactive communication platform to showcase success stories for feral deer management around Australia. This is also reliant on gathering detailed information about feral deer management programs and converting the data for map display.



Figure 23. Prototype map for feral deer management programs

## PILOT OF A NEW INCURSIONS PORTAL

The NewPests reporting feature in FeralScan is the most recently developed component of the FeralScan platform. It has been live for a year, and is used to raise awareness about American corn snakes and red slider turtles in NSW, and to encourage existing FeralScan users to record information if they see new pest threats in their local area. The platform has seen over twenty reports from users with new information about corn snakes and red-eared slider turtles, but the website 'animal identification' pages have been viewed more than two thousand times. This suggests that people have taken the time to learn how to identify corn snakes and red-eared slider turtles.

The NewPests reporter can play an important role in the FeralScan platform, as an additional tool that allows users to record new pests if they find them in their local area. The opportunity still exists to engage further with existing FeralScan users throughout Greater Sydney (and other regions) to develop a network of community representatives.

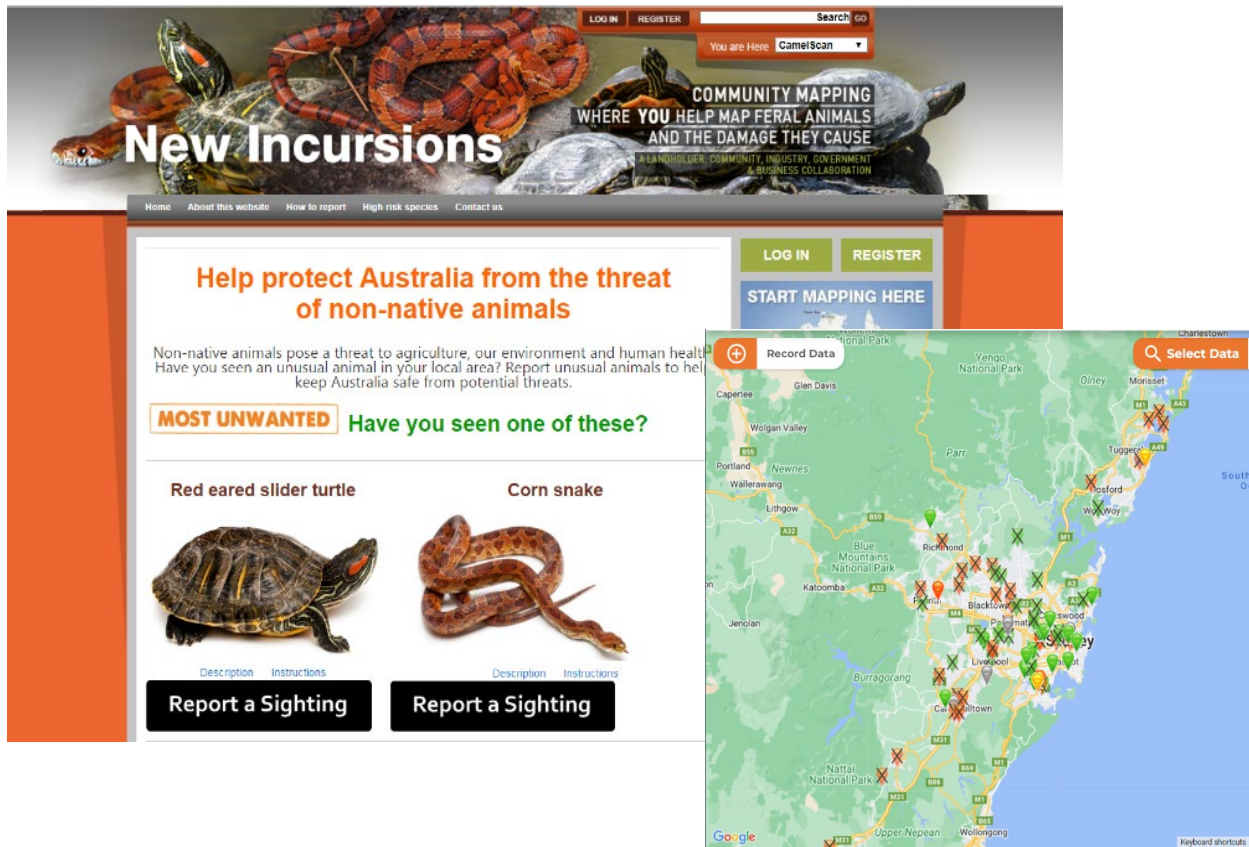


Figure 24. The NewPests website homepage (left) and a map of Greater Sydney region (right) showing reporting locations for new pests detected in NSW

## PROJECT OUTPUTS

This project has delivered a purpose-built and adaptable pest animal monitoring, recording, and management resource for communities, pest controllers and biosecurity groups Australia-wide.

The project has delivered several significant outputs, including:

1. **a national FeralScan web and mobile app community platform enabling all Australians to monitor, record and manage pest species.** The platform consists of the FeralScan Pest Mapping app (in Apple and Android formats) and 14 species-based websites with interactive maps containing reports of pest animals, the damage they cause and control actions. The platform can be used for wild dogs, rabbits, six feral deer species, feral pigs, feral cats, feral goats, foxes, cane toads, myna birds, starlings, pest fish species, the house mouse, large herbivore pests (including donkeys, camels and buffalo) and new pests (namely corn snakes and red-eared slider turtles).
2. **a national database containing 316,855 records of introduced pest animal species across Australia** recorded by farmers, landholders, community groups, professional pest controllers, biosecurity groups, government agency representatives, and the general public. The database contains data for all species, with the largest datasets for wild dogs, rabbits, foxes, feral deer and feral pigs.
3. **a registered users database consisting of 40,422 users from around Australia.** The number of registered users has nearly doubled in the past 12 months alone, showing high growth and demand for FeralScan as it becomes and more and more useful resource for communities and pest managers. The database now contains 2,767 government staff members Australia-wide.
4. **adoption by 623 private landholder, community and biosecurity groups. The number of groups has increased steadily throughout the project.** This constitutes 457 new groups registered during this project, and an average of 90 new groups per year. The majority of groups are reporting in NSW, Vic, Qld and WA. FeralScan has not been as well promoted in the ACT, Tas and NT compared to other states.
5. **a national community and biosecurity group training program.** Training workshops, webinars and information sessions were delivered to major stakeholder groups around Australia during the five-year project period. The events focused on PestSmart resources, Glovebox Guides, FeralScan and camera-trap training, and tailored support to assist groups adopt online technology to support best practice pest management.
6. **data-sharing with the Australian Government through ALA.** A new arrangement has been established for real-time sharing of FeralScan data with ALA, via a series of secure web APIs. This will enable ALA and its users across government, industry, research and community to gain access to non-sensitive FeralScan data.
7. **data-sharing with local government, regional biosecurity groups and state governments around Australia.** This involves a range of methods including API data-sharing, exchange of datasets, data-access logins and real-time alert notifications.
8. **a new data access portal within FeralScan** to give external clients access to FeralScan datasets. This has been developed to formalise arrangements for sharing data with people who request access.
9. **NewPests, a new incursions reporting platform.** Using the FeralScan technology, it enables public reporting of possible new pest animal incursions. This platform has so far focussed on red-eared slider turtles and American corn snakes, but will promote reporting of Indian ring-necked parakeets, and other species such as Asian house geckos in future.

10. **customised, real-time alert notifications (email and in-app) to FeralScan users.** In-app alert notifications are offered to FeralScan users and user groups, to ensure mobile device users are informed in a timely manner about pest issues, such as nearby wild dog attacks. The alert notifications have been used to deliver custom toolkits of information such as practical manuals, PestSmart Glovebox Guides and links to local support (such as a biosecurity group).
11. **interactive dashboards for FeralScan users and user groups.** These display users' summary data, and data from their user groups, across a series of line graphs, tables and charts. Approximately 510 registered private user groups have access to the live dashboards to view pest animal data.
12. **a series of 22 new videos and instructional support.** This project has developed videos providing instruction, guidance and promotion of FeralScan and accompanying resources, such as PestSmart. The videos were produced for YouTube and Vimeo formats, in collaboration with local, regional, state and national partners. These include new 'farmer-teaching-farmer' style videos.
13. **a RabbitScan Biocontrol Tracker website and app.** This resource was further developed and maintained to allow users to submit samples of possible rabbit haemorrhagic disease virus (RHDV) for analysis. It has been managed by NSW DPI and used primarily by CSIRO for laboratory analysis. It was most widely used in 2017 and 2018, but has been used steadily over recent years.
14. **a prototype interactive National Wild Dog Management Program Map** to showcase successful wild dog management programs across Australia. This has been developed in partnership with the National Wild Dog Action Plan and requires information about programs under way across all states and territories.
15. **a prototype interactive National Feral Deer Management Program Map** to showcase successful feral deer management programs across Australia. This has been developed in partnership with the National Feral Deer Action Plan and requires information about programs in action across all states and territories.
16. **an image library containing 40,499 photos linked to FeralScan records,** predominantly of wild dogs, rabbits, foxes, deer, feral pigs and feral cats.
17. **distribution of 2,500 copies of each Glovebox Guide directly to land managers.**
18. **development of the National CarpMap Survey website** in partnership with Fisheries Research and Development Corporation (FRDC).

Additional activities of the project included preparing the platform to:

1. connect with newly developing information systems such as WeedScan.
2. host datasets from emerging technologies, including GPS tags/collars such as CERES wildlife tags.
3. disseminate important information hosted by existing information hubs, such as PestSmart.
4. support communities and agencies to build datasets about feral pig populations to reduce the risk of FMD in these populations if it were introduced to Australia.

# DISCUSSION

## Benefits to on-ground management

This project has delivered a free purpose-built national pest animal surveillance, monitoring, recording and management resource for a variety of users and user groups. The platform consists of the FeralScan Pest Mapping app (Apple and Android), its website, and 14 species-based websites and interactive maps containing reports of pest animals, the damage they cause and control actions.

Users can record information through the platform on the following pests: wild dogs, six feral deer species, feral pigs, feral cats, feral goats, rabbits, foxes, cane toads, myna birds, starlings, pest fish species, the house mouse, large herbivore pests (including donkeys, camels and buffalo) and new pests (namely corn snakes and red-eared slider turtles). The objectives and usage summaries of these 14 species sites can be found in Appendix 2.

Over 40,000 people have now registered to use FeralScan around Australia. This equates to 34,053 new users since project inception – an average of 6,810 new users per year. The number of registered users has nearly doubled in the past 12 months alone, showing high growth and demand for FeralScan as it becomes an increasingly essential resource for communities and pest managers. There are also 2,767 government and biosecurity experts registered to use FeralScan across Australia.

Over 620 private landholder, community and biosecurity groups have registered to use FeralScan for their local pest monitoring and management activities. Most of the groups are in NSW, Vic, Qld, WA and SA. Most groups can access interactive dashboards that include summary data in a series of line graphs, tables and charts. This enables them to view and interpret the data that people in their local group have recorded. Case studies of the successful use of FeralScan for monitoring and control activities from a sample of these user groups can be found in [Appendix 3](#).

A series of 22 new videos and instructional support have been developed during the project, to provide instruction, guidance, promotion of FeralScan and accompanying resources such as PestSmart. The videos were produced in collaboration with local, regional, state and national partners. These include new 'farmer-teaching-farmer' style videos.

Data is shared with government organisations across Australia, including ALA, as well as local government authorities, regional biosecurity groups and state/territory government departments.

# RECOMMENDATIONS

To maximise the future benefits to pest management programs across Australia, we present the following recommendations for the platform:

1. **Maintain and increase investment to support users.** It is vital that there is continuity in the ongoing management and support of FeralScan, to maintain high rates of adoption and enhance all the benefits that a large user base creates.
2. **Secure endorsement of FeralScan as a national community pest monitoring and management resource.** There should be increased promotion of the platform across all states and territories to maintain current adoption rates and maximise benefits.
3. **Form a project advisory group with representatives from all states and territories.** Consensus is needed to guide the future direction of FeralScan as a community, and a pest management tool.
4. **Disseminate research, development and extension innovations to FeralScan users.** With a large existing userbase on the platform, there is enormous scope for connecting users to new innovations and technology as the platform grows. Until now, this has been provided through PestSmart online resources (and other valued services) but there are new methods, such as smart cross-platform design, that should be explored.
5. **Service growing demand for FeralScan in all states and territories.** It is vital that appropriate resources are allocated to supporting existing and new user groups. One approach would be to appoint coordinators and local champions in all jurisdictions, including relevant government or biosecurity agencies.
6. **Share data with biosecurity groups and government.** FeralScan data represents a vital information layer for future pest animal and biosecurity management. With FeralScan's current high rates of adoption, consideration must be given to developing and maintaining appropriate data-sharing arrangements with biosecurity groups Australia-wide.
7. **Update FeralScan platform technology to match user demand.** Design the platform to harness the benefits of emerging technologies, such as CERES GPS tags.
8. **Bring FeralScan and PestSmart together through cross-platform design.** Enhance the benefits of FeralScan and PestSmart by:
  - increasing communication with farmers, landholder groups and communities about pest animal research and development innovations
  - enhancing communication with registered users of FeralScan and PestSmart
  - improving the delivery of PestSmart toolkits to FeralScan users based on their location, circumstances, needs and requirements.
9. **Promote FeralScan as a preparation tool for potential exotic animal disease emergencies.** FeralScan should be extensively promoted across all states and territories to increase preparedness for exotic diseases such as FMD. FeralScan has already seen an increase in feral pig and deer recordings by many organisations and groups in response to the heightened risk of FMD. In NSW alone, several LLS groups contract professional feral pig controllers who are using the app to document evidence and control outcomes. There are significant opportunities to encourage and support more user groups to collect detailed information on these populations (including disease sampling of feral pigs).

## LESSONS LEARNED

This project has developed and delivered a national FeralScan web and mobile app community platform, to enable all Australians to monitor, record and manage pest species in their communities. Some of the lessons learned throughout the project were:

- The project needed to address evolving needs and changes in a suite of requirements for users and user groups that could not have been foreseen at project inception. The needs of many user groups have evolved, and their requirements for FeralScan have changed. Similarly new groups and organisations have requested more from FeralScan. This has required the project to adapt to changes in demand.
- The project has had to manage growing demand, with the number of users and user groups increasing sharply throughout the project. This included providing more support and guidance, without additional resources or support.
- The project has had to manage expectations of 40,000 users across Australia, as well as user groups, pest management stakeholders and organisations (such as local government) that may have their own projects/program and expectations of FeralScan.
- Maintaining mobile app platform technology (and changes imposed by Apple and Google) has resulted in costs for app development and maintenance that were not anticipated nor budgeted for.
- Developing FeralScan as a national product and maximising its benefits needed an active steering committee or advisory group, with representatives from all jurisdictions and pest management stakeholder groups.
- Adapting to changing circumstances has been critical to the success of the project. The project methodology required a shift towards online webinars and training events due to COVID-19 restrictions. The pandemic also caused a drop in FeralScan use, and increased demand for one-on-one training with users and online training for organisations (e.g. government and biosecurity groups).



# ACKNOWLEDGEMENTS

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The author wishes to acknowledge and thank every farmer, land manager, volunteer, member of the community, pest control professional and biosecurity officer that have taken time to record information about introduced pest animals. FeralScan is primarily a resource for communities, and with every individual contribution it becomes increasingly useful to inform effective local pest management programs.

This project would not have been possible without collaborations and partnerships. Special thanks to Peter Adams, Meja Aldrich, Cameron Allan, Kaylene Allan, Richard Ali, Phil Baird, Candida Barclay, Krystie Bremer, Peter Boyd, Antia Brademann, Gillian Basnett, Glenice Batchelor, Luke Booth, Peter Brown, Tony Buckmaster, Leanne Calthorpe, Dean Chamberlain, Heather Channon, Lucy-anne Cobby, Lucy Collingridge, Tamar Cohen, Peter Day, Bruce Duncan, Kate Duzevich, Ian Evans, Shannon Evenden, Colleen Farrow, Peter Fleming, Ellen Freeman, Dave Frelek, Annaliese Geddes, Paul Gibb, Jen Gillis, Andreas Glanznig, Alistair Gordon-Smith, Bec Gray, Quentin Hart, Chris Havelberg, Karen Heap, Steve Henry, Vicki Horstman, Nina Huang, Rachel Hughes, Robert Ingram, Dawn Jean-Luc, Sarah Johnson, Tracey Kreplins, Helen Lawson, Ian McDonald, Steve McCleod, Simon Merewether, Greg Mifsud, Heather Miller, Jim Miller, Matt Morris, Julie Old, Rosemary O'Connor, Lisa O'Neill, Peggy Newman, Katherina Ng, Liam Orrock, Rebecca O'Leary, Jenny O'Sullivan, Dave Pemberton, Jamie Petrie, Richard Price, Nathan Ring, Jonathan Randle, Rhett Robinson, Thomas Ross, Ricky Spencer, Georgeanna Story, Pat Taggart, Myall Tarran, Mark Tarrant, Pete Turner, Lisa Wellman, Steven Wentworth, Annelise Wiebkin, Jason Wishart, Dave Worsley, and many other wonderful people that have contributed in various ways. Thank you also to Emma Sawyers for providing outstanding support to communities and pest managers across NSW.

The FeralScan software has been developed by Michael Newton at NewtonGreen Technologies. FeralScan is a legacy project of the Invasive Animals Cooperative Research Centre – and many people were involved in its early development.

# APPENDICES

## APPENDIX 1. PROJECT MILESTONES

#	MILESTONE	DUE DATE	OUTCOME AND OUTPUT	DETAILS
1	Contract execution	1 July 2017	Fully executed Project Detail and an executed Partner Investment Declaration.	Completed
2	Appoint a National Digital Resources Facilitator	30 July 2017	National Facilitator appointed.	Completed
3	Participate in development of project Monitoring, Evaluation, Reporting and Improvement (MERI) and CISS Extension Strategy	2 Nov 2018	Input provided into MERI framework and CISS Extension Strategy.	This is an ongoing item guided by Canberra-based CISS staff.
4	CISS Annual/Progress Report and Research Portfolio summary update	2 Nov 2018	CISS Annual/Progress Report accepted by CISS management. Research Portfolio summary submitted.	Completed
5	CISS Progress Report	2 Dec 2018	Progress Report accepted by CISS and Australian Wool Innovation (AWI) management, including progress on milestones 6, 9 and 10.	Completed
6	CISS Annual/Progress Report and Research Portfolio summary update	28 Feb 2019		Completed
7	CISS Annual/Progress Report and Research Portfolio summary update	31 Mar 2019	CISS Annual/Progress report accepted by CISS board and AWI management.	Completed
8	Enhance existing web- and app-based pest surveillance, detection and alert systems for farmers and regional management organisations, with interactive pest mapping services, client-based products and marketing.	1 July 2019	The FeralScan community engagement and pest surveillance website and app has been upgraded to include better data handling, sharing, collection and reporting capabilities. New species and new dashboard reporting outputs greatly enhanced FeralScan. All alert notification services were upgraded and can be deployed via in-app notifications to FeralScan users. A client-focused data access portal was designed. New capabilities of FeralScan offer greater outputs for regional pest managers. A database redesign to enable data-driven queries will increase the agility of FeralScan to cater for a wide range of user groups and their data collection and reporting needs of user groups. This will be recommended for CISS 2.	The primary outcome is the delivery of alert notifications (in-app and via email) that have been customised for landholders who have agreed to join closed 'private' groups in FeralScan and professional pest controllers (trappers), to keep them promptly informed about landholder-recorded pest impacts or activity, biosecurity officers and state-level pest managers. Notifications are based on geographic areas (normally only the area relevant to each client), and each is tailored for a user's specific needs. Alert notifications are active for sightings, impacts and/or control activities (including successful outcomes, such as wild dogs that have been trapped and destroyed). New dashboard reporting tools provide dynamic charts and tables of data, and downloadable static-PDF reports for each client/user group.
9	CISS Progress Report	31 Aug 2019		Completed
10	CISS Progress Report	30 Sept 2019		Completed

#	MILESTONE	DUE DATE	OUTCOME AND OUTPUT	DETAILS
11	CISS Annual/Progress Report and Research Portfolio summary update	28 Feb 2020		Completed
12	CISS Annual/Progress Report and Research Portfolio summary update	31 March 2020		Completed
13	Commence and complete transfer of FeralScan to CISS servers	30 June 2020	The viability of the proposal to transfer FeralScan to Invasive Animals Limited servers was assessed.	A meeting between technology providers and the CISS Communications Manager took place in September 2020. The proposal was determined to be not feasible and this was reported to the Domain Leader and CISS Board in 2020. See Appendix 3 for further details.
14	Support development of new community networking resources to connect land managers to services, supporting organisations, pest control practitioners, regional organisations and provide access to the latest pest control technologies, advice and extension services.	1 July 2020	New community networking resources accessed by major pest management stakeholders and the community. New tools and toolkits identified for development and discussed with CISS regarding appropriate hosting/maintenance.	This milestone is complete. This has involved a modification to existing software, and was deployed with the FeralScan website upgrade in 2020, to better: <ul style="list-style-type: none"> <li>• connect people to biosecurity groups/organisations.</li> <li>• involve organisations in private landholder groups.</li> <li>• notify organisations about pest data of high, moderate or low significance, such as data in Biosecurity Containment Zones.</li> <li>• include professional pest controllers in private FeralScan groups, for sharing records and working together.</li> <li>• deliver training to professional pest controllers using FeralScan.</li> <li>• connect users to biosecurity groups for support and advice.</li> <li>• help each FeralScan user connect to PestSmart.</li> <li>• generate and distribute new alert methods in FeralScan.</li> <li>• activate alerts for all groups.</li> <li>• issue new alert types for special significance data, such as new incursions of established pests into new areas.</li> </ul>
15	CISS Progress Report	31 Aug 2020		Completed
16	CISS Progress Report	30 Sept 2020		Completed
17	CISS Annual/Progress Report and Research Portfolio summary update	28 Feb 2021		Completed
18	CISS Annual/Progress Report and Research Portfolio summary update	31 Mar 2021		Completed
19	Build public and stakeholder investment in surveillance, reporting and response through regionally marketed web- and	1 July 2021	Stakeholder group investment in surveillance, reporting and response, such as institutionalising	Completed

#	MILESTONE	DUE DATE	OUTCOME AND OUTPUT	DETAILS
	app-based pest mapping technology, via FeralScan.		FeralScan within local/regional pest management plans and agency information systems architecture. This project has focused on: <ol style="list-style-type: none"> <li>1. empowering local groups to take action and get results, by ensuring FeralScan is available to them, and acknowledging and valuing user contributions.</li> <li>2. ensuring reports reach regional Biosecurity Groups.</li> <li>3. supporting use of new reports by recipients.</li> <li>4. offering genuine benefit to biosecurity groups through collaboration and partnerships, and building confidence in the FeralScan brand and product.</li> </ol>	
20	Pilot a weeds community tool via FeralScan	1 July 2021	Trial the application of the FeralScan platform to enable community mapping of weeds.	Participation in design of WeedScan.
21	CISS Progress Report	31 Aug 2021		Completed
22	CISS Progress Report	30 Sept 2021		Completed
23	Develop a client-focused system for data access, data-sharing, pest control support and accessing local/regional services.	31 Dec 2021	A client-focused web-based service for user groups has been developed and is accessible from FeralScan. This service, called the 'data access portal', enables users to request access to pest animal data. This service requires a coordinator to respond to requests. Users that have 'data access rights', can view their access provisions through their profile on the live website. This enables them to view the precise information that they can access for their jurisdiction, and they can see the name of the jurisdiction (such as a local government area).	Completed Data-sharing provisions: User groups can select from the Legend, which layers of data they would like to display on their interactive map (such as exclusion-fences or administrative boundaries). Users can also choose to add layers of spatial data onto their interactive map. Users can also see the alert notifications that they are receiving in their user profile (which may be individual alerts or alerts for a private group they are a member of). All users can view charts and tables of live data.
24	Package and deliver customised pest control resource toolkits tailored to meet the needs of community groups, local government organisations, landholder associations, regional NRM bodies, and pest management agencies.	30 June 2022	Client-focused resource toolkits made available for free to website users as they elect to receive kits tailored to their local area and specific needs. This will be contingent on the PestSmart website being able to host this service.	Recipients of email alert notifications (and in-app notifications) now receive information products tailored to their specific location and needs. This includes the delivery of links to information products and resources available on the PestSmart website, through existing notification messages to FeralScan users. For example, all users who receive notifications about wild dogs receive a link to the Glovebox Guide for managing wild dogs, and guide for baiting wild dogs. Maintenance of this service is ongoing, as the needs of clients are progressively defined, and as new resources are developed and become available.

#	MILESTONE	DUE DATE	OUTCOME AND OUTPUT	DETAILS
25	Investigate sustainable funding models		Recommendations presented to CISS for sustainable future funding of FeralScan via stakeholder groups and users.	Not within the scope of this project.
26	Develop improved extension and training resources such as podcasts, webinars and farmer-teaching-farmer training for mobile device users, delivered through online services and sharable across platforms.	30 June 2022	A series of new training video resources are being published on YouTube (in partnership with NSW LLS). These are being rolled out to user groups accessing FeralScan upon availability.	Completed. A series of 22 short videos providing instruction or promoting the use of FeralScan have been produced during the project term, in collaboration with local, regional, state and national partners. The videos are summarised in this report and cover stepwise instructions for using the app, the importance of monitoring pest animals, how to record information, why to report, etc.
27	Facilitate collaboration through regional, business and local government partnerships.	30 June 2022	Regional, business and local government partnerships in place.	Completed. Partnerships have been developed with local government authorities across NSW, Vic, Qld, WA, SA, Tas and NT. Those organisations either receive data directly from FeralScan from their communities or use the platform directly for documenting pest activity and control. Similarly, regional biosecurity groups in NSW, Qld, WA and SA receive data from FeralScan, or use the platform for documenting pests and control. Data access and alert notifications are provided to all parties. Automatic cross-platform data-sharing exists with most parties. State government agencies in NSW, Qld, WA, SA, ACT and Tas received data from FeralScan directly. Further, data-sharing with the Australian Government is delivered through data-sharing with ALA. A strong working partnership has been developed with the ICT provider NewtonGreen Technologies throughout the project.
28	CISS Final Report Annual Report and Research Portfolio summary update	30 June 2022 (extended to 30 Sept 2022)	Final Report submitted and accepted by CISS and AWI management, including updates and final recommendations on all milestones and all key activities. CISS Annual/Progress Report submitted and accepted by CISS management. Research Portfolio summary submitted.	Completed

## APPENDIX 2. SUMMARY OF THE FERALSCAN SPECIES PLATFORMS

### WILDDOGSCAN

[www.wilddogscan.org.au](http://www.wilddogscan.org.au)

#### OBJECTIVES

- encourage communities to actively document wild dog activity to share with their community and local authorities
- involve people in proactively looking for wild dogs (and evidence) and recording information about sightings, sign, monitoring camera images, attacks and control actions
- invite people to connect with local groups, and promote collaborations
- use community data to inform on-ground actions by communities, groups or local authorities
- promote people to work with their community and government organisations
- share data with biosecurity, government or pest management organisations
- share important information resources with all users, such as practical wild dog control information, guides or videos
- disseminate PestSmart resources to users, i.e. the wild dog Glovebox Guide
- connect users to wild dog management coordinators, and the National Wild Dog Action Plan.

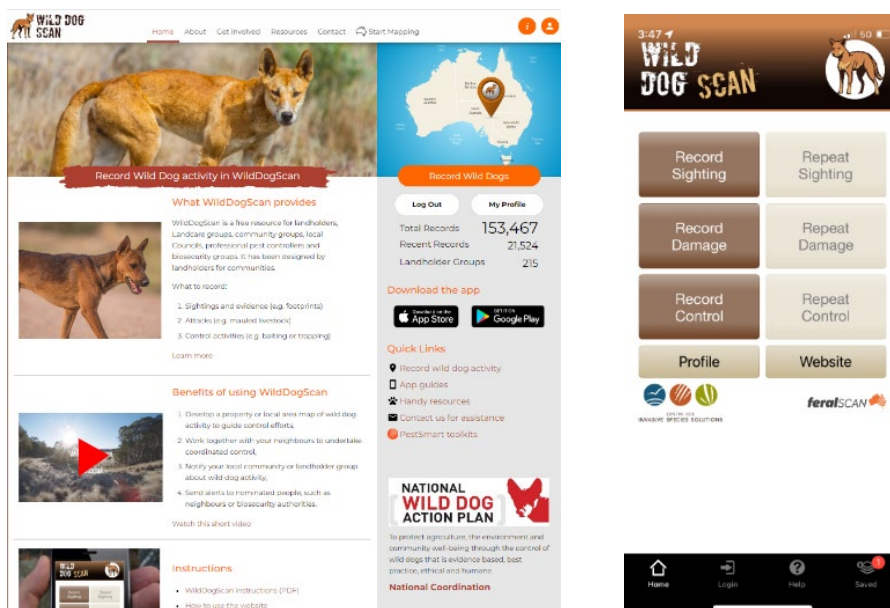


Figure 25. The WildDogScan landing page (left) and reporting page in the FeralScan mobile app (right)

## USAGE SUMMARY

- WildDogScan hosts 23,428 sighting records, 4,022 reports of attacks and 126,303 control actions.
- Control actions have been documented in WA (69,261), NSW (17,685), SA (7,669) and Qld (2,189).
- There are more private groups registered to use FeralScan for monitoring and recording data about wild dogs than any other species.

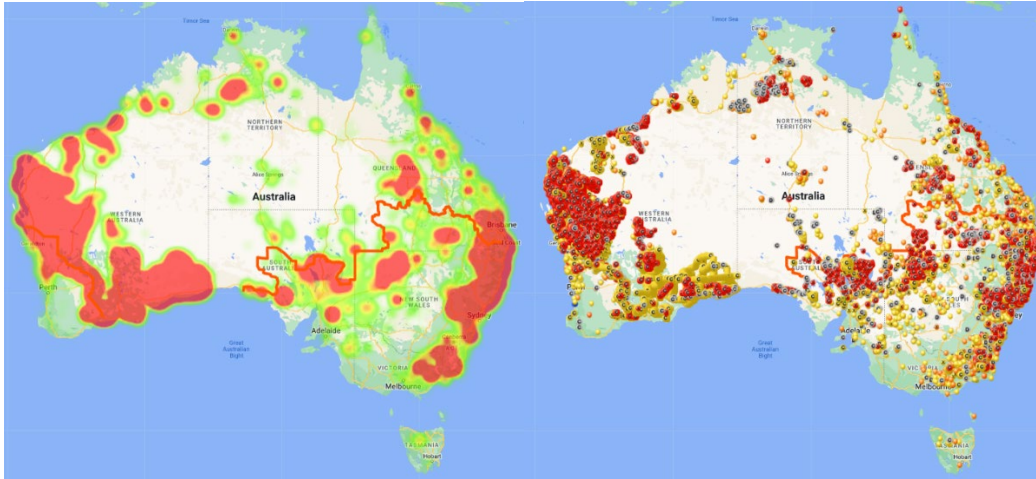
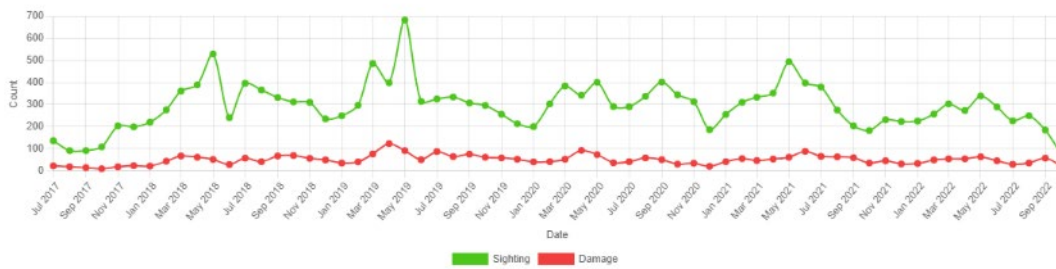


Figure 26. WildDogScan map concealing all records to public users (left) and showing public and private/secure data (right). This data is not displayed publicly.

### Sighting and Damage



### Control

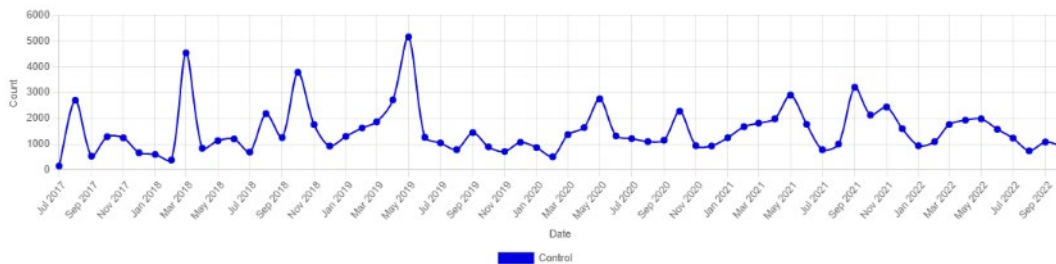


Figure 27. Trend in recording rates to WildDogScan throughout the project term, displaying steady use

## OUTCOMES

- WildDogScan is the most used component of FeralScan.
- Government and professional pest control contractors rely on this resource in WA, NSW, SA, Qld and NT.
- Usage rates have varied throughout the project, but it remains a well-used resource for biosecurity groups, professional pest controllers, wild dog control associations, landholder groups and individual farmers.
- In some jurisdictions, all wild dog control associations for a region have been registered and encouraged to use WildDogScan, such as the Northern Tablelands and Hunter regions of NSW.
- There appears to be growing demand across many jurisdictions.
- Proposed upgrades to the FeralScan app will provide a significant benefit to professional pest controllers and landholders undertaking control such as baiting and trapping.
- WildDogScan was the primary focus of 70% of all 312 workshops, webinars and field days.
- This resource is also relied upon by large pastoral companies in some regions such as Heytesbury Cattle Company (NT) and some mining leased land.
- In all states and territories, information recorded by the community is shared with biosecurity, state government or local authorities.



## DEERSCAN

[www.deerscan.org.au](http://www.deerscan.org.au)

### OBJECTIVES

- engage with communities about feral deer as a problem, threat or risk
- involve people in proactively looking for deer and recording information
- invite people to participate in being part of a solution by documenting what they're seeing
- create community advocates of deer management/control
- use community data to inform on-ground actions
- promote people to work with their community and government organisations
- share data with biosecurity, government or pest management organisations
- share important information resources with all users, such as practical deer control information, guides or videos
- disseminate practical deer identification guides, and information about research development and practical control options to users
- connect users to the National Feral Deer Action Plan and its Coordinator.

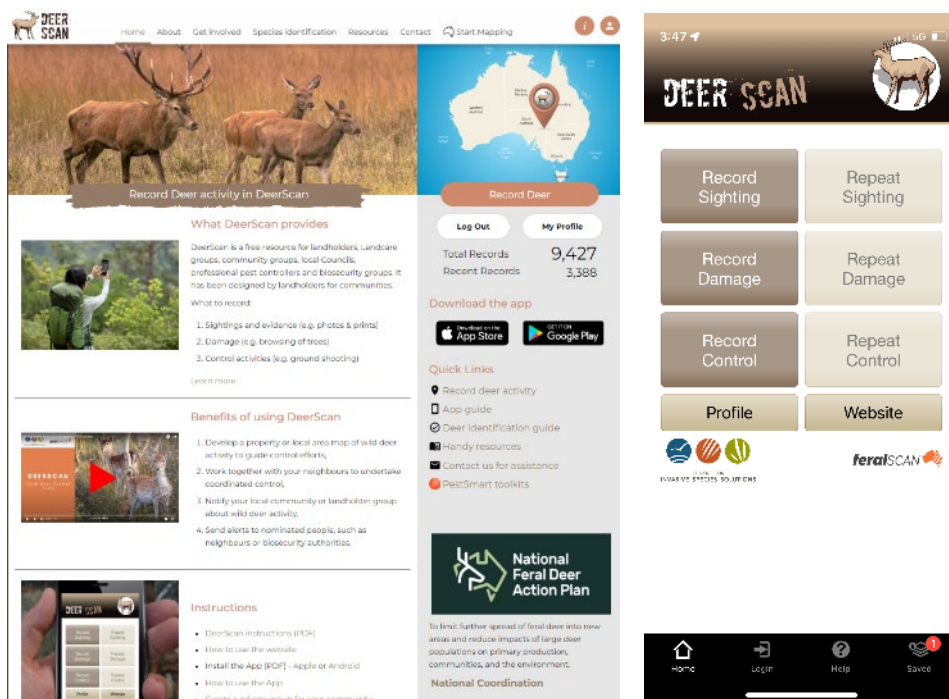


Figure 28. The DeerScan landing page (left) and reporting page in the FeralScan mobile app (right)

### USAGE SUMMARY

- DeerScan contains 7,280 sighting reports of deer, 735 reports of deer damage and 1,437 control actions.
- There is a growing trend in recording rates of feral deer.

- There is a growing number of private groups registered to use DeerScan for monitoring and recording data about feral deer species and their impacts.
- DeerScan was made available to the public in late 2018.

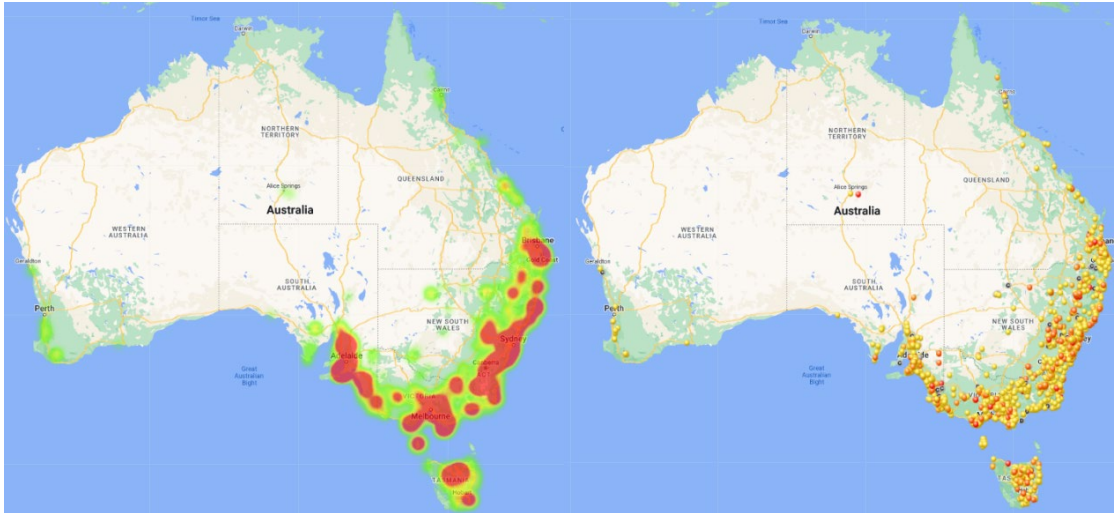


Figure 29. DeerScan map concealing all records to public users (left) and showing public and private/secure data (right). This data is not displayed publicly.

#### Sighting and Damage



#### Control

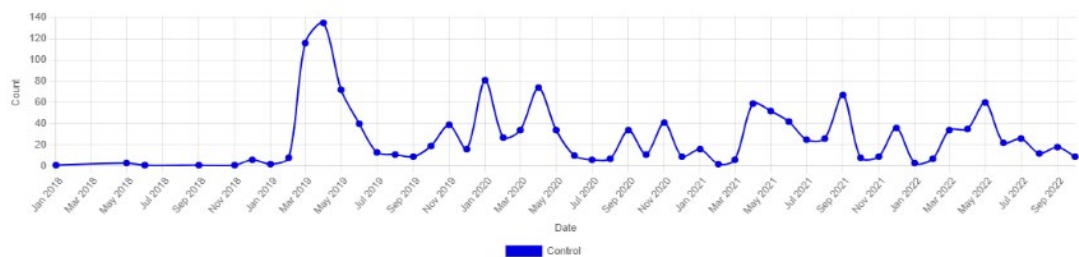


Figure 30. Trend in recording rates to DeerScan throughout the project term, displaying steady and increased use

#### OUTCOMES

- An increasing number of private landholder groups or communities have been using DeerScan during the past 12 months primarily in NSW, Vic and Tas.
- Many local government authorities and state government security authorities actively promote community reporting within DeerScan.

- In some regions, there are professional pest controllers contract by local government or state government authorities who use the platform to document their control activities, such as the Hills and Fleurieu Landscape Board in SA.
- The DeerScan resource is relied upon by many organisations and communities who are actively documenting feral deer species in their local area.
- Several local government authorities in Vic promote community reporting and use this data.
- DeerScan data is shared with government and biosecurity stakeholders in NSW, Vic, Qld, WA, SA, Tas and ACT.
- There are several multi-agency, cross jurisdictional collaborations using DeerScan and sharing information to reduce feral deer problems, such as the Northern Rivers Feral Deer Alert project in NSW.
- Demand for the DeerScan resource remains strong.

## RABBITSCAN

[www.rabbitscan.org.au](http://www.rabbitscan.org.au)

### OBJECTIVES

- encourage landholders and community groups to actively document rabbit activity, rabbit damage and control activities
- provide an easy method for users (including pest controllers) to record rabbit warrens and control actions (e.g. warren fumigation, ripping or baiting)
- provide the Rabbit Biocontrol Tracker map to the general public, vets and government representatives to view information about rabbit diseases, as well as record information about evidence of rabbit disease (and submit a sample for analysis)
- share all data with rabbit researchers at CSIRO and state government agencies as requested
- promote people to work with community and government organisations
- use community data to inform on-ground actions
- share data with biosecurity, government or pest management organisations
- share important information resources with all users, such as practical control information, guides or videos
- share PestSmart information with users, such as the rabbit Glovebox Guide.

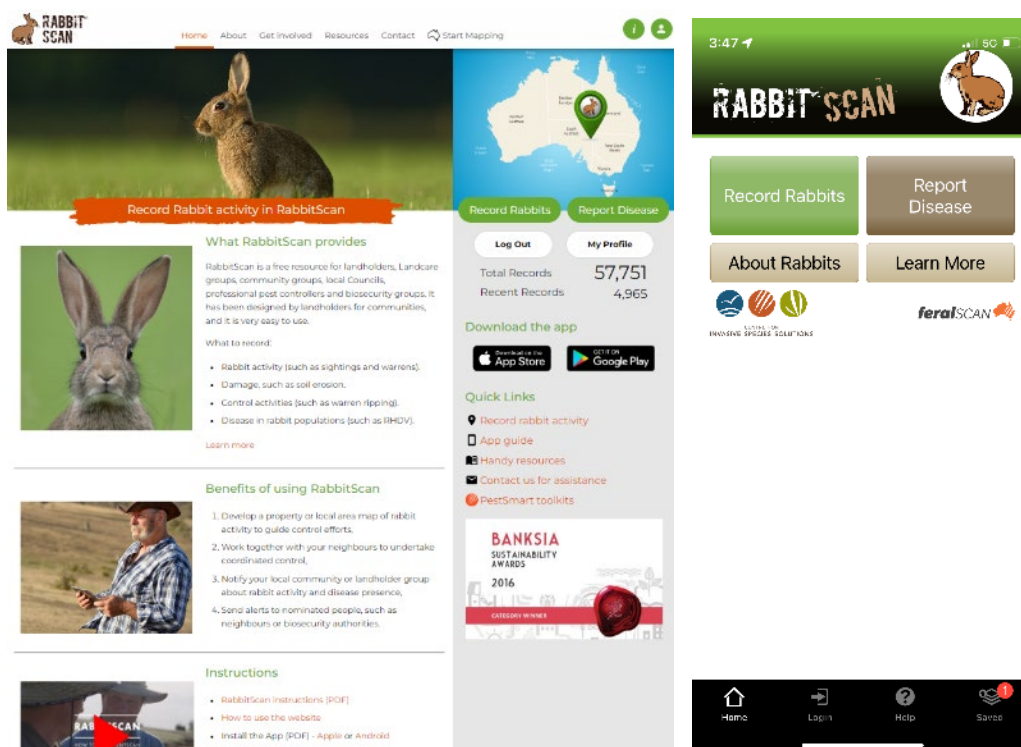


Figure 31. The RabbitScan landing page (left) and reporting page in the FeralScan mobile app (right)

## USAGE SUMMARY

- RabbitScan contains 41,806 sighting reports (including warrens), 2,568 reports of rabbit damage and 10,287 control actions (such a warren fumigation)
- The Rabbit Biocontrol Tracker map has continued to receive a steady number of rabbit samples that are shared with and analysed by CSIRO.

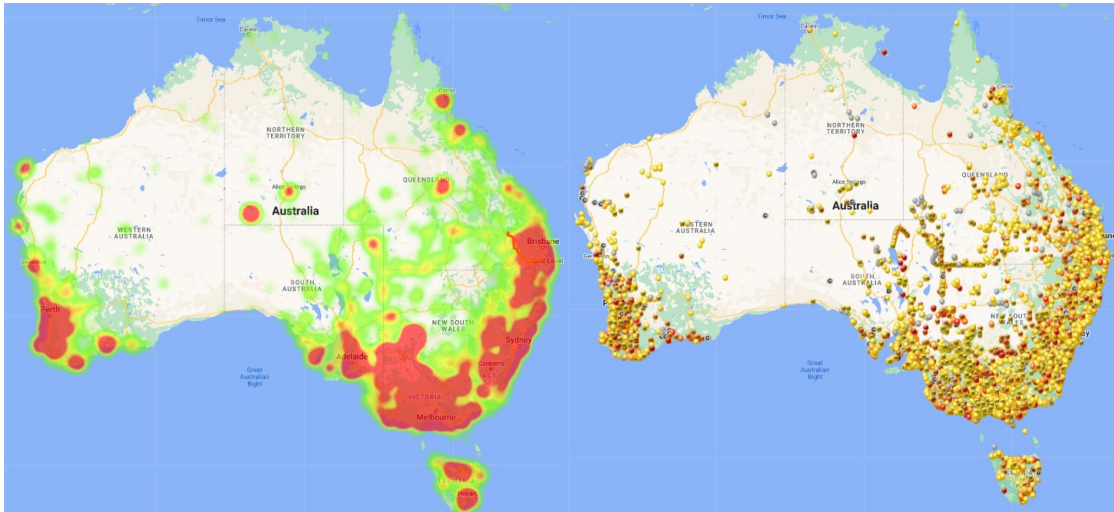


Figure 32. RabbitScan map concealing all records to public users (left) and showing public and private/secure data (right). This data is not displayed publicly.

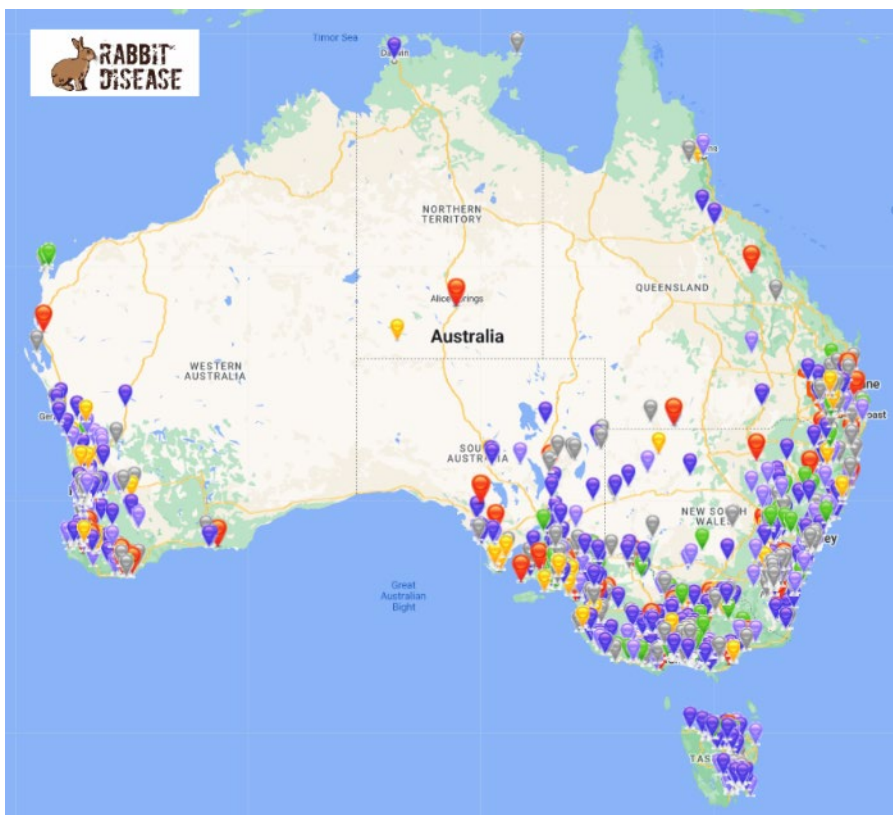
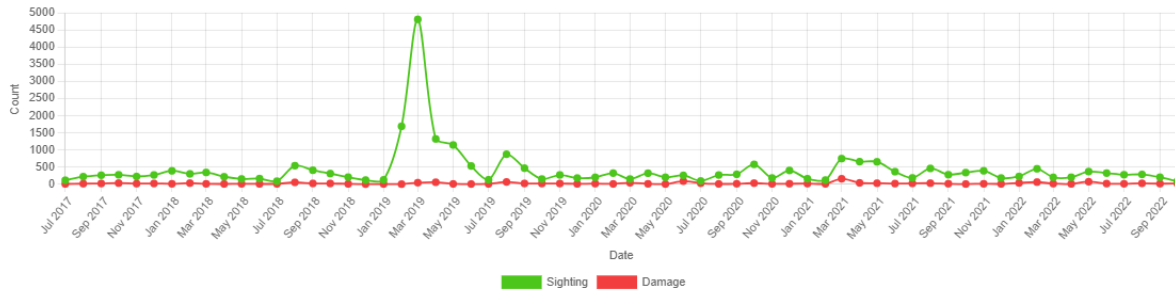


Figure 33. RabbitScan 'Report Disease' Map displaying all records (showing public and private/secure data). This data is not displayed publicly.

## Sighting and Damage



## Control

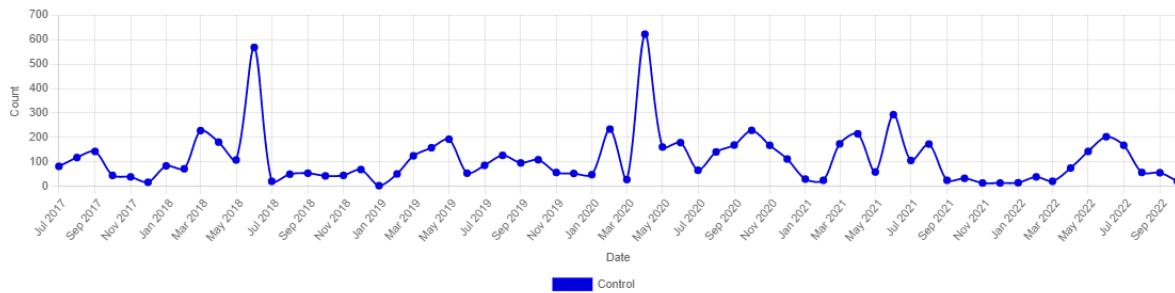


Figure 34. Trend in recording rates to RabbitScan throughout the project term, displaying steady use

## OUTCOMES

- RabbitScan continues to be widely used across all states and territories by landholders, community groups and local government organisations.
- There has been steady use of the platform, and continued use of the Rabbit Biocontrol Tracker interactive map by people wishing to view or record information about rabbit disease and have samples submitted for laboratory testing.
- RabbitScan is used and relied upon by many rabbit control contractors working for local government and state government organisations.
- since the release of the rabbit haemorrhagic disease virus (RHDV) biocontrol in 2017, use of RabbitScan has been steady, with significant pulses of activity associated with rabbit control by communities and pest controllers.
- RabbitScan remains a valuable tool for community groups to guide local control.
- Demand for this resource remains constant.

## FERALCATSCAN

[www.feralcatscan.org.au](http://www.feralcatscan.org.au)

### OBJECTIVES

- raise awareness of feral cats as a pest species and encourage people to actively record information about feral cats in their local area
- engage with communities and create community advocates for feral cat management/control
- use community data to inform on-ground actions by sharing data with local authorities
- share data with local government, biosecurity or pest management organisations
- connect users to the national feral cat management coordinator
- share important information resources with all users, such as practical feral cat control information, and the newly released CISS PestSmart Glovebox Guide to managing feral cats
- disseminate practical information about research, development and practical control options to users.

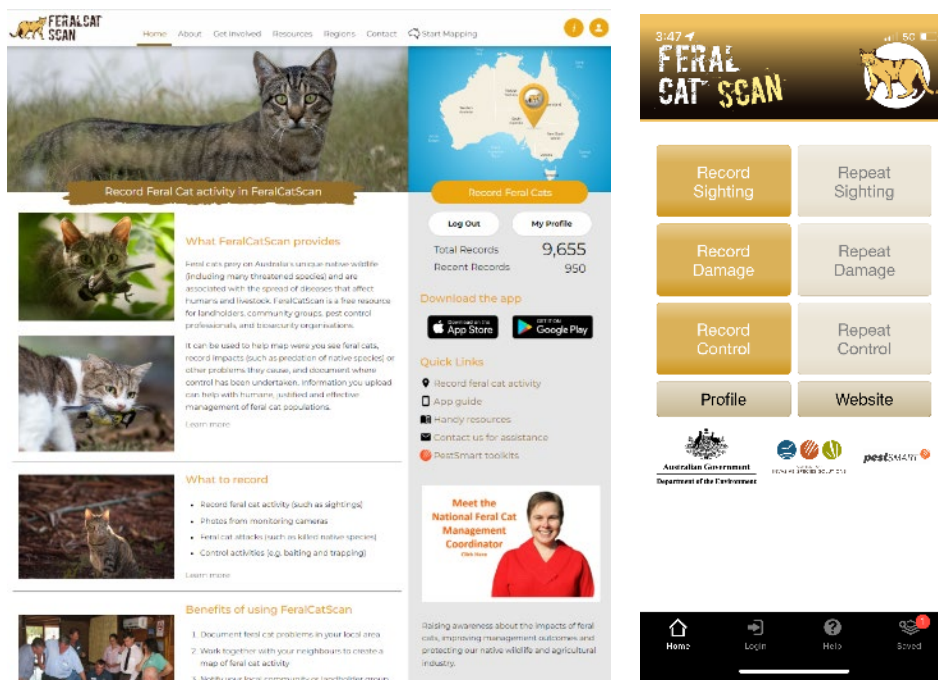


Figure 35. The FeralCatScan landing page (left) and reporting page in the FeralScan mobile app (right)

### USAGE SUMMARY

- FeralCatScan contains 6,930 sighting reports, 245 reports of cat predation and 2,506 control actions.
- It is used by professional pest controllers, who are often contracted by local government organisations or regional biosecurity groups.
- It has been used by some groups actively focusing on the impacts of feral cats on biodiversity, and has been widely used across several islands including Kangaroo Island (SA), French Island (Vic) and Bruny Island (Tas).

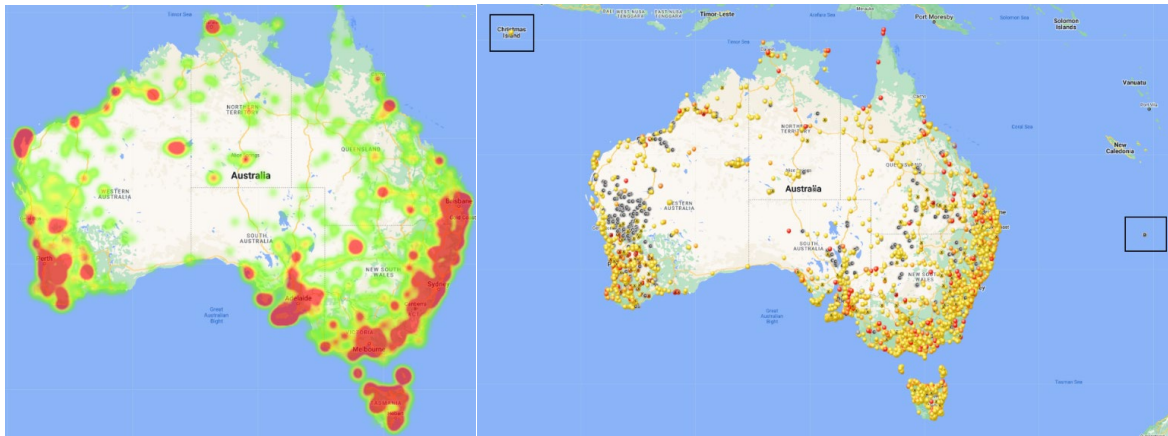
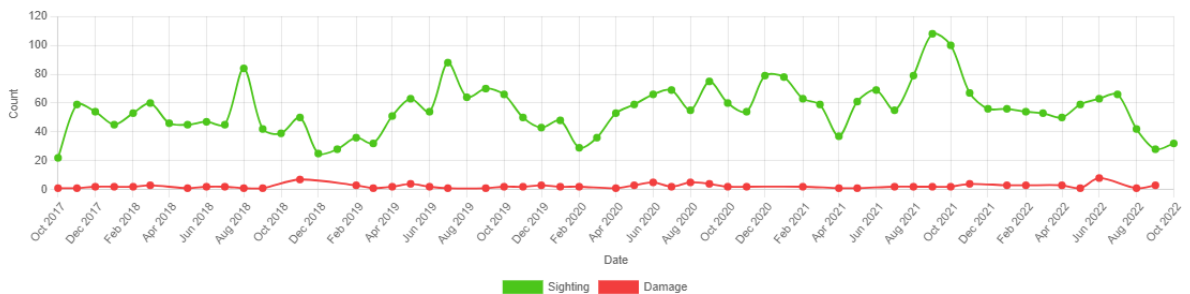


Figure 36. FeralCatScan map concealing all records to public users (left) and showing public and private/secure data (right). Note: records on Christmas Island and Norfolk Island. This data is not displayed publicly.

### Sighting and Damage



### Control

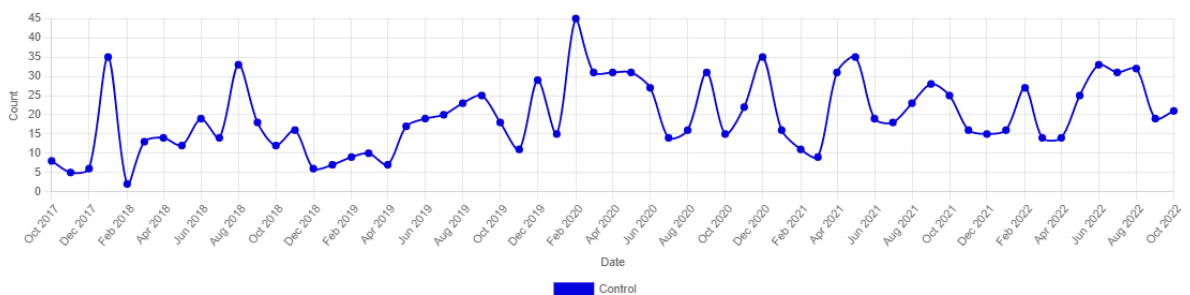


Figure 37. Trend in recording rates to FeralCatScan throughout the project term, showing steady use

## OUTCOMES

- FeralCatScan has been used widely across all jurisdictions of Australia, but most used in well populated towns and cities.
- It is increasingly being used by communities in rural and remote areas, including by groups undertaking active control.
- The website remains an active resource for raising awareness about feral cats and connecting users to practical resources and feral cat control information.
- The FeralCatScan platform can be a useful tool for disseminating information about feral cat research and outcomes to users.



- FeralCatScan has been used on Kangaroo Island to encourage community reporting of sightings by land management stakeholders, and it is being actively encouraged on Bruny Island by local government organisations.
- It has been used on Christmas Island and Norfolk Island, and opportunities still exist to promote its use in these high priority areas.
- Users have received copies of the newly produced Glovebox Guide to managing feral cats by PestSmart.
- Demand for this resource remains steady.

## FOXSCAN

[www.foxscan.org.au](http://www.foxscan.org.au)

### OBJECTIVES

- raise awareness of foxes as a pest species and encourage people to actively record information about foxes in their local area
- engage with communities and create community advocates of fox control and management
- use community data to inform on-ground actions by sharing data with local authorities
- share data with local government, biosecurity and management organisations
- connect users to the FeralScan National Feral Cat and Fox Management Coordinator
- share important information resources with all users, such as practical fox control information, the CISS PestSmart Glovebox Guide to managing foxes, and online resources
- disseminate practical information about research, development and practical control options to users.

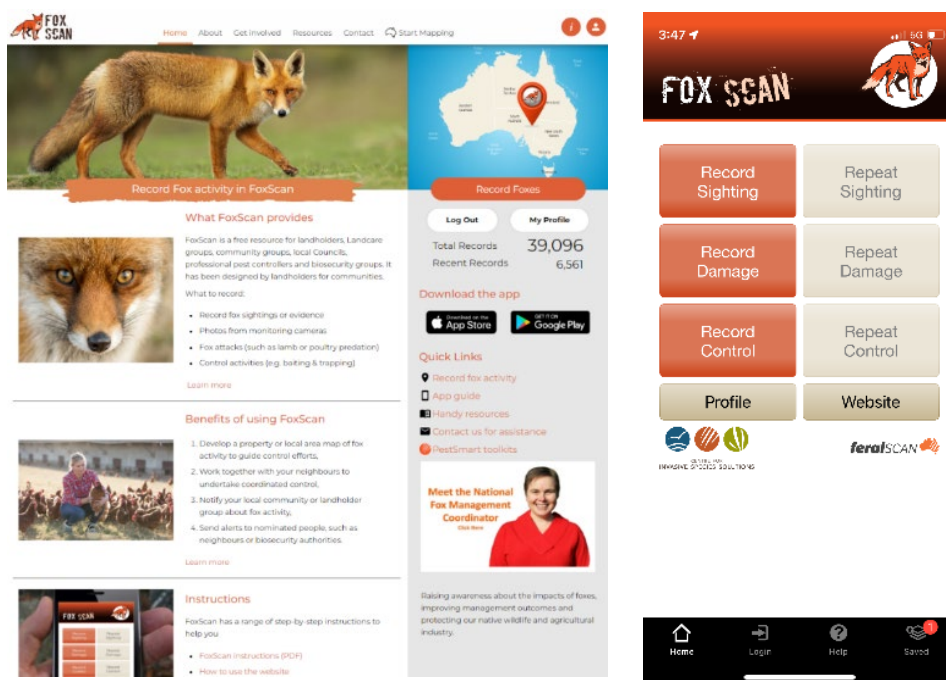


Figure 38. The FoxScan landing page (left) and reporting page in the FeralScan mobile app (right)

### USAGE SUMMARY

- FoxScan contains 24,473 sighting reports, 2,276 reports of fox predation and 12,403 control actions.
- It is widely used by landholders for documenting fox control (including 1080 baiting) and ground-based shooting.
- It is widely used in urban and residential areas by people wishing to record sightings of foxes and have that information shared with local authorities.
- It is often used by funded projects or landholder groups undertaking monitoring and control.

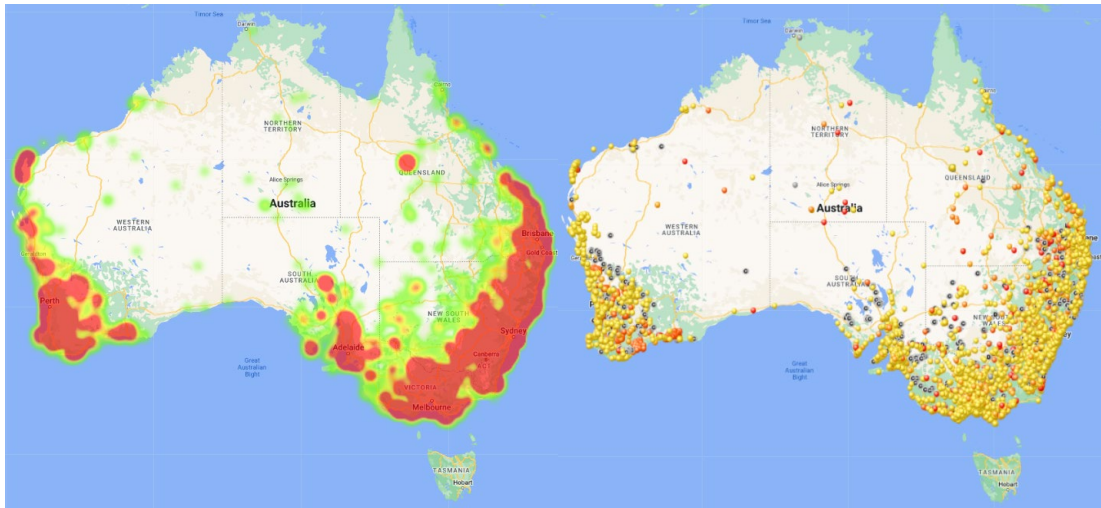
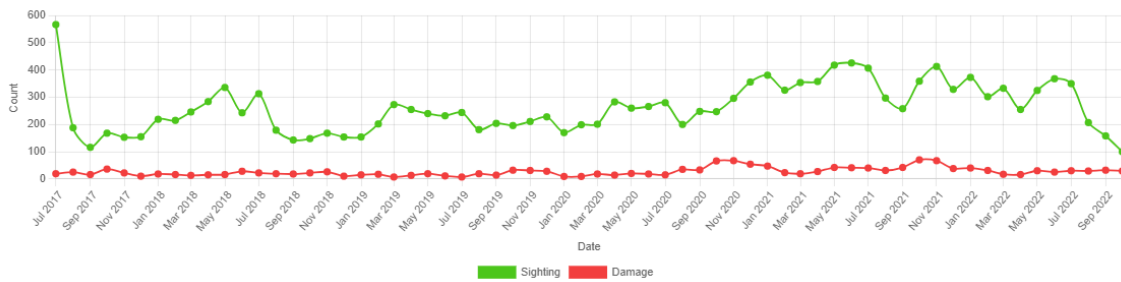


Figure 39. FoxScan map concealing all records to public users (left) and showing public and private/secure data (right). This data is not displayed publicly.

### Sighting and Damage



### Control

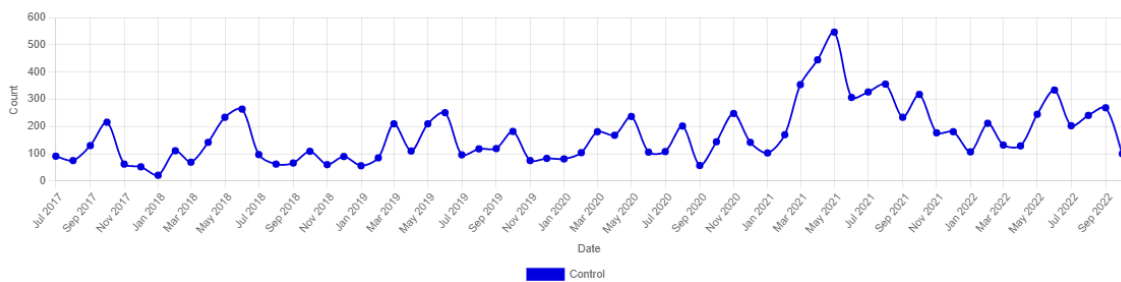


Figure 40. Trend in recording rates to FoxScan throughout the project term, showing steady use

## OUTCOMES

- FoxScan has continued to be an important resource for the community to record information about fox activity, and to share this information with local authorities.
- Local government organisations in several states and territories use this resource to document fox control activities, including ground-based baiting and shooting.
- Professional pest controllers often record fox control with this resource to document the outcomes of their efforts.
- Throughout this project, several workshops and webinars have been delivered to urban and peri-urban communities concerned about the impacts foxes have on biodiversity and threatened species, as well as domestic poultry and pets.

- This resource remains important for many communities and organisations.
- A significant number of PestSmart Glovebox Guides to managing foxes have been disseminated throughout this project to landholders and community groups.

## FERALPIGSCAN

[www.feralpigscan.org.au](http://www.feralpigscan.org.au)

### OBJECTIVES

- engage with communities about feral pigs as a problem, threat or risk
- encourage people to monitor feral pigs and document observations or problems
- invite people to report activity using FeralScan as secure platform
- encourage people to work with their community and government organisations
- dispel the myth that FeralPigScan records are visible to the broader community
- share data with biosecurity, government or pest management organisations
- share important information resources with all users, such as practical feral pig control information, guides or videos
- connect users to the National Feral Pig Action Plan and its National Coordinator
- disseminate information about research, development and practical control options to users.

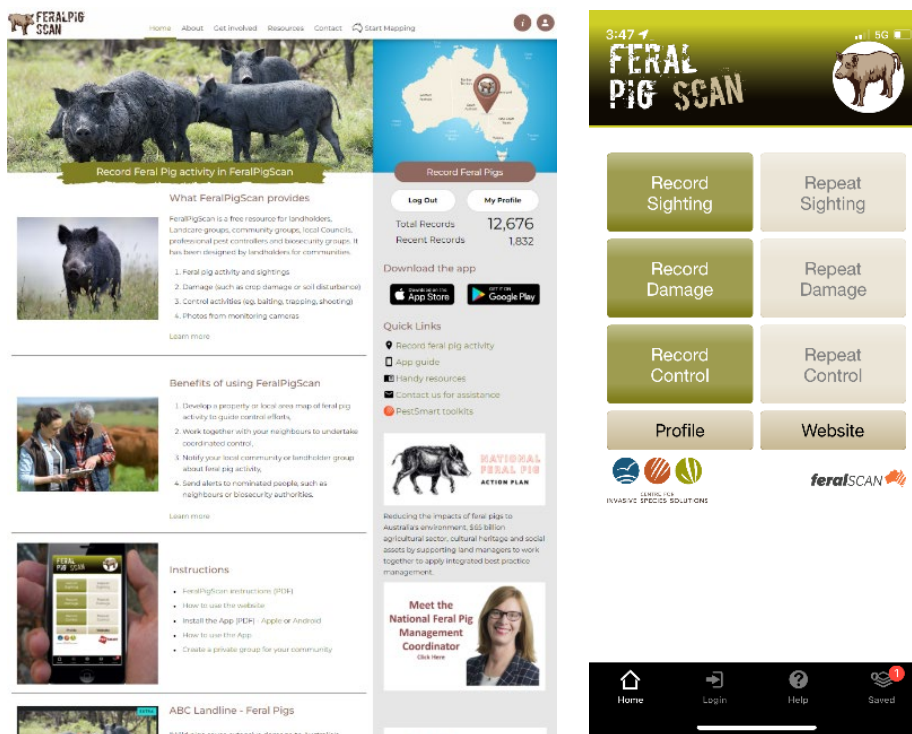


Figure 41. The FeralPigScan landing page (left) and reporting page in the FeralScan mobile app (right)

## USAGE SUMMARY

- FeralPigScan contains 5,756 sighting reports, 3,245 reports of pig damage and 3,688 control actions.
- In recent months, there has been an increase in public interest in using FeralPigScan for documenting feral pig problems.
- Information is shared with local, regional and state government biosecurity stakeholders in all jurisdictions.

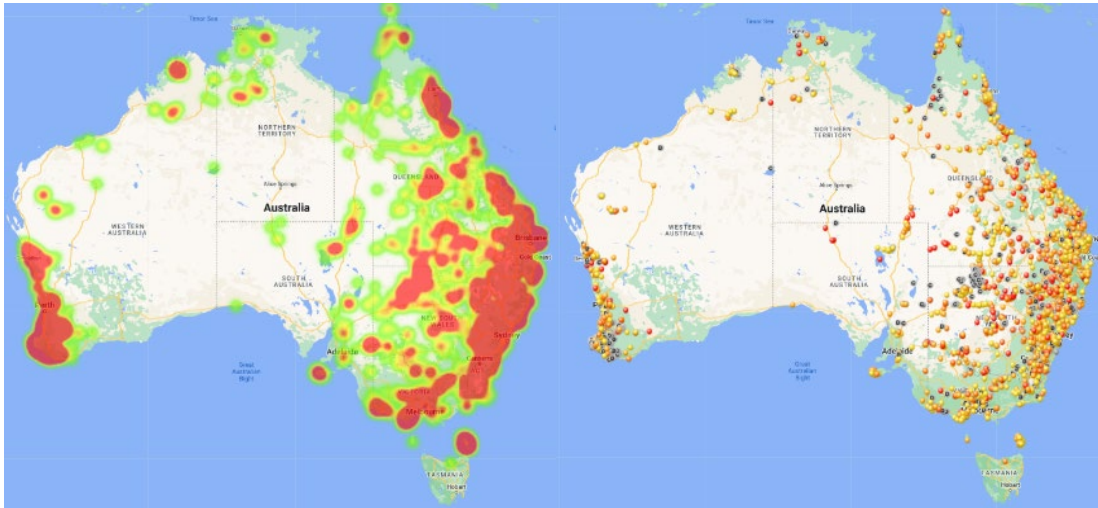


Figure 42. FeralPigScan map concealing all records to public users (left) and showing public and private/secure data (right). This data is not displayed publicly.

## OUTCOMES

- FeralPigScan is used by farmers, landholder groups, contracted professional pest controllers and biosecurity groups in different regions of Australia.
- Recent increases in use may be a result of potential FMD risk, and increased awareness that information is not shared publicly.
- A number of local farming, catchment and government groups are using FeralPigScan in Far North Queensland to document feral pig activity and guide local control activities, including poison baiting. These programs are multi-agency collaborations to reduce feral pig impacts on a landscape scale.
- This resource continues to provide a valuable service to many groups and organisations Australia-wide, and its use will likely increase with potential FMD risk in pig populations.

## MYNASCAN

[www.feralscan.org.au/mynascan](http://www.feralscan.org.au/mynascan)

### OBJECTIVES

- raise awareness of myna birds as a problem, threat or risk
- encourage people to monitor and document observations or problems
- invite people to report activity using FeralScan, including control actions
- encourage people to work with their community and government organisations
- share data with biosecurity, government or pest management organisations
- share important information resources with all users, such as practical guides or videos.

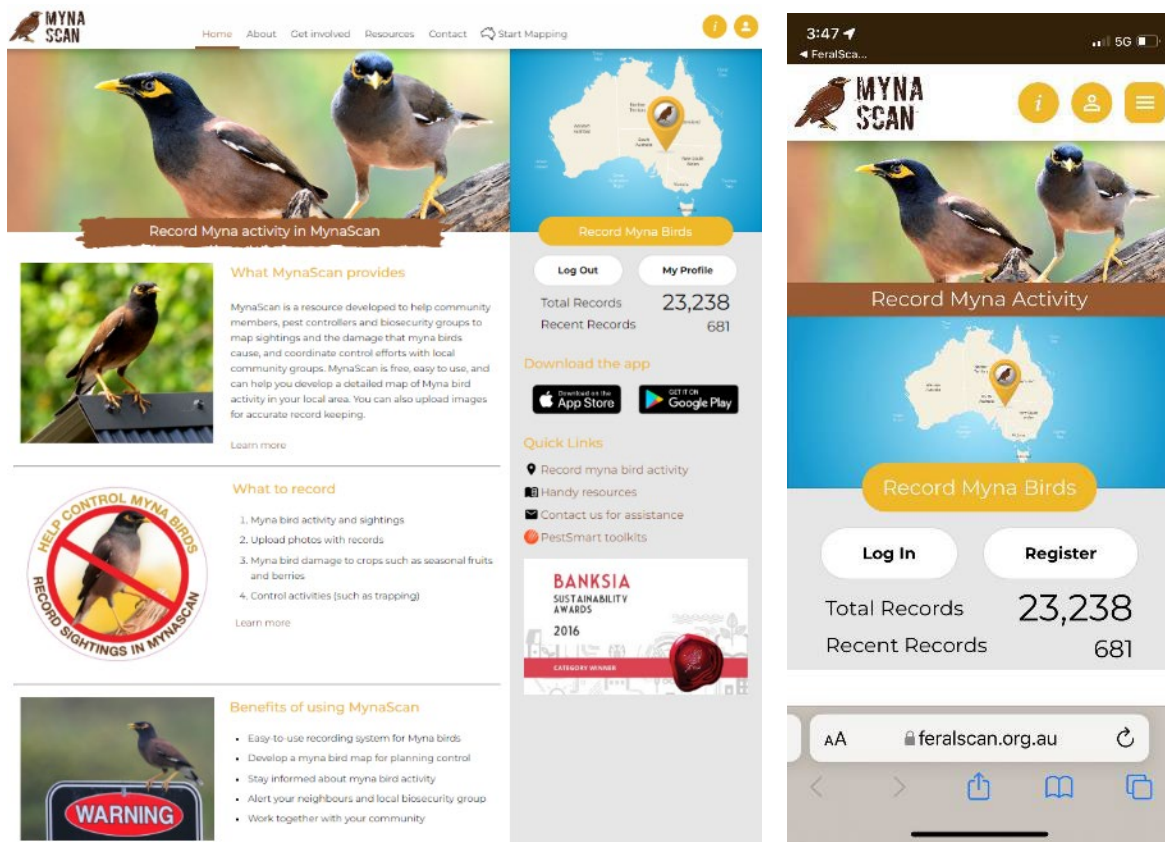


Figure 43. The MynaScan landing page (left) and reporting page in the FeralScan mobile app (right)

### USAGE SUMMARY

- MynaScan has been used to document 21,552 sightings (includes nests), 435 reports of damage and 1,255 control actions.
- It has been used to identify range extensions for this invasive bird in several states and territories. This species continues to spread in rural areas.
- Reports are shared with biosecurity authorities and local government organisations.

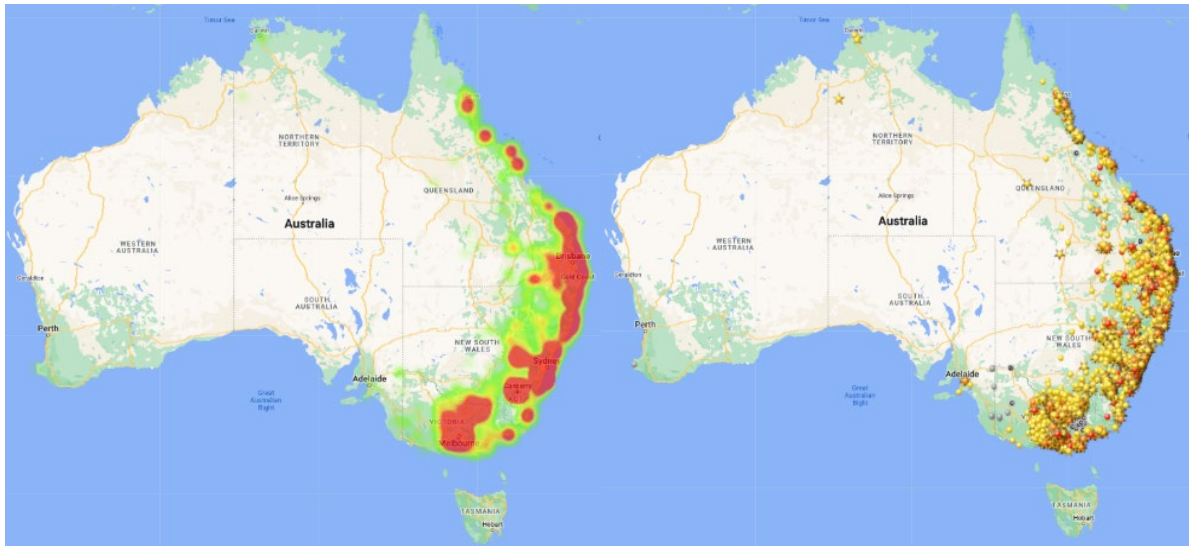


Figure 44. MynaScan map concealing all records to public users (left) and displaying all records, including nesting sites (right). This data is not displayed publicly.

#### OUTCOMES

- MynaScan has been used across eastern Australia, and is most commonly used in towns and cities where people report sightings of the bird.
- It is increasingly being used by communities in rural towns.
- The website raises awareness about myna birds and connects users to a range of practical resources and control information.



## TOADSCAN

[www.toadscan.org.au](http://www.toadscan.org.au)

### OBJECTIVES

- engage with communities about cane toads as a problem, threat or risk
- encourage people to correctly identify and monitor toads, and to document observations or problems via ToadScan
- encourage people to connect with their community and government agencies
- share data with biosecurity, government or pest management organisations
- share practical control information, guides or videos with all users
- disseminate information about new cane toad control tools.

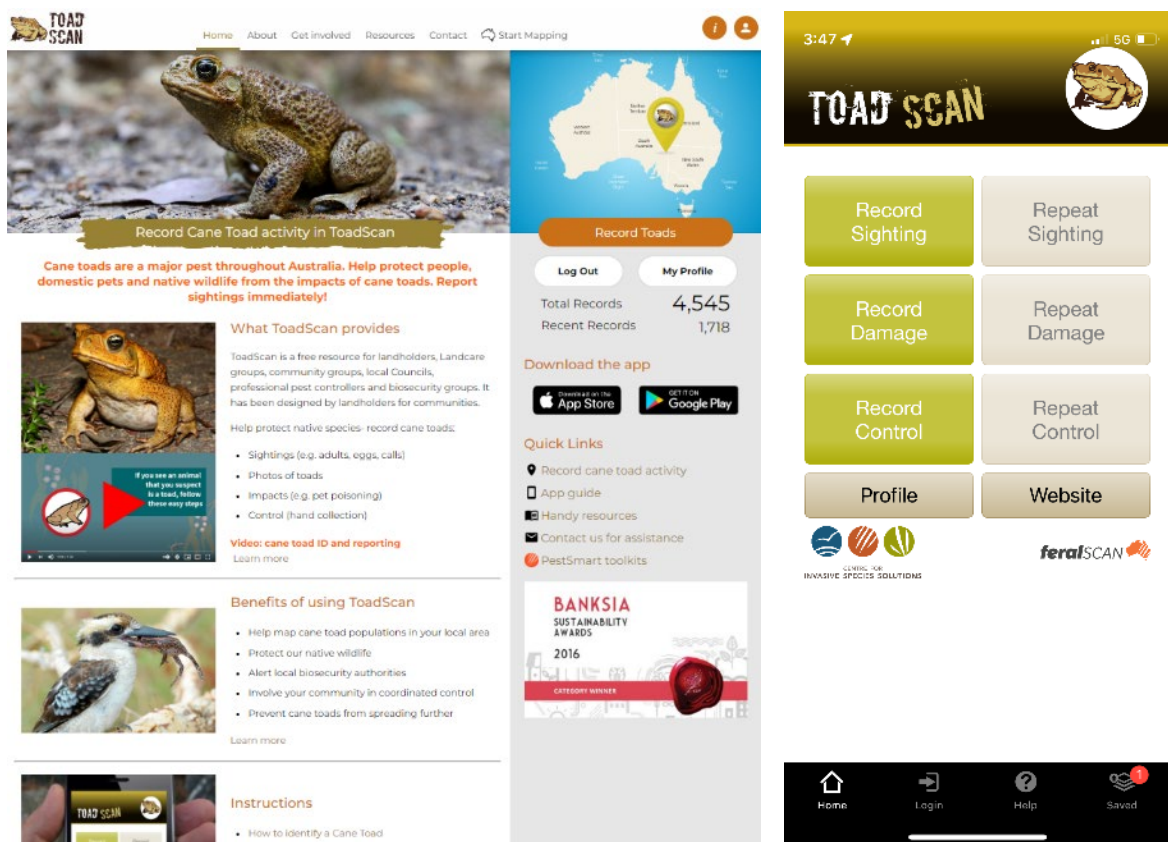


Figure 45. The ToadScan landing page (left) and reporting page in the FeralScan mobile app (right)

### USAGE SUMMARY

- ToadScan has been used by the community to record 3,273 reports of sightings, 66 reports of cane toad poisonings and 1,209 control actions.
- It is well used in northern NSW by landcare groups and government.
- Reports that constitute new incursions of cane toads are sent directly to state biosecurity authorities, who coordinate local responses.

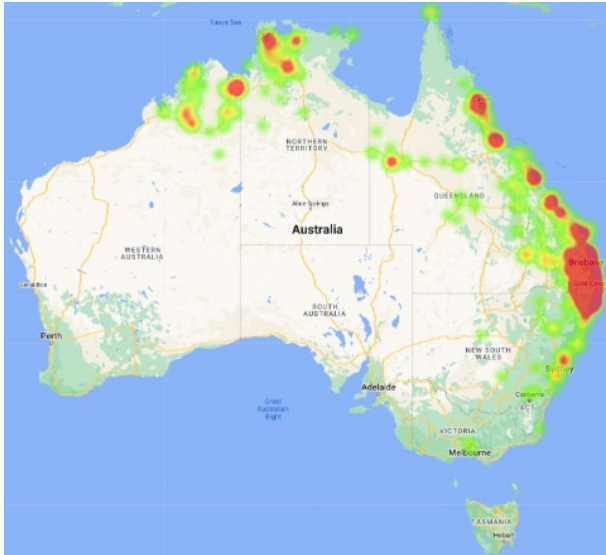


Figure 46. ToadScan heat map concealing all records to public users

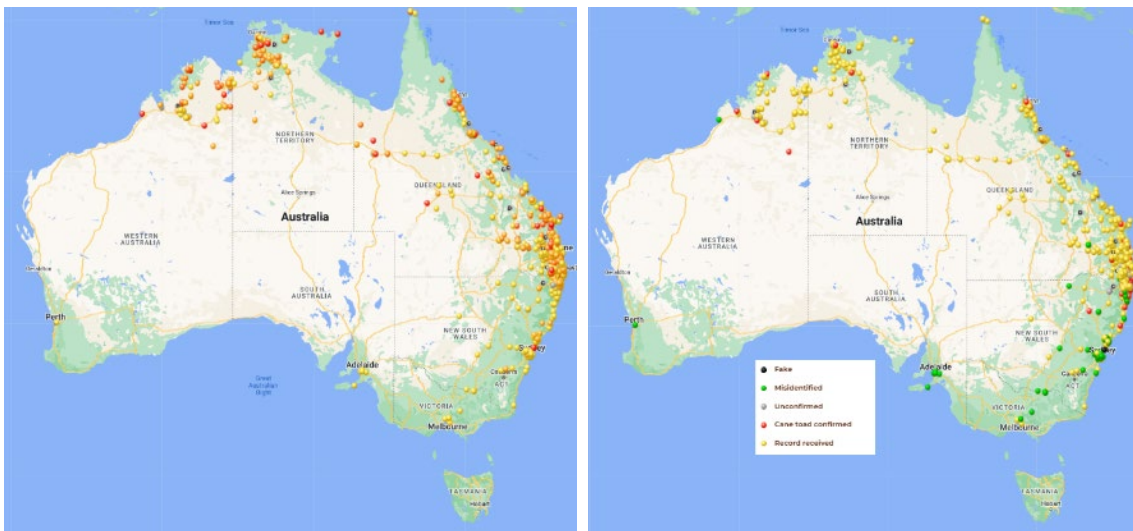


Figure 47. ToadScan map showing all records (public and private/secure data) (left) and administration records, including misidentified animals (right). This data is not displayed publicly.

## OUTCOMES

- The ToadScan resource is mainly used to record sightings or observations of cane toads.
- The project has assisted organisations and individuals in many locations to correctly identify cane toads.
- ToadScan is well used in northern NSW by landcare groups and government.
- Reports that constitute new incursions of cane toads are sent directly to state biosecurity authorities, who coordinate local responses.
- Notifications are deployed to biosecurity organisations in priority areas.

## MOUSEALERT

[www.mousealert.org.au](http://www.mousealert.org.au)

### OBJECTIVES

- encourage people to monitor mouse activity and document observations
- encourage people to connect with government agencies and industry groups
- share data with CSIRO and government departments for monitoring and research purposes
- share practical control information with people who record information about mouse activity
- disseminate information about mouse control, mouse monitoring and industry resources to rural landholders using MouseAlert.

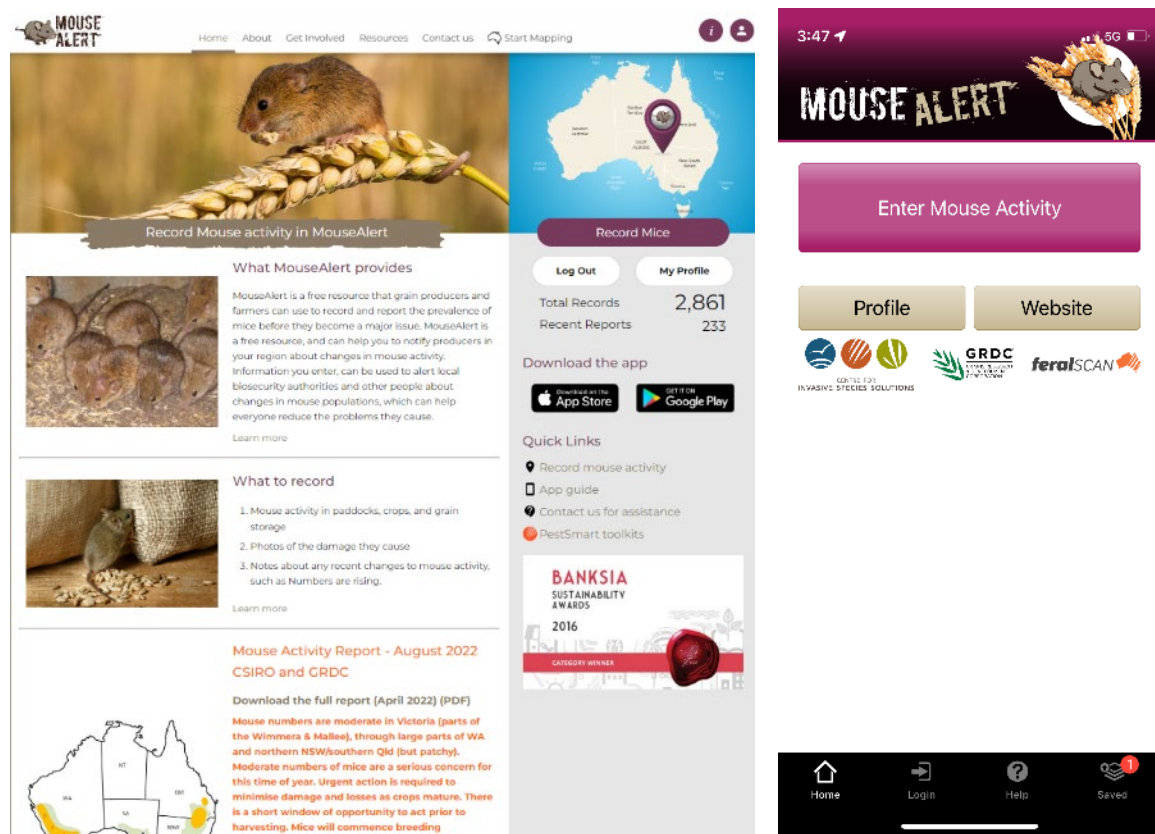


Figure 48. The MouseAlert landing page (left) and reporting page in the FeralScan mobile app (right)

### USAGE SUMMARY

- During the project term, 2,861 reports of mouse activity were entered into MouseAlert.
- The majority of reports were made during the mouse plague throughout 2020 to 2021.

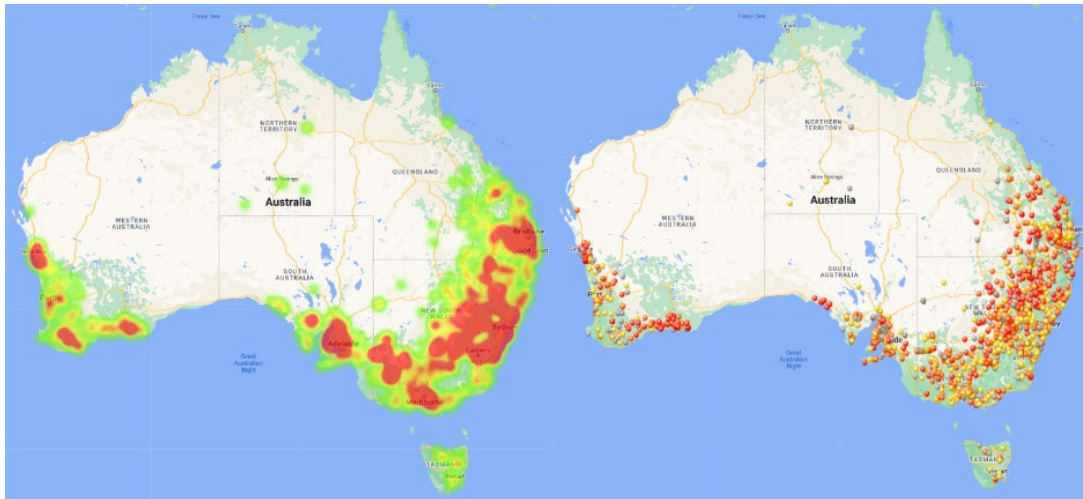


Figure 49. MouseAlert map concealing all records to public users (left) and showing public and private/secure data (right). This data is not displayed publicly.

### OUTCOMES

- MouseAlert has been used widely throughout grain production regions in association with recent plague events.
- CSIRO mouse monitoring updates were sent via automatic notifications back to MouseAlert users who contributed information.
- Users receive information about available industry and government support, and events such as mouse control webinars hosted by government and industry.
- MouseAlert could continue to play an important role in communicating information back out to grain producers and farmers, including new monitoring technology and new control tools or conditions for use of rodenticides.

## FERALGOATSCAN

[www.feralscan.org.au/feralgoatscan](http://www.feralscan.org.au/feralgoatscan)

### OBJECTIVES

- raise awareness of feral goats as a problem, threat or risk in many areas
- encourage people to monitor and document observations or problems
- invite people to report activity using FeralScan, including control actions
- encourage people to work with their community and government organisations
- share data with biosecurity, government or pest management organisations
- share important information resources with all users, such as best practice guides.

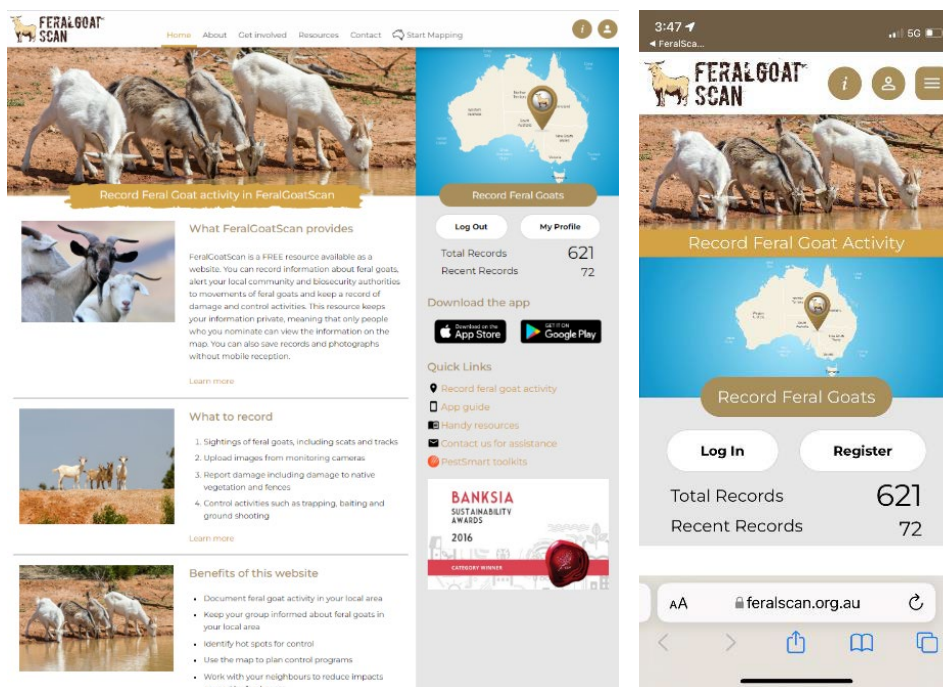


Figure 50. The FeralGoatScan landing page (left) and reporting page in the FeralScan mobile app (right)

### USAGE SUMMARY

- FeralGoatScan has been used by the community to report 569 sightings, 21 cases of goat damage and 31 goat control activities.
- A small number of local government organisations are using this resource.
- There are only a small number of landholder groups that are using FeralGoatScan, primarily for sharing observations with local government agencies.

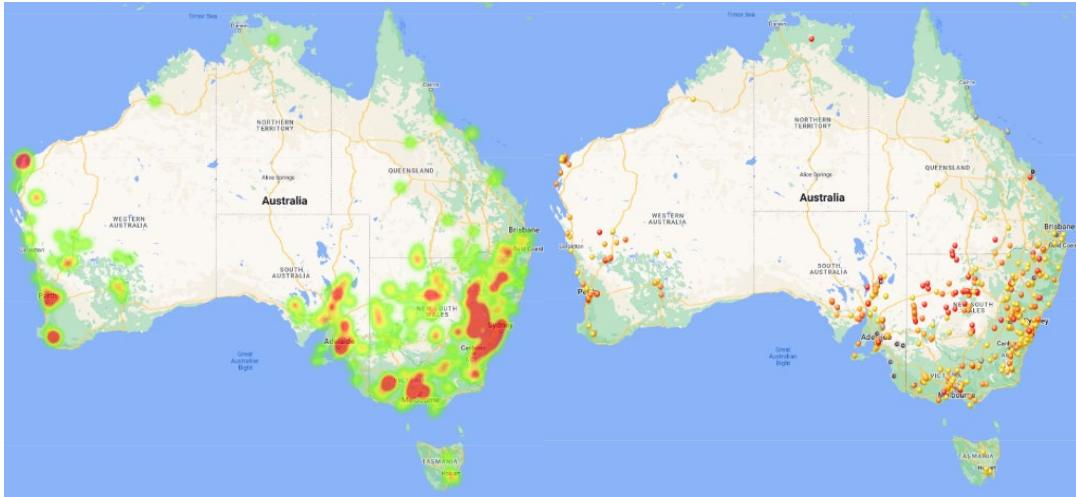


Figure 51. FeralGoatScan map concealing all records to public users (left) and showing public and private/secure data (right). This data is not displayed publicly.

### OUTCOMES

- FeralGoatScan has not been used widely but remains a useful tool for communities to record information to local authorities.
- It has been most valuable when the public have reported seeing feral goats in unusual locations, along roadways or within protected areas.
- Notifications have been deployed to local authorities and biosecurity organisations.

## FERALFISHSCAN

[www.feralfishscan.org.au](http://www.feralfishscan.org.au)

### OBJECTIVES

- raise awareness of seven pest fish species in Australia's waterways as a problem, threat or risk
- encourage people to monitor and document observations or problems caused by these species
- invite people to report activity using FeralScan, including detailed information about habitat variables
- share data with aquatic biosecurity, government or pest management organisations
- notify authorities about potential incursions of pest fish in waterways.

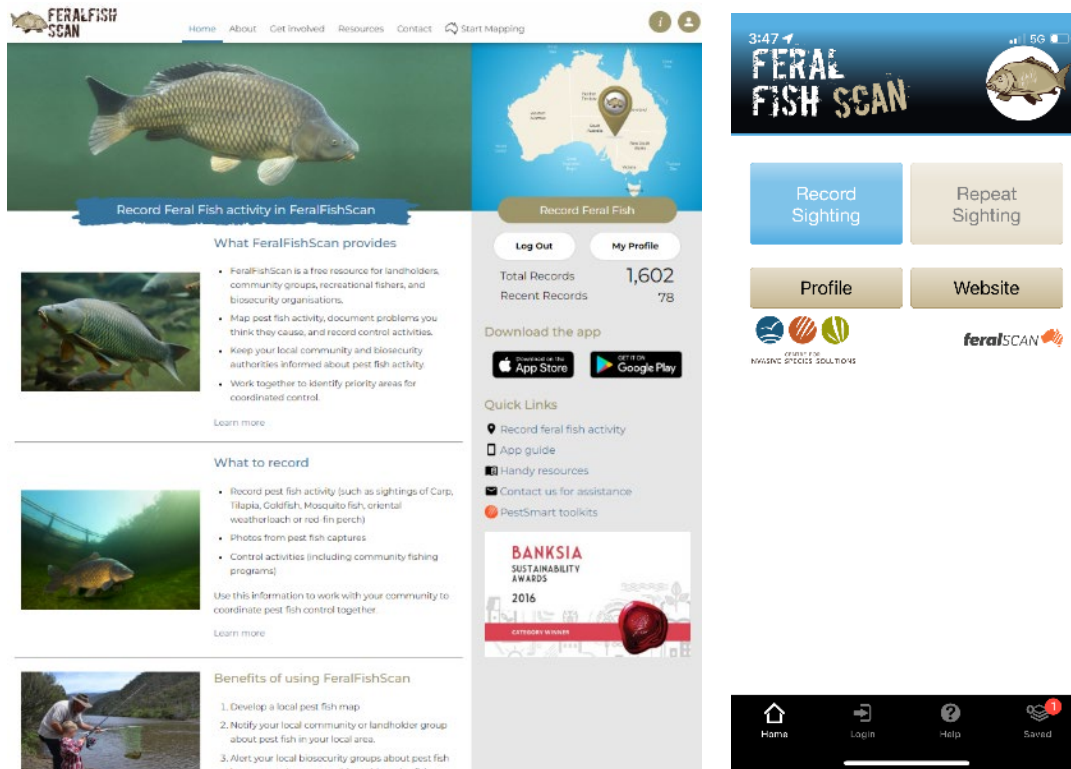


Figure 52. The FeralFishScan landing page (left) and reporting page in the FeralScan mobile app (right)

### USAGE SUMMARY

- This resource has been used by the community to record 1,603 reports of pest fish in waterways.
- FeralFishScan has been used to report the following pest fish species in different locations: common carp (996 sites), Mozambique tilapia (243 sites), Eastern gambusia (174 sites), redfin perch (107 sites), feral goldfish (51 sites), oriental weatherloach (22 sites) and spotted tilapia (15 sites).

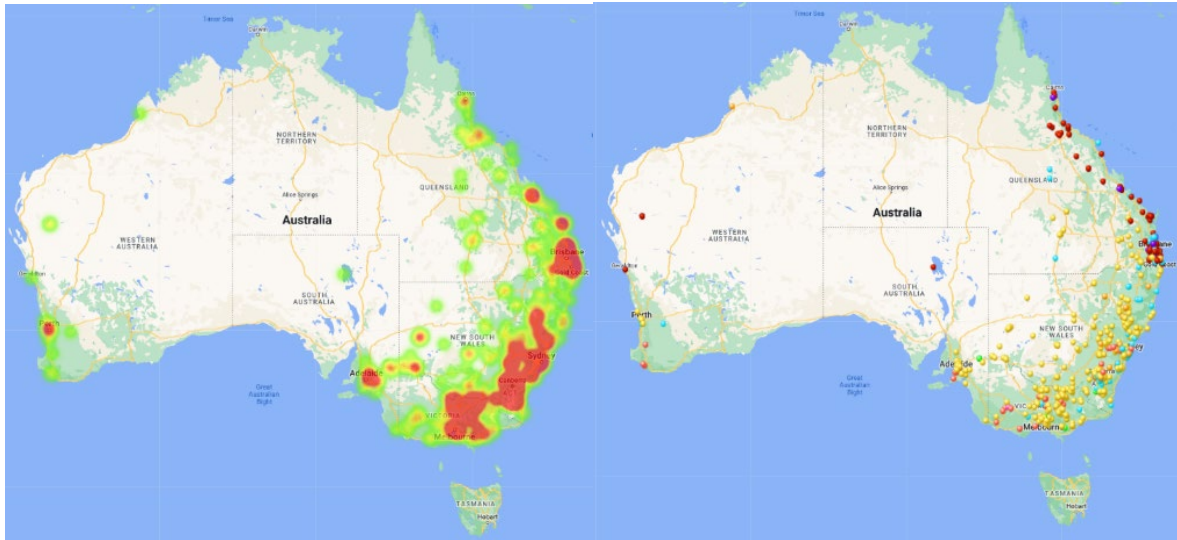


Figure 53. FeralFishScan map concealing all records to public users (left) and showing public and private/secure data (right). This data is not displayed publicly.

### OUTCOMES

- FeralFishScan has been used by communities (mainly recreational fishers) to report pest fish in many waters, including some that were not known to local authorities.
- FeralFishScan has alerted biosecurity authorities in four state/territory jurisdictions about pest fish incursions.
- This resource is best used in association with active projects, programs and surveillance activities.



## STARLINGSCAN

[www.feralscan.org.au/starlingscan](http://www.feralscan.org.au/starlingscan)

### OBJECTIVES

- raise awareness of starlings as a problem, threat or risk in many areas (including urban and rural areas)
- encourage people to report observations or problems
- encourage people to access resources online to reduce the problems caused by starlings, and to follow humane code of practice guidelines
- share data with biosecurity, government or pest management organisations where relevant
- notify authorities in areas where starlings have been reported but are considered a high risk, such as WA.

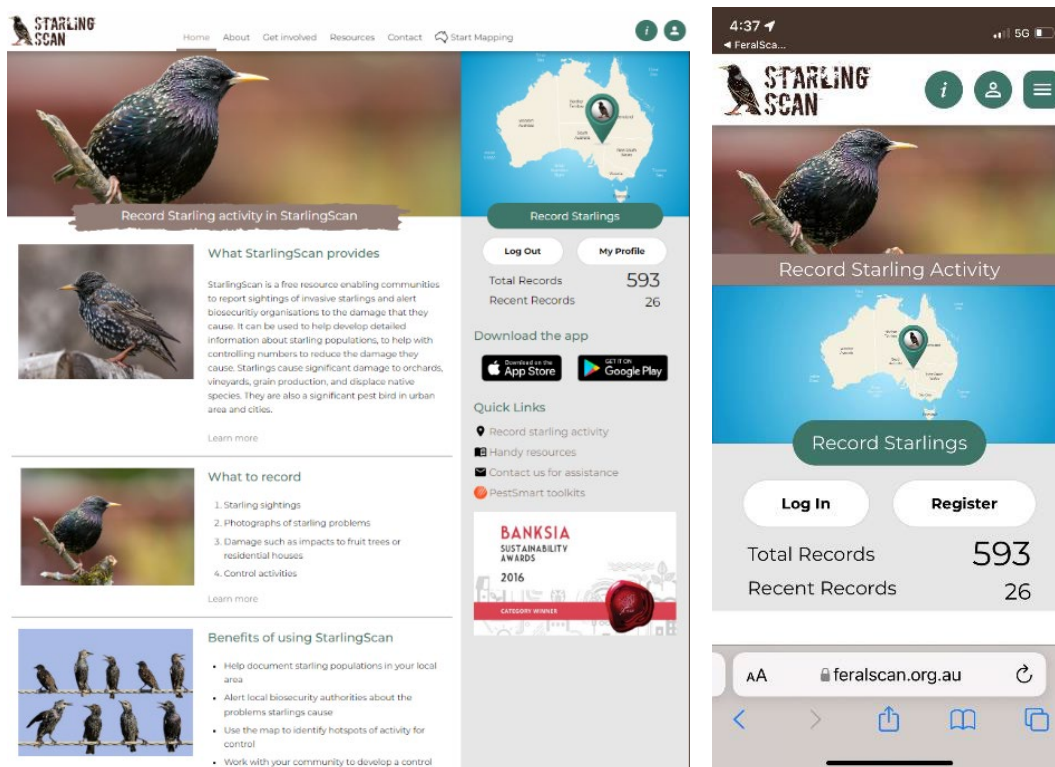


Figure 54. The StarlingScan landing page (left) and reporting page in the FeralScan mobile app (right)

### USAGE SUMMARY

- StarlingScan has received reports of 484 starling sightings, 23 cases of damage and 86 control actions.
- Fifty control activities have been recorded in WA through this resource in association with the states starling eradication program.

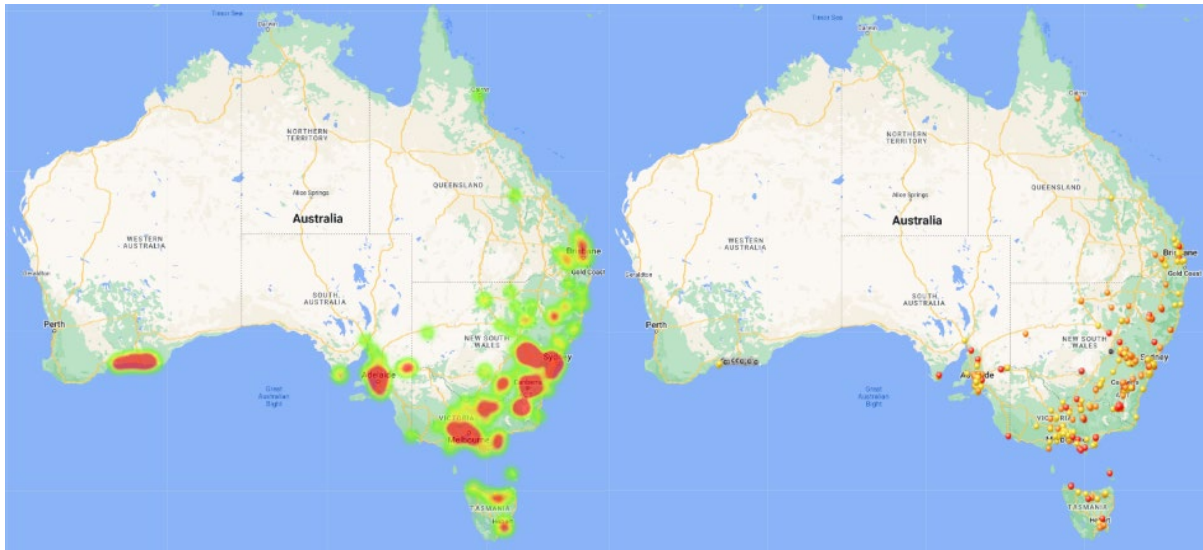


Figure 55. StarlingScan map concealing all records to public users (left) and showing public and private/secure data (right). This data is not displayed publicly.

### OUTCOMES

- StarlingScan has been used by communities (in predominantly urban and semi-rural areas) to report incidental observations of starlings.
- This resource has alerted biosecurity authorities in Qld, WA, SA and NT about possible incursions of starling into new areas.
- This resource has been used by the WA government to document starling control.
- This resource is best used in association with active projects, programs and surveillance activities.

## OTHER PESTS - FERAL DONKEYS, FERAL CAMELS, FERAL BUFFALO

[www.feralscan.org.au/otherpests](http://www.feralscan.org.au/otherpests)

### OBJECTIVES

- raise awareness of large feral herbivores (including camels, donkeys, buffalo, and feral cattle and horses) as a problem, threat or risk in many rangelands across Australia
- encourage people to document observations to local authorities
- share data with biosecurity, government, regional biosecurity groups or pest management organisations
- share important information with all users, such as practical guides to managing the impacts of large herbivore pests.

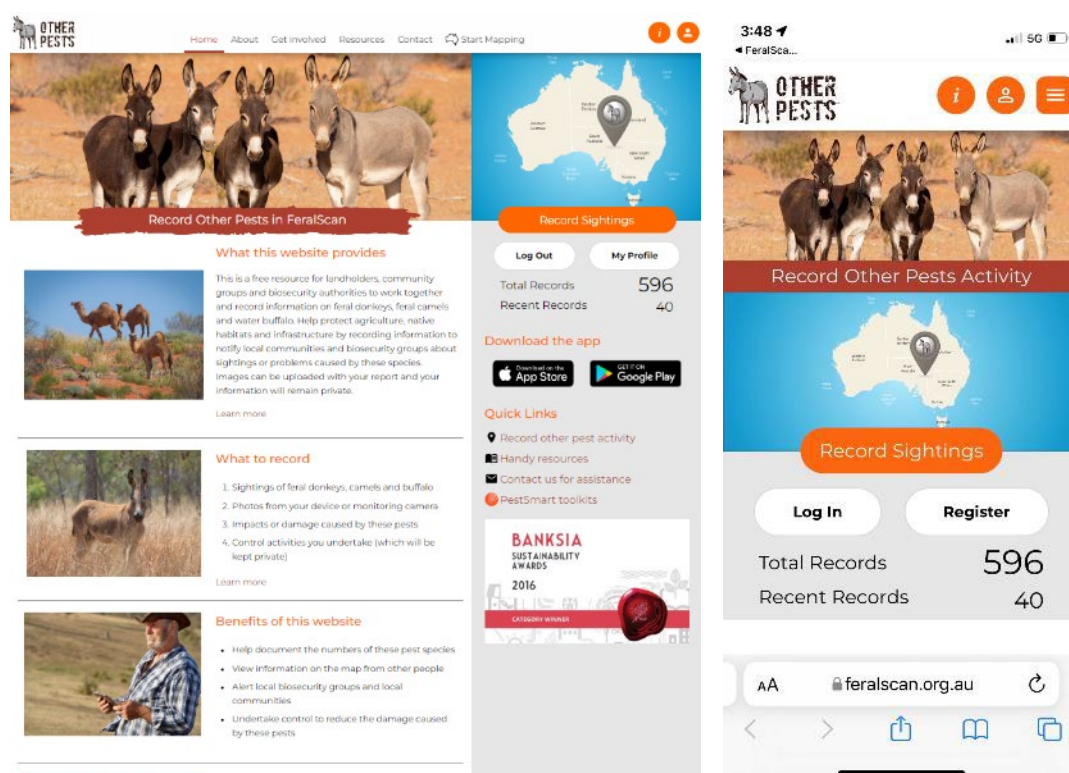


Figure 56. The OtherPests landing page (left) and reporting page in the FeralScan mobile app (right)

### USAGE SUMMARY

- OtherPests has received 524 reports of feral donkeys, camels and buffalo have to the platform. There have been 23 reports of damage, and 49 control actions documented.
- This resource was developed in late 2021 and has not been widely promoted yet.
- Reports received have been shared with regional biosecurity groups.

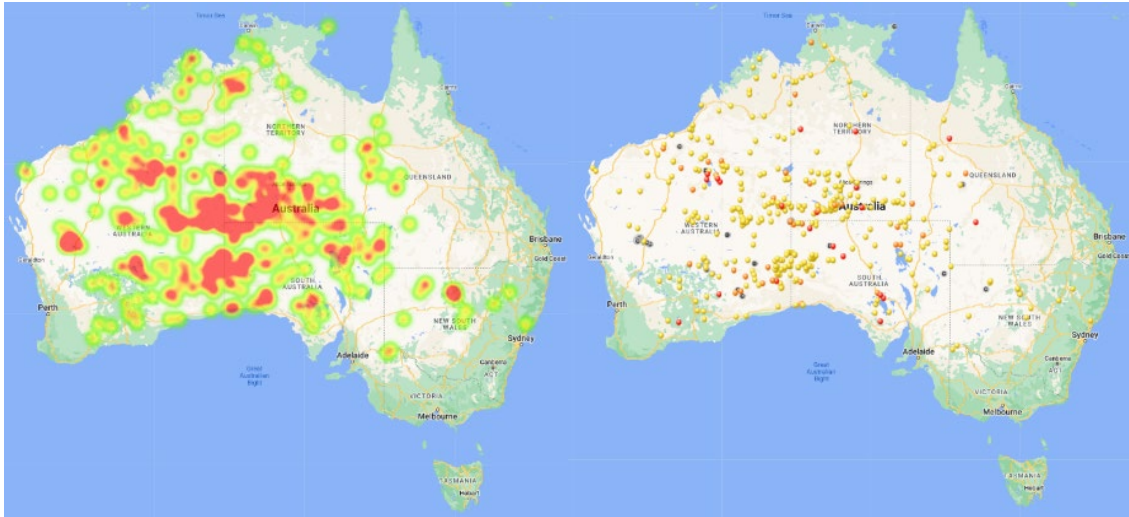


Figure 57. FeralScan map of large herbivores/other pests (including donkeys, camels and buffalo) concealing all records to public users (left) and showing public and private/secure data (right). This data is not displayed publicly.

### OUTCOMES

- This resource was developed in late 2021 in collaboration with the Kimberley Rangelands Biosecurity Group.
- It is intended to provide a platform to enable landowners and people travelling in remote areas to report observations of feral camels, donkeys and other large herbivores (potentially including feral cattle and horses).
- The intent will be to expand this resource and promote its use in many regional areas of Australia, especially where large herbivores are found on roadsides and in remote areas.

## NEWPESTS - CORN SNAKES, RED-EARED SLIDER TURTLES

[www.feralscan.org.au/newpests](http://www.feralscan.org.au/newpests)

### OBJECTIVES

- raise awareness about species such as red-eared slider turtles and American corn snakes as a problem, threat or potential risk
- encourage people to document observations to local authorities, and encourage a behaviour of reporting unusual animals seen in the wild
- share data with biosecurity, government, regional biosecurity groups or pest management organisations
- provide a 'non-government' platform for community reporting of possible high-risk species
- gauge public interest in reporting new pests through non-government channels.

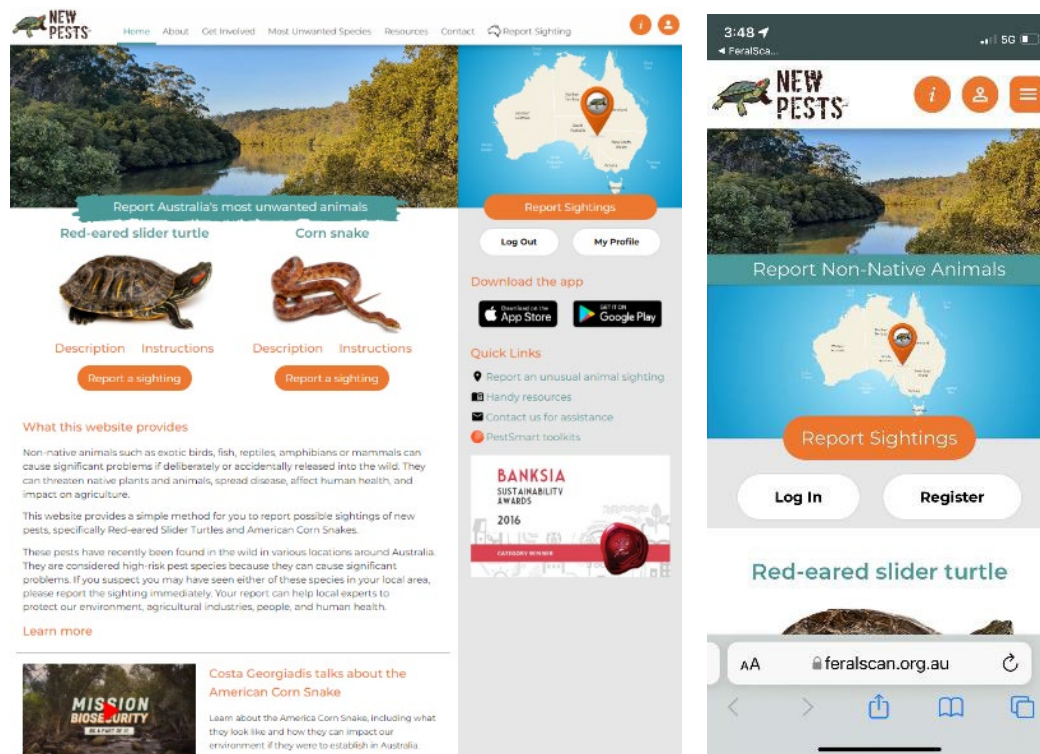


Figure 58. The NewPests landing page (left) and reporting page in the FeralScan mobile app (right)

### USAGE SUMMARY

- The NewPests resource is in its early stages, having been developed in mid-2021.
- It contains 116 reports of new pest incursions in NSW, and many reports are duplicated within NSW Government databases.
- It contains three reports in Vic and Tas, that were misidentifications.
- Reports received have been followed up by local biosecurity authorities.



Figure 59. FeralScan map of corn snakes and red-eared slider turtles showing all public records (left) and all records, including administration markers (right). This data is not displayed publicly.

## OUTCOMES

- Reports received have been shared with regional biosecurity groups.
- This resource has alerted biosecurity authorities in NSW, Vic and Tas about possible incursions into new areas.
- This resource is best used in association with active projects, programs and surveillance activities.
- The intent will be to expand this resource and promote its use, to offer an additional avenue for community-based reporting of high-risk new pests.
- FeralScan users have been asked to remain on the lookout for American corn snakes and red-eared slider turtles.

## APPENDIX 3. FERALS SCAN IN THE FIELD: CASE STUDIES FROM ACROSS AUSTRALIA

### CASE STUDY 1: DATA-SHARING WITH ATLAS OF LIVING AUSTRALIA

The FeralScan platform now shares non-sensitive data with ALA. Over 111,000 pest animal occurrence records are available to ALA, allowing its users and partners to access non-sensitive FeralScan records. This represents approximately 32% of all FeralScan data and photographs.

Sharing FeralScan data with ALA forms the basis of an important partnership between these distinct data management platforms.

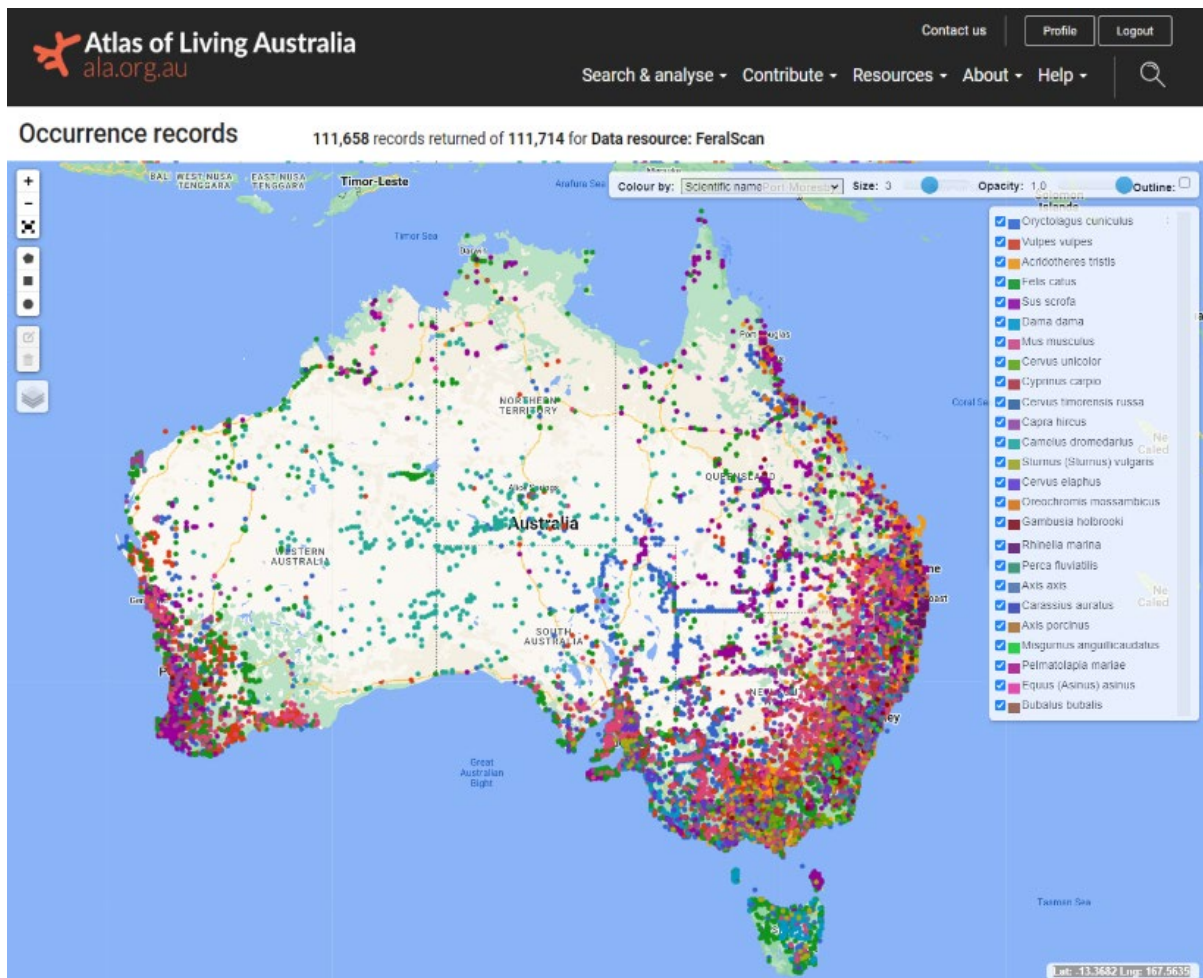


Figure 60. The Atlas of Living Australia receives daily updated FeralScan data. Note: only non-sensitive species' data is shared with ALA, and this data is managed securely.

## CASE STUDY 2: FERAL PIG AND FERAL DEER MONITORING WITH COMMUNITY SUPPORT IN OTWAY, VIC

The Conservation Ecology Centre (CEC) based in the Greater Otway, Vic, has partnered with several land management organisations (including Parks Victoria, Barwon Water and local councils) to collect detailed information about feral deer and pigs throughout the district. Each organisation is documenting information about these pest species, and this information is shared across organisations. The broader community is also actively encouraged to record evidence of feral deer and pigs, to determine which deer species occur in which localities, to identify the distribution of deer and pigs, and identify opportunities for collaboration in pest management. The community supplies detailed information which is then documented by staff within these organisations.

Importantly, a lot of new information has been obtained which is guiding management. The FeralScan platform is providing an invaluable tool for engaging with the public, documenting the situation with pest animals, securely sharing information across organisations in the district and using the information to undertake pest animal control.



Figure 61. Team members involved in the collaboration (top right) and a map of the project area in the Otways, Vic (bottom left), where communities have been actively encouraged to report feral deer and pig activity.



### CASE STUDY 3: HARGRAVES-HILL END WILD DOG CONTROL ASSOCIATION

For the Hargraves-Hill End Wild Dog Control Association, WildDogScan has become a valuable tool for monitoring and managing wild dogs. The group has 48 registered members in their private FeralScan group, including farmers, a local landholder coordinator, professional pest controllers and staff from local government departments. The group has used WildDogScan for many years to:

1. provide a single location for all wild dog information for their local community.
2. involve landholders and the community in monitoring wild dog activity.
3. build a detailed wild dog activity map for their local area and use information to guide local control activities.
4. receive email alerts about wild dog attacks to help them respond to threats.
5. view charts, tables and maps of information to evaluate management.

FeralScan has allowed the group to bring landholders, pest controllers, local biosecurity agencies and land managers together to define the scale of the wild dog problem in their area, identify priority areas for control, coordinate control activities and monitor outcomes. FeralScan has become a vital tool for this landholder group.

To date, the group has documented 837 reports of wild dog activity, 160 attacks (during which 354 sheep were killed and 235 mauled) and 349 control actions (with 88 wild dogs reported destroyed).

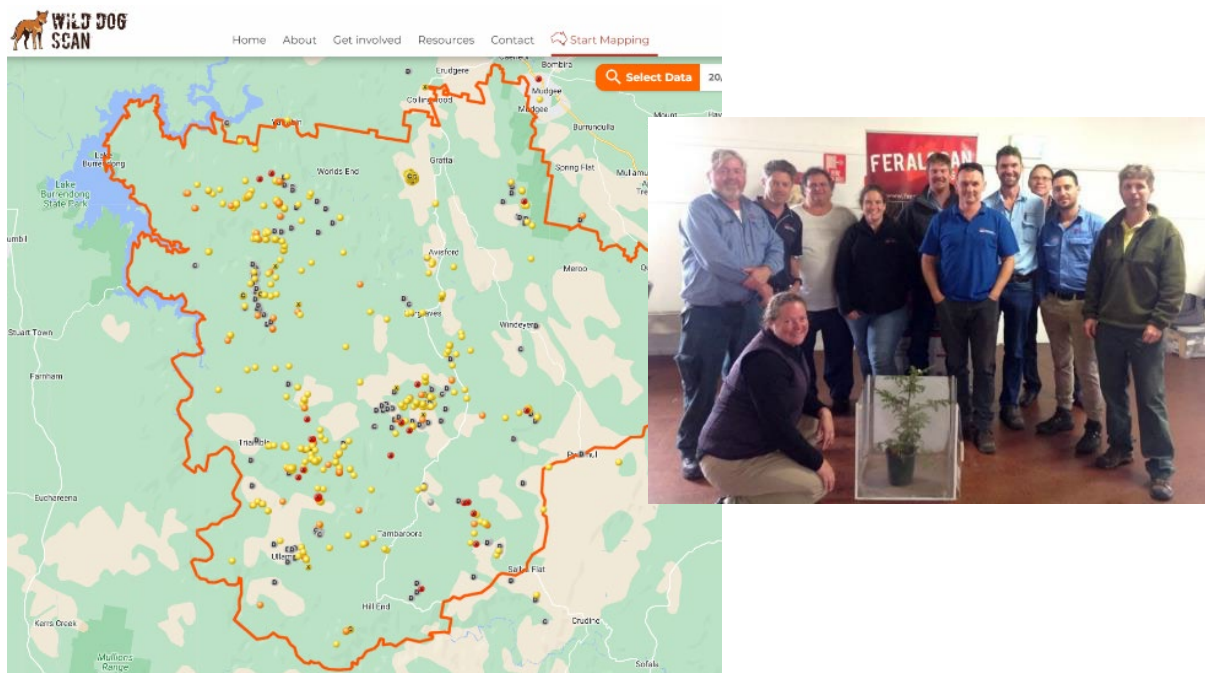


Figure 62. Community members and agency staff came together to promote monitoring and management of pests (right). A local wild dog activity map for the Hargraves Hill End Wild Dog Control Association (left)

### Sighting and Damage



### Control

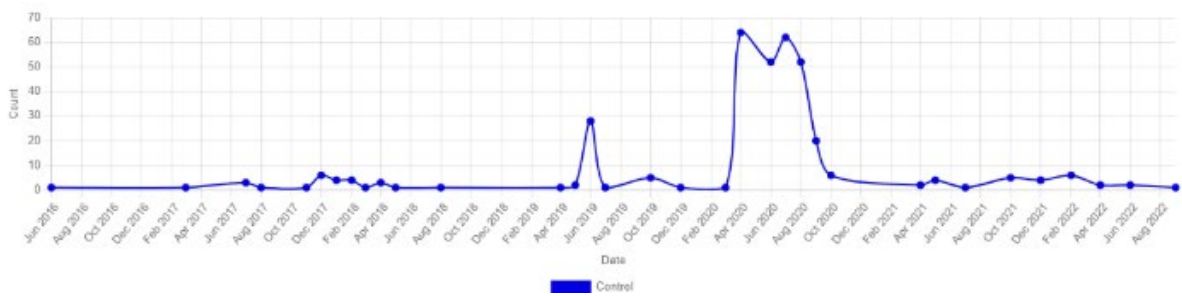


Figure 63. The Hargraves Hill End Wild Dog Control Associations private FeralScan dashboard shows information recorded by landholders since 2015, including sightings and evidence of wild dogs, attacks and control activities.

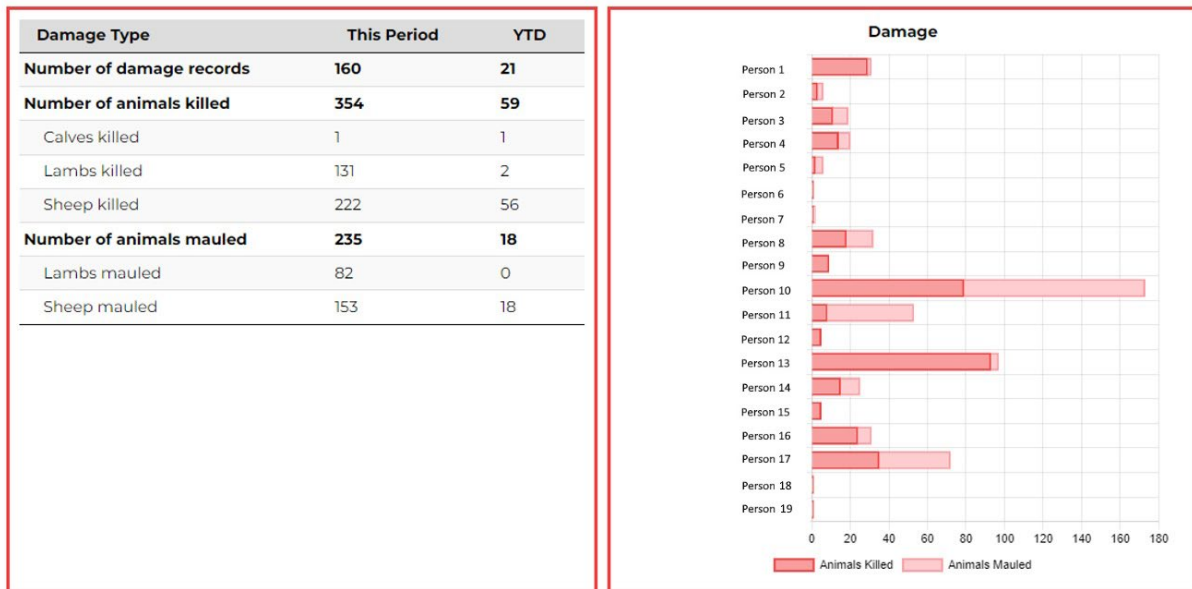


Figure 64. The number of sheep, lambs and calves that have been killed or mauled by wild dogs, recorded by users in the Hargraves Hill End Wild Dog Control Associations private FeralScan group. Note: this figure displays some data recorded about wild dog impacts at this locality, and not all wild dog attacks are documented.

## CASE STUDY 4: NORTHERN RIVERS FERAL DEER ALERT PROJECT

The Northern Rivers Feral Deer Alert project is a collaboration between seven local government organisations and the North Coast LLS in the Northern Rivers region of NSW. Feral deer are not abundant in most parts of this region, and these organisations are working together to try to prevent deer from establishing, or colonising new areas of the region. The group actively encourage the community to record all observations of feral deer, and share information across the region amongst stakeholders as they collaborate to control deer populations. The group have been reporting through the DeerScan platform for over a year, and it has become an invaluable tool for its members.

The image shows a screenshot of the Northern Rivers Feral Deer Alert website. At the top left is the logo 'THE NORTHERN RIVERS IS ON FERAL DEER ALERT' with a red deer silhouette. To the right is a navigation menu with buttons for Home, Understand, Identify, Report, Management, Deer watch, and FAQ. Below the logo is a video player with a play button and a progress bar. The video content shows a map of the Northern Rivers region with a red deer silhouette and the text 'THE NORTHERN RIVERS IS ON FERAL DEER ALERT'. To the right of the video player is a text block with the heading 'FERAL DEER ARE BECOMING ONE OF AUSTRALIA'S WORST PEST ANIMALS' and two paragraphs of text. Below the text is a 'DEER SCAN' logo and a map of the Northern Rivers region showing the project area. The map is a satellite view with an orange outline of the region and several orange dots indicating detected feral deer locations.

THE NORTHERN RIVERS IS ON  
**FERAL DEER ALERT**

Home Understand Identify Report Management Deer watch FAQ

Help us prevent feral deer numbers growing out of control in The Northern Rivers.

We need the whole community to stay on Feral Deer Alert, while you're driving, bushwalking or managing your property.

**How you can help**

Help your community understand the devastating impacts of feral deer

Learn how to identify each feral deer before you report a sighting

Report all feral deer sightings as soon as possible

**FERAL DEER ARE BECOMING ONE OF AUSTRALIA'S WORST PEST ANIMALS**

When you first see a deer or two in the landscape it can be a novelty.

But feral deer can quickly breed and develop into large herds with even bigger appetites.

**DEER SCAN**

Figure 65. The Feral Deer Alert project website (top left). A DeerScan map showing the project area where feral deer have been detected by the community at multiple locations (bottom right)

## CASE STUDY 5: WILD DOG CONTROL ACTIVITIES OF RECOGNISED BIOSECURITY GROUPS, WA

Throughout WA, there are 14 recognised biosecurity groups and associations using FeralScan, who to record information or document control activities for wild dogs, feral pigs, feral cats, rabbits and foxes. These groups include:

- Kimberley Rangelands Biosecurity Association
- Pilbara Regional Biosecurity Group
- Meekatharra Rangelands Biosecurity Association
- Northern Biosecurity Group
- Carnarvon Rangelands Biosecurity Group
- Central Wheatbelt Biosecurity Group
- Eastern Wheatbelt Biosecurity Association
- Southern Biosecurity Group
- Goldfields Nullarbor Rangelands Biosecurity Association
- Esperance Biosecurity Association
- Leschenault Biosecurity Group
- Blackwood Biosecurity Inc.
- Peel Harvey Biosecurity Group
- Midlands Biosecurity Group.

WildDogScan is the main reporting tool used by these biosecurity groups. In total, 69,621 wild dog control activities have been documented by licensed pest management technicians in WA. The FeralScan platform provides an essential resource for these organisations/groups, and their management of pests.

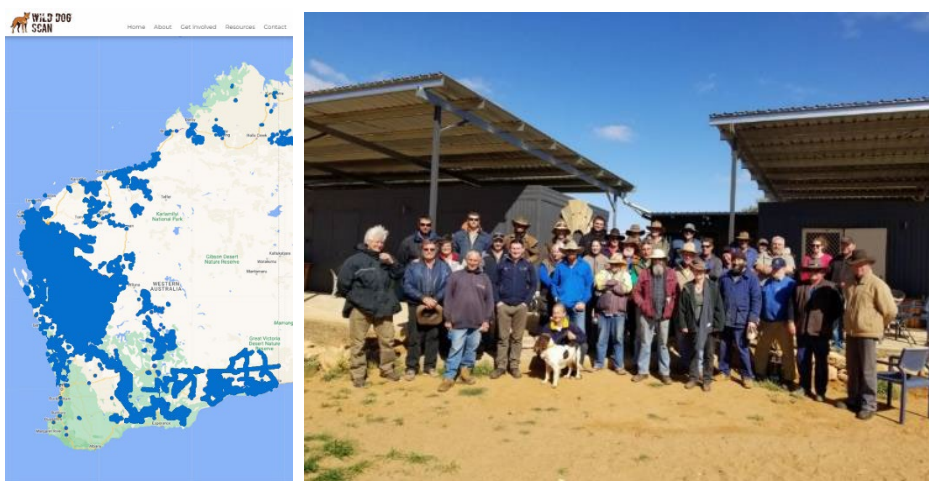


Figure 66. The wild dog data entered by these biosecurity groups (left) and a photograph of licensed pest-management technicians and wild dog management stakeholders in WA (right)

## CASE STUDY 6: CARNARVON RANGELANDS BIOSECURITY ASSOCIATION TRACK WILD DOGS IN WA

The Carnarvon Rangelands Biosecurity Association has been using the WildDogScan component of FeralScan for many years. There are 17 licenced pest management technicians who have been using the WildDogScan app to document control activities. Most of their work is done in areas without mobile service, and they use the app in remote areas for long periods of time. Pest controllers working for the association have documented a total of 3,817 wild dog sightings, 117 attacks on sheep and 28,446 control activities (including trapping, baiting, canid pest ejector use and shooting).

The WildDogScan resource provides this group with a live dashboard of information and summary reports. It is an essential platform for this organisation.

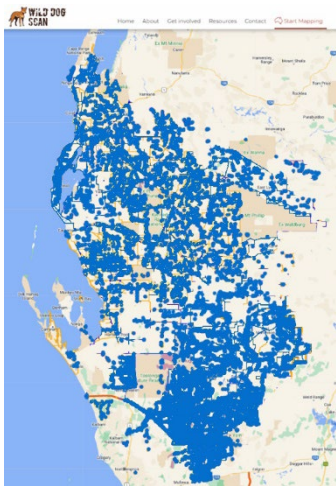


Figure 67. Some of the information documented by licensed pest-management technicians operating in this region of WA (left), and a photo taken during a training program delivered by the FeralScan Coordinator (right)

## CASE STUDY 7: RABBIT MANAGEMENT IN THE BELLARINE PENINSULA, VIC

The RabbitScan platform has been used extensively across the Bellarine Peninsula by the Bellarine Landcare Group, community volunteers, landowners and local council staff. Rabbits are a problem across the Bellarine Peninsula, and a collaboration has formed between community and government organisations to work together to reduce rabbits in several high priority locations. Community volunteers have been actively mapping rabbit warrens and areas where rabbits are abundant, and the information has been used to guide control programs such as fumigation and poisoning.

The Bellarine Landcare Group is the main group coordinating activities, who have been using the RabbitScan resource for many years.

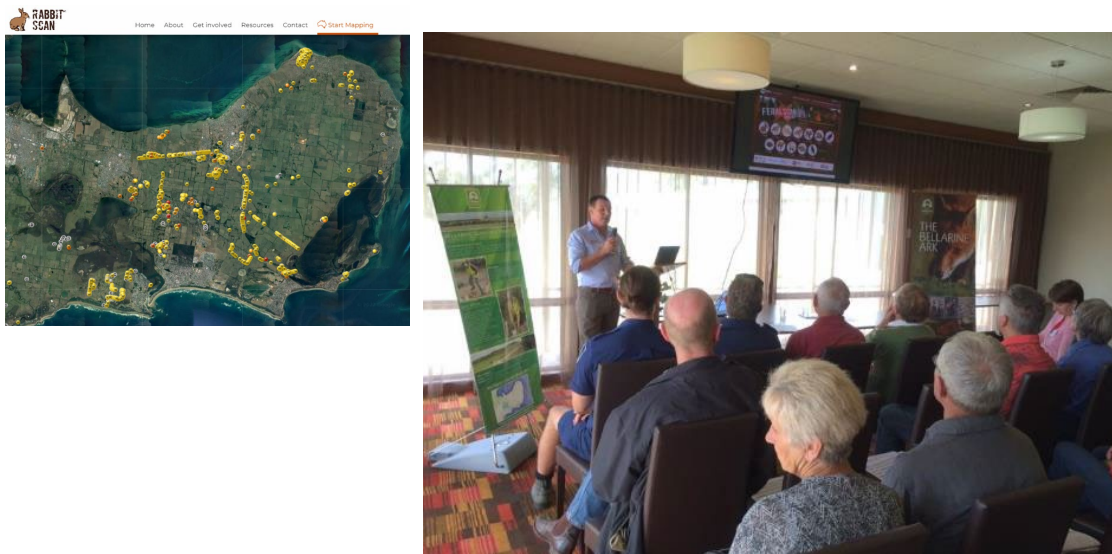


Figure 68. A RabbitScan map of some information recorded across the Bellarine Peninsula (left), and a photo from a face-to-face training session delivered by the FeralScan Coordinator (right)

## CASE STUDY 8: GAME SERVICES TASMANIA MONITOR FALLOW DEER

Games Services Tasmania (a branch of the Department of Natural Resources and Environment Tasmania) are currently using the DeerScan platform to engage with communities across Tas, and actively encourage farmers, landholders, community groups, tourism operators, wilderness area users and the general public to record deer sightings or problems in the app.

This information contributes to understanding the distribution of, and problems caused by, fallow deer across the state, and is used by Games Services Tasmania to guide future management approaches. Communities have been documenting sightings and problems with fallow deer in many areas of the state, and this information has helped identify several new locations where fallow deer had not been known to occur. DeerScan has been an invaluable tool to engage with the public and capture information about deer across Tas.



*Figure 69. Communities are encouraged to record observations or evidence of deer into DeerScan across Tasmania. Pictured here: fallow deer prints along a beach on the east coast of Tas. Source: Quent 2023.*

## **CASE STUDY 9: NSW LOCAL LAND SERVICES WORKS WITH COMMUNITY DEER REPORTING ACROSS GREATER SYDNEY AND ILLAWARRA**

Feral deer have become a significant problem throughout the Greater Sydney and Illawarra regions of NSW, with numerous problems reported to authorities in recent years, such as incidents of motor vehicle collisions on roadways.

The Greater Sydney and South East LLS have been using the DeerScan platform for many years, and are actively encouraging communities to record information about feral deer into DeerScan. Information recorded by the community is helping these organisations to build a detailed map of feral deer activity across the regions, guiding local control activities (including trapping and ground-based shooting) and undertake targeted education activities to areas where deer are problematic.

The project has improved knowledge of where feral deer are found in areas of Greater Sydney and Illawarra, and helped to grow community advocacy for feral deer management. The DeerScan resource has become a highly valued resource for these regions.



*Figure 70. Communities have entered 4,500 feral deer sightings (predominantly rusa, fallow and red) and deer damage reports into DeerScan across the Greater Sydney and Illawarra regions of NSW in recent years. Pictured here: two rusa deer bucks emerge from undergrowth. Source: N Kennedy.*



## CASE STUDY 10: FERAL PIG CONTROL THROUGHOUT FAR NORTH QUEENSLAND

Feral pigs are abundant throughout North and Far North Queensland. The FeralScan app is being used by several organisations, including local government and private landholder groups, to document feral pig activity and use the information that is recorded to guide local control activities. Local government organisations actively encourage the community to record information about feral pigs, particularly farmers who are adversely impacted by pigs such as sugar cane and banana producers.

Several professional feral pig controllers are contracted to manage the impacts of feral pigs in this region. They are using the FeralScan app to document pig activity and trapping and baiting initiatives.

Feral pig data is carefully and privately managed to enable landowners and land managers to collaboratively reduce the damage caused by feral pigs in Far North Queensland.



*Figure 71. Landholders are encouraged to report feral pig activity and work in partnership with local authorities to control feral pigs. Pictured here: feral pig evidence reported by a sugar cane producer near Mareeba, north Qld. Image source: B Rankine.*

## CASE STUDY 11: WILD DOG MONITORING AND MANAGEMENT ON HEYTESBURY CATTLE STATIONS, NT

The Heytesbury Cattle Company currently uses the FeralScan WildDogScan platform to document information on wild dog activity and attacks across multiple large pastoral stations managed by different station managers and teams. The private enterprise also documents wild dog control across the stations, allowing station managers to see where control is being undertaken relative to locations of wild dog attacks on cattle or calves.

The organisation has imported station information to the WildDogScan map to improve the WildDogScan map for use in planning and decision-making. Ten Heytesbury station managers have access to the interactive map and summary dashboards.

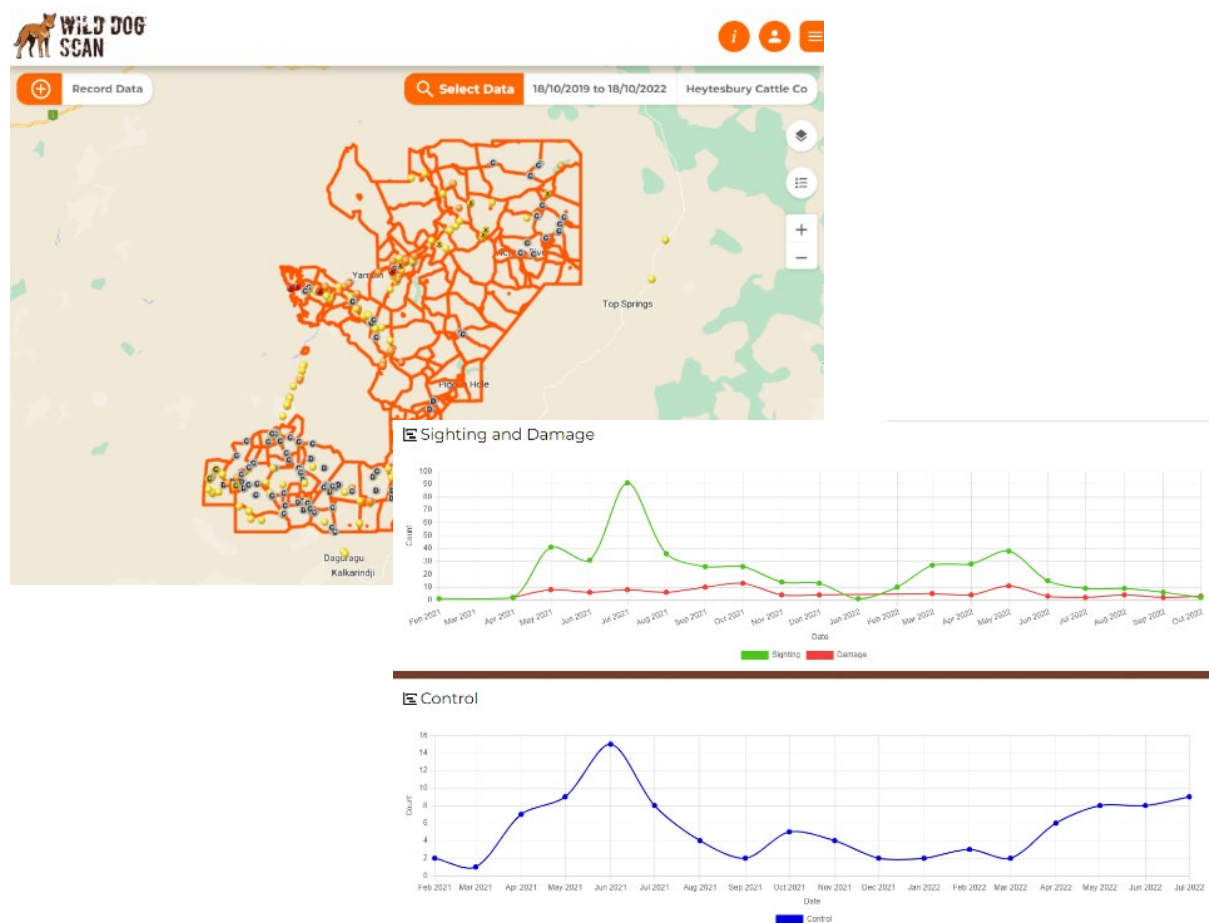


Figure 72. A map of some of the Heytesbury Cattle Company stations (left), and trends in recording rates throughout the project term showing variation in wild dog activity and control (right)

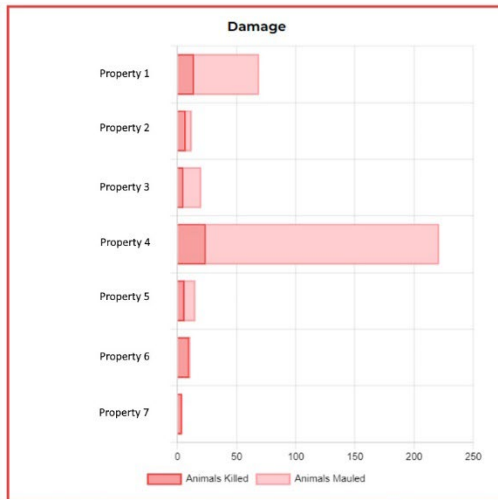
Sighting Type	This Period	YTD
<b>Number of sighting records</b>	<b>426</b>	<b>145</b>
<b>Number of wild dogs observed</b>	<b>581</b>	<b>274</b>
Live dogs observed	296	136
Dead dogs observed	23	15
<b>Camera trap photos</b>	<b>3</b>	<b>0</b>
<b>Sign (track/scat)</b>	<b>257</b>	<b>123</b>
<b>Howling</b>	<b>2</b>	<b>0</b>

\* Note, this does not reflect all observations and wild dog activity.



Damage Type	This Period	YTD
<b>Number of damage records</b>	<b>95</b>	<b>34</b>
<b>Number of animals killed</b>	<b>70</b>	<b>23</b>
Cattle killed	24	8
Calves killed	43	13
Domestic animals killed	1	0
Goat kids killed	2	2
<b>Number of animals mauled</b>	<b>282</b>	<b>110</b>
Cattle mauled	67	58
Calves mauled	213	50
Goat mauled	2	2

\* Note, this does not reflect total damage caused by wild dogs



Control Type	This Period	YTD
<b>Number of control records</b>	<b>97</b>	<b>38</b>
<b>Number of dogs destroyed</b>	<b>116</b>	<b>46</b>
Wild dogs trapped:	11	0
Wild dogs shot:	105	46
<b>Number of baits laid</b>	<b>2</b>	<b>0</b>
ground bait laid:	2	0

\* Note, this does not reflect all control activities for wild dogs

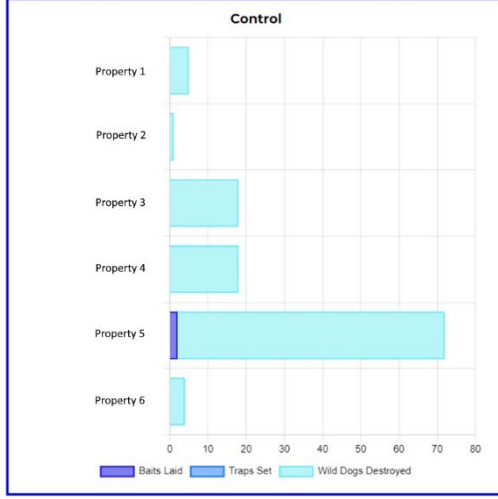


Figure 73. Summary data from the Heytesbury Cattle Company WildDogScan dashboard shows trends in observations of wild dogs, trends in attacks from wild dogs discovered by staff, and trends in control activity.

## CASE STUDY 12: RABBIT WARREN MAPPING BY WESTERN LANDCARE NSW AT LAKE MUNGO AND WILLANDRA LAKES WORLD HERITAGE AREA

Western Landcare NSW have been using the RabbitScan platform for many years to document rabbit activity (including rabbit warrens) throughout the Lake Mungo and Willandra Lakes World Heritage Area in western NSW. In total, the group have documented more than 8,000 rabbit warrens using RabbitScan, which has guided rabbit control programs across the area.



Figure 74. A map of one area where RabbitScan was used to map warrens at Lake Mungo National Park in 2019 (left), following individualised training with the FeralScan Coordinator (right).

### CASE STUDY 13: EXTENSIVE RABBIT WARREN MAPPING AND CONTROL ACROSS VICTORIAN MALLEE

The Mildura Rural City Council have been engaging rabbit management contractors for many years to undertake targeted roadside rabbit control throughout the Victorian Mallee. Adjacent local government areas have been undertaking similar work.

Rabbit control contractors have used the RabbitScan resource to map rabbit activity areas, and have undertaken extensive rabbit warren mapping. The information is shared with relevant local government organisations across the region and is used to seek funding and resources for roadside rabbit management.

Landholders in the district have also participated in documenting rabbit activity to support effective control across the region. the RabbitScan results has been a useful tool to both local government and community groups in this district for many years.

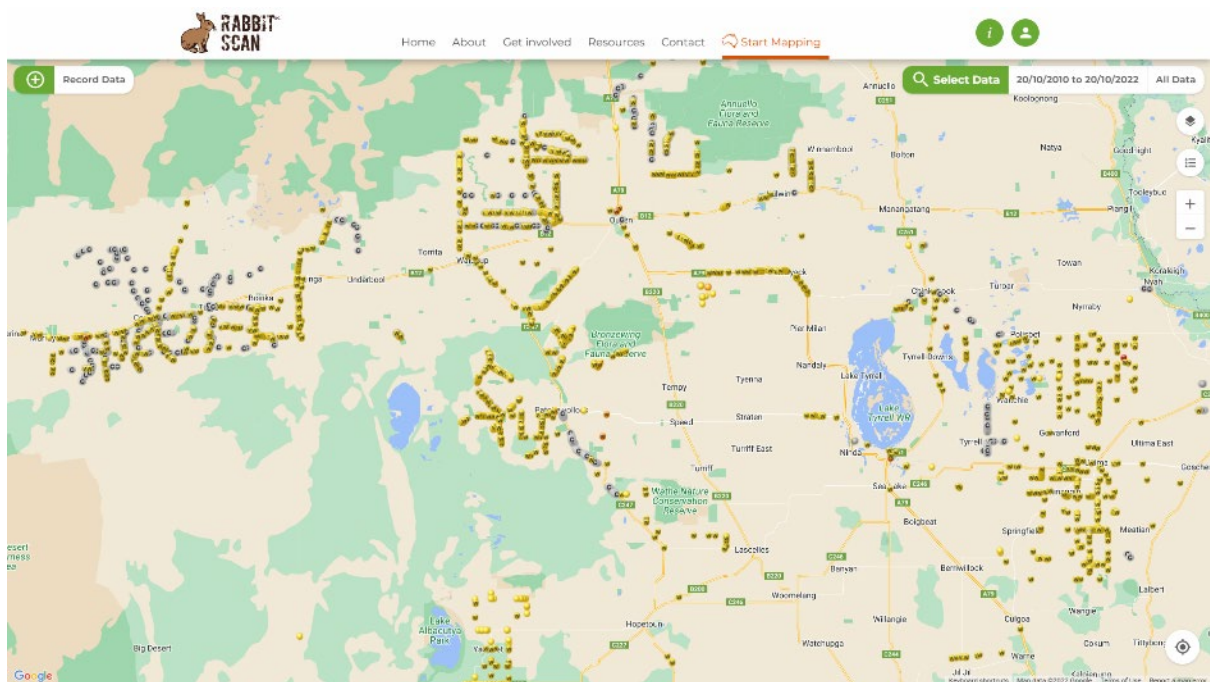


Figure 75. A RabbitScan map showing thousands of rabbit warrens along roadsides across the Victorian Mallee, which were targeted in control activities.

## CASE STUDY 14: WILDDOGSCAN USED BY CORROWONG TOMBONG MERRIANGAAH BYADBO WILD DOG MANAGEMENT GROUP, NSW

The Corrowong Tombong Merriangaah Byadbo Wild Dog Management Group in southern NSW have been using the WildDogScan platform for many years to document wild dog activity, attacks on sheep and control activities on rural properties. A total of 42 farmers, landholders and government agency representatives are working together with WildDogScan to document information about wild dog activity, to guide targeted and strategic wild dog management activities in the area. The group uses the interactive map, WildDogScan app, alert notifications and dashboard to help them collaborate across the district. This group works collaboratively with the NSW LLS, NSW National Parks and Wildlife Service, and the Forestry Corporation of NSW.

The website map has been tailored for this group, so that users can select various datasets to display on their interactive map (such as exclusion-fences, national parks, state forests, etc.). Users can also choose to add layers of spatial data onto their interactive map. WildDogScan is an important resource for this group.

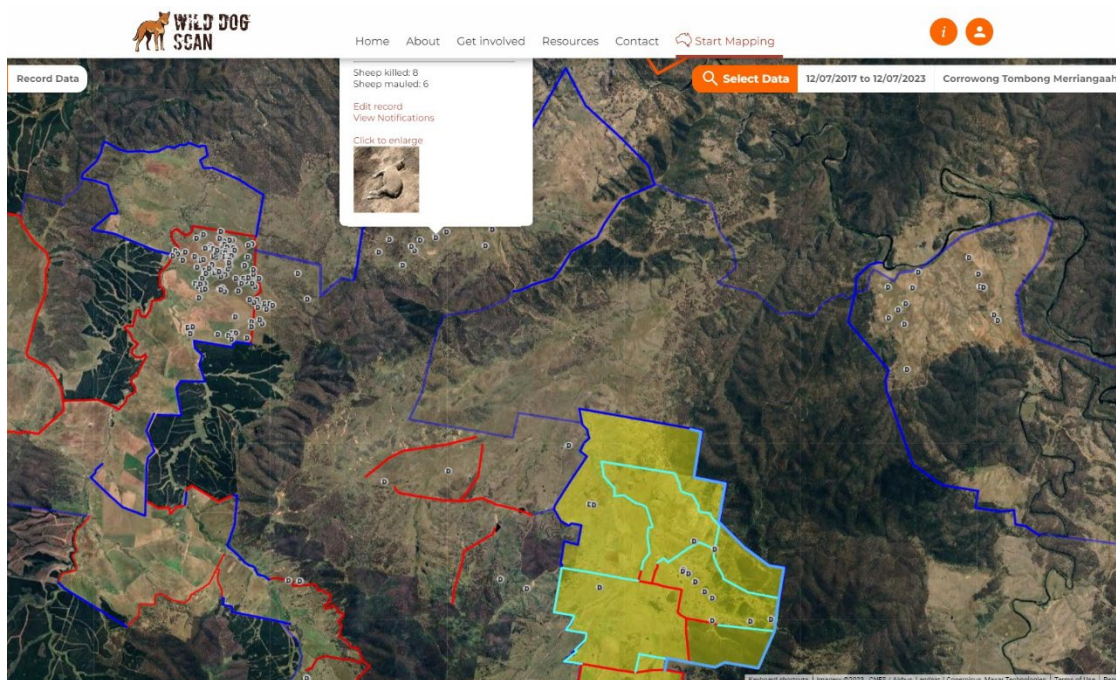


Figure 76. The Corrowong Tombong Merriangaah Byadbo Wild Dog Management Group use WildDogScan to assist them with the planning and management of wild dogs. Pictured here are some locations of wild dog attacks on sheep in recent years.

## CASE STUDY 15: NSW HUNTER LLS WORKS WITH PROFESSIONAL WILD DOG CONTROLLERS

Professional wild dog controllers operate throughout the Upper Hunter Region of NSW in partnership with the Hunter LLS and NSW National Parks and Wildlife Service. They operate across private and public lands, using the WildDogScan app to document their control activities. Information they record is managed securely and is not visible to the general public; some information is shared with local wild dog control associations operating in the area. Information recorded by landholders within those associations is also shared with the professional wild dog controllers to alert them to recent attacks, incidents or wild dog threats. Wild dog management is coordinated by the Hunter LLS, who endorse the use of WildDogScan by landholders, biosecurity staff, mining companies and professional pest controllers. Increased community use of the WildDogScan resource will result in more cost-effective use of professional wild dog controllers.



Figure 77. A map of one area where WildDogScan was used to map wild dog activity and control programs in the Hunter region, NSW (top), following training with biosecurity officers and mining companies by the FeralScan Coordinator (right).

## **CASE STUDY 16: NSW WESTERN LLS WORKING WITH PROFESSIONAL WILD DOG CONTROLLERS**

The Western LLS has contracted six professional wild dog controllers to undertake strategic control activities across different districts of western NSW. Each of the professional wild dog controllers is using the WildDogScan app to document their activities. FeralScan's WildDogScan resource is very important for this group, allowing them to document the precise location of their control activities across the landscape.



*Figure 78. The professional wild dog controllers document as much information about wild dog activity as they can to guide future management. Pictured here: wild dog tracks in sand reveal the presence of wild dogs on a property, and dead sheep and goats reveal the consequence.*



## CASE STUDY 17: PRIVATE LANDHOLDERS IN CAPE LIPTRAP CONDUCT FERAL DEER MANAGEMENT

The Cape Liptrap community in southern Vic have recently begun using the DeerScan platform to help landowners and farmers in the district document information about feral deer and the problems they are causing across their properties. Feral deer species have reportedly become increasingly problematic to landowners in this region, and the community are rallying together to collaboratively improve the way deer species are managed. The community are working closely with local organisations and government groups to document deer sightings, impacts and control activities. The information people record is being used to guide local control in both a strategic and reactive way, to reduce the impacts of feral deer on rural properties and the environment in this peninsula. They have reported 1,250 observations of feral deer using DeerScan.

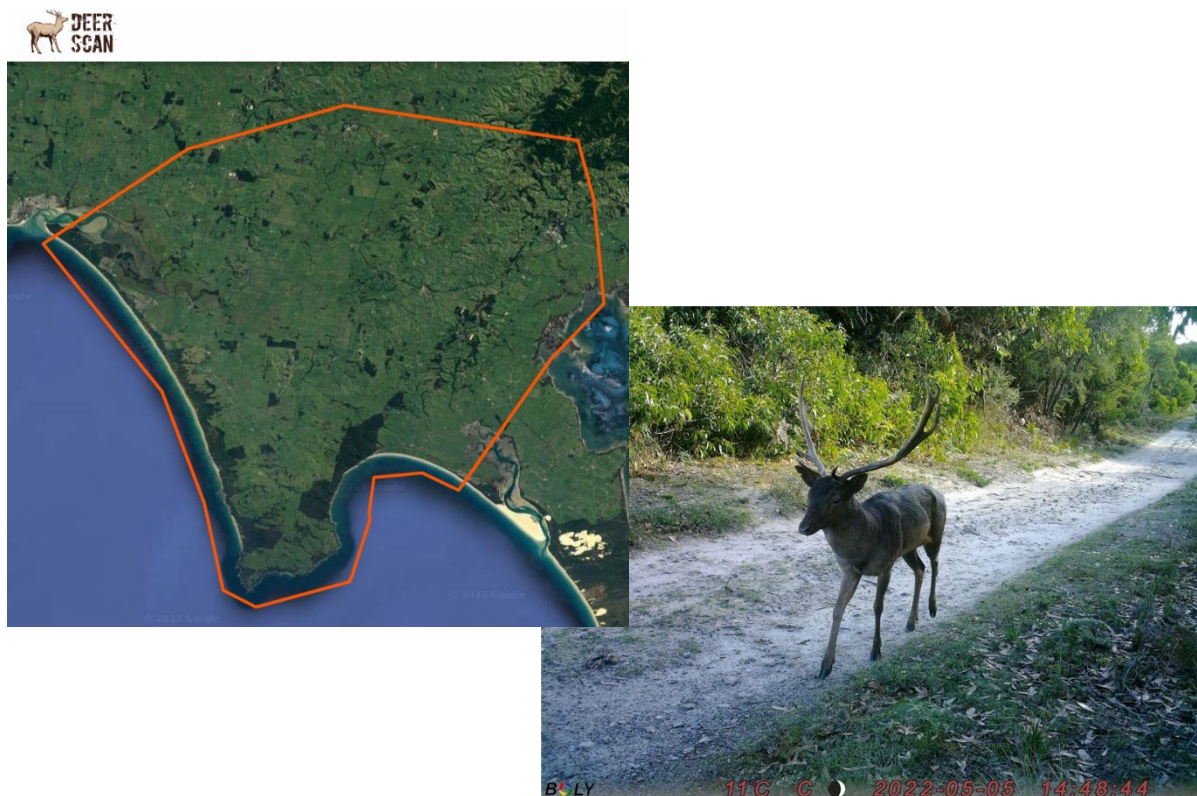


Figure 79. The Cape Liptrap feral deer management area (top) and a fallow deer detected using a wildlife monitoring camera (bottom)

## CASE STUDY 18: FALLOW DEER MONITORING AND CONTROL ON KING ISLAND

Fallow deer are pests across King Island in Tas, and farmers and landholders have been reporting problems associated with deer for many years. Local authorities have been actively using the DeerScan platform to document information about deer, including control efforts. The King Island Council staff are able to access all deer data recorded by the community or agency staff, to help them determine when and where to implement control activities to reduce the problems caused by deer.

The DeerScan resource has been an important tool for developing knowledge and understanding of the current fallow deer activity on King Island. All deer data is managed privately and securely, with only local government organisations able to access information recorded by the community.

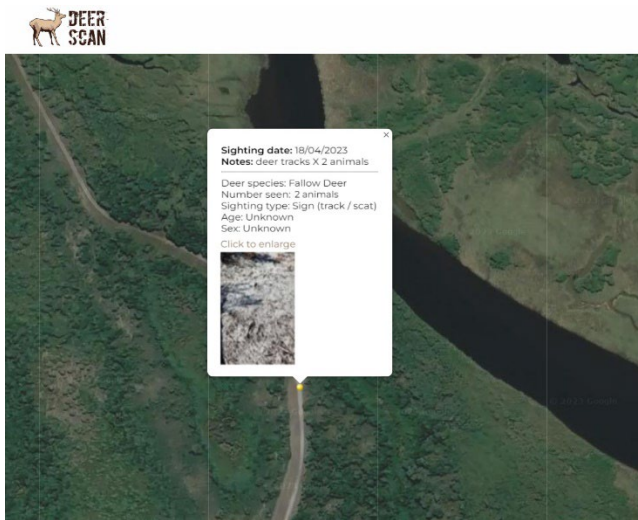


Figure 80. DeerScan provides a password-protected interactive map of reports. Pictured here: the DeerScan map displays summary data and a photo of a report of deer in a remote area of the island.

## CASE STUDY 19: FERAL PIG CONTROL ON FLINDERS ISLAND

Feral pigs were introduced to Flinders Island in Tas in the 1800s. In recent years, landholders and visitors to the island have been reporting problems with feral pigs. The Tasmanian government has been actively monitoring for evidence of feral pigs across the island over the last 1–2 years, documenting all evidence through the FeralScan app.

The community have also played an important role by documenting sightings and damage caused by feral pigs in several new areas previously unknown to authorities. Information that has been recorded about feral pig activity is now being used to guide feral pig control programs across the island.



*Figure 81. Feral pigs cause visible damage throughout many areas of the Island. Source: D Pemberton.*

## CASE STUDY 20: COMMUNITY MONITORING AND MANAGEMENT OF FERAL DEER, SA

The DeerScan platform has been used extensively over many years throughout SA by local government organisations, Landscape Boards SA and the Department of Primary Industries and Regions SA (PIRSA). Information is shared with the SA Deer Coordinator and other government organisation staff.

The DeerScan platform has become a highly valued resource for these organisations and groups, allowing them to engage with and encourage the community to document information about feral deer and the problems they are causing. The information is being used to guide local control programs.

In some regions, professional deer control contractors have been engaged to undertake intensive shooting programs to reduce the number of deer and the impacts they are causing to landholders and the environment.

Sighting Type	
<b>Number of individual sightings of feral deer</b>	<b>1521</b>
<b>Number of feral deer seen</b>	<b>4997</b>
Fallow	3743
Rusa	26
Sambar	4
Red	660
Chital	29
Hog	4
Unknown	531



*Figure 82. Nearly 5,000 feral deer (mainly fallow and red deer) have been seen and reported into DeerScan throughout SA (left). A photo from a training session with PIRSA staff (right)*

## CASE STUDY 21: CENTRAL QUEENSLAND WILD DOG CONTROLLERS

Throughout Central Queensland, wild dog syndicates, regional councils and professional wild dog controllers are working together to manage wild dogs, part of which involves documenting wild dog activity through the WildDogScan app. Several wild dog controllers, who are contracted to undertake trapping and baiting programs, also use the WildDogScan app to record control efforts. Landholders are also recording information about wild dog activity, such as attacks on cattle. Information recorded by landholders and professional wild dog controllers is shared with relevant groups and government authorities, allowing members to work together to identify ways to improve future wild dog control.



*Figure 83. Wild dog control programs reduce the number of sheep and native wildlife killed by wild dogs.*

## CASE STUDY 22: NORTHERN TABLELANDS LLS AND WILD DOG CONTROL ASSOCIATIONS WORKING WITH PROFESSIONAL WILD DOG CONTROLLERS

The WildDogScan resource has been used extensively throughout the Northern Tablelands of NSW, led by the NSW LLS. A total of 35 wild dog control associations have registered private groups in WildDogScan, containing over 3,500 landholders and government representatives. Landholders in these regions can document information about wild dog activity, including wild dog attacks, and the information they record is communicated rapidly to local pest animal controllers contracted by the Northern Tablelands LLS. The information recorded is also rapidly shared with other members of their association, ensuring that everybody is equally informed about current wild dog activity.

The use of WildDogScan is actively encouraged across the Northern Tablelands by biosecurity staff and wild dog control associations. It has become a valuable tool for farmers, wild dog associations, pest control groups and government.

Damage Type	
<b>Number of damage records</b>	<b>834</b>
<b>Number of animals killed</b>	<b>2612</b>
Cattle killed	15
Calves killed	77
Farm Dogs killed	2
Domestic animals killed	2
Goat killed	18
Goat kids killed	26
Lambs killed	573
Sheep killed	1899
<b>Number of animals mauled</b>	<b>1207</b>
Cattle mauled	4
Calves mauled	27
Farm Dogs mauled	4
Domestic animals mauled	1
Goat mauled	19
Goat kids mauled	2
Lambs mauled	213
Sheep mauled	937



Figure 84. Aggregated wild dog information recorded by landholders can be examined to evaluate the effectiveness of control programs (left). A photograph from a local WildDogScan training session run by the FeralScan Coordinator (right)

## CASE STUDY 23: NORTH COAST NSW PROFESSIONAL WILD DOG CONTROLLERS

The North Coast LLS currently contracts several professional wild dog controllers to operate throughout the North Coast NSW region. They undertake targeted and strategic wild dog control activities to reduce the impacts of wild dogs on farmers and biodiversity. They record information directly into the WildDogScan app, and this data is shared with the LLS; all data is managed securely and privately. The WildDogScan platform is used to present summary data for their activities to staff from the North Coast LLS. Public reporting of wild dog issues and impacts has helped to define the problem areas for wild dogs along the North Coast, enabling professional wild dog controllers to focus on areas where they are most needed.

WildDogScan has become an important resource to this organisation, with professional wild dog controllers trained to use this tool from number of their current activities, as well as future activities relating to feral pig management.

Damage Type	
<b>Number of damage records</b>	<b>111</b>
<b>Number of animals killed</b>	<b>201</b>
Cattle killed	5
Calves killed	32
Farm Dogs killed	1
Domestic animals killed	4
Goat killed	14
Goat kids killed	15
Lambs killed	12
Poultry killed	19
Sheep killed	99
<b>Number of animals mauled</b>	<b>120</b>
Calves mauled	6
Farm Dogs mauled	7
Domestic animals mauled	4
Goat mauled	2
Lambs mauled	12
Sheep mauled	89

Figure 85. Reports from the public are helping to better understand the types of impacts caused by wild dogs along the NSW North Coast. Pictured here: an example dashboard reveals a wide range of impacts reported by the public.

## CASE STUDY 24: FERAL PIG MANAGEMENT ON MORTON ISLAND

Feral Pigs are currently managed on Morton Island by the Queensland Parks and Wildlife Service of the Department of Environment and Science. The FeralScan app has been used extensively by staff from the department to document evidence or activity of feral pigs across the island, and targeted feral pig control efforts.

The information they have recorded is managed securely and presented back to staff so they may evaluate the effectiveness of their monitoring and control activities. Staff have used the app to record and upload a large number of photographs that they can access later.

Sighting Type	
<b>Number of sighting records</b>	<b>553</b>
<b>Number of feral pig seen</b>	<b>33</b>
Live feral pig observed	28
Dead feral pig observed	1
<b>Number of feral pig seen</b>	<b>33</b>
Adults	1
<b>Camera trap detection</b>	<b>12</b>
<b>Sign (track/scat)</b>	<b>492</b>
N/A	20



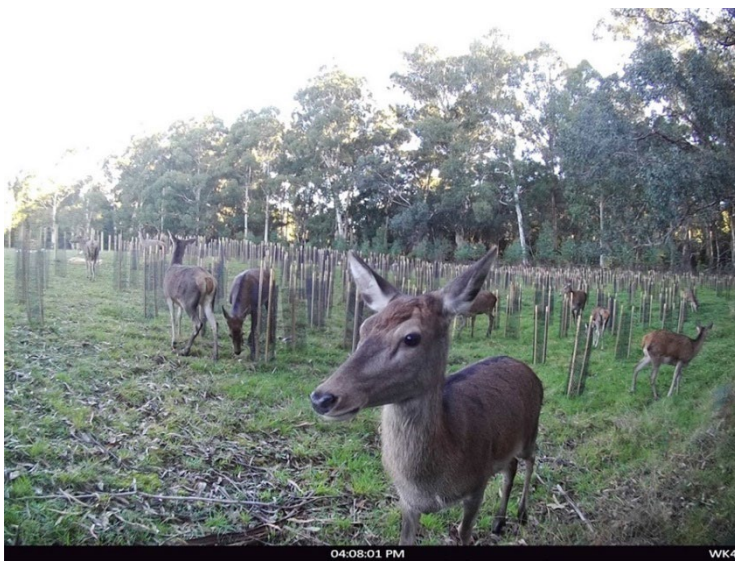
Figure 86. Dashboard tables and charts provide aggregate data to government representatives. Pictured here: a table summarises sighting data and control results during a control program (left), and a photograph of some feral pigs destroyed during control operations (right). Source: P Bull.



## **CASE STUDY 25: LOCAL GOVERNMENT AND COMMUNITIES MONITORING AND MANAGING DEER NORTH-EAST OF MELBOURNE**

The DeerScan resource is being extensively used throughout local government areas north and east of Melbourne, including Manningham, Nillumbik and Cardinia Shires. Representatives from these local government authorities have been actively promoting community recording of information about feral deer species. The DeerScan platform has been configured to share information from the public with these local government organisations. Staff are alerted to reports from the public automatically, and this ensures that agency staff are informed about current feral deer activity detected within their management area.

Several community-led collaborations are also forming in these regions, such as the Cardinia Deer Management Coalition, and members are using the DeerScan platform to document feral deer activity to reduce the problems they cause for peri-urban landholders, local farms and the environment.



*Figure 87. Community monitoring of feral deer has provided thousands of reports to better inform management programs. Pictured here: a herd of red deer, detected using a wildlife monitoring camera, damage newly planted trees on the outskirts of Melbourne. Source: R Sawyer.*

## CASE STUDY 26: DRIVERS AND BARRIERS TO WILD DOG REPORTING IN LANDHOLDERS

The following is a summary of a case study conducted by Dr Lynette McLeod for a final report to CISS titled, *Behaviourally effective communication and engagement in the management of wild dogs* (see [Appendix 9](#) for the full case study extract).

### LANDHOLDER REPORTING OF WILD DOGS AND THEIR IMPACTS

Using phone surveys of rural landholders, this study identified two landholder segments that had not reported wild dogs and their impacts:

1. Landholders that had not reported and were not likely to report in future (*non-reporters*), and
2. Landholders that had not reported but were likely to report in future (*potential reporters*).

A COM (*capability, opportunity, motivation*) driver/barrier profile was developed for each landholder segment. From this, it was learned that:

- both *non-reporters* and *potential reporters* perceived no problems with wild dogs, and considered current reporting methods to be too time-consuming.
- *non-reporters* were unsure of who to contact, considered reporting was too inconvenient and did not know of anyone else who reported.
- *non-reporters* did not believe it was their responsibility to report, and felt the authorities did not act on the advice anyway. Many *non-reporters* did not want anyone interfering with their property and did not want to be made to do control. If there were problems, they would handle any themselves.

To complete this case study, instead of developing a new reporting intervention, we evaluated a current reporting tool – WildDogScan. A number of barrier and driver factors influencing WildDogScan uptake were identified:

- lack of skills and confidence to use the technology
- perceived reduced opportunity owing to poor phone and/or internet coverage
- spending time learning how to use WildDogScan, then remembering how to use it
- no perceived benefit over current methods
- preference to have contact with other people
- had nothing to report (wild dogs were not currently a problem for them)
- not motivated to report (regardless of their wild dog problems or the reporting tool).

Recommendations:

1. Agencies need to build a culture of acknowledging landholders' efforts and earn their trust by demonstrating that reporting will lead to support and assistance with wild dog problems.
2. A many faceted approach is required to educate, train and support landholders. Not only more targeted training opportunities, and provision of information to improve awareness and dispel any perceived misconceptions, but real-time support functions to ease the cognitive burden and save time.
3. To increase WildDogScan uptake, agencies and the developers need to promote and demonstrate not only the benefits of its reporting functions, but the planning, funding and social benefits.

## CASE STUDY 27: SHARING PLATFORM TECHNOLOGY WITH THIRD PARTIES

This project has been fortunate enough to share the platform technology with a range of third parties, to extend the benefits of the FeralScan project to other wildlife conservation and pest animal management initiatives. These projects are listed below.

**TURTLESAT:** [WWW.TURTLESAT.ORG.AU](http://WWW.TURTLESAT.ORG.AU)

A community platform for recording observations of freshwater turtles around Australia. TurtleSAT is partnered with Western Sydney University.

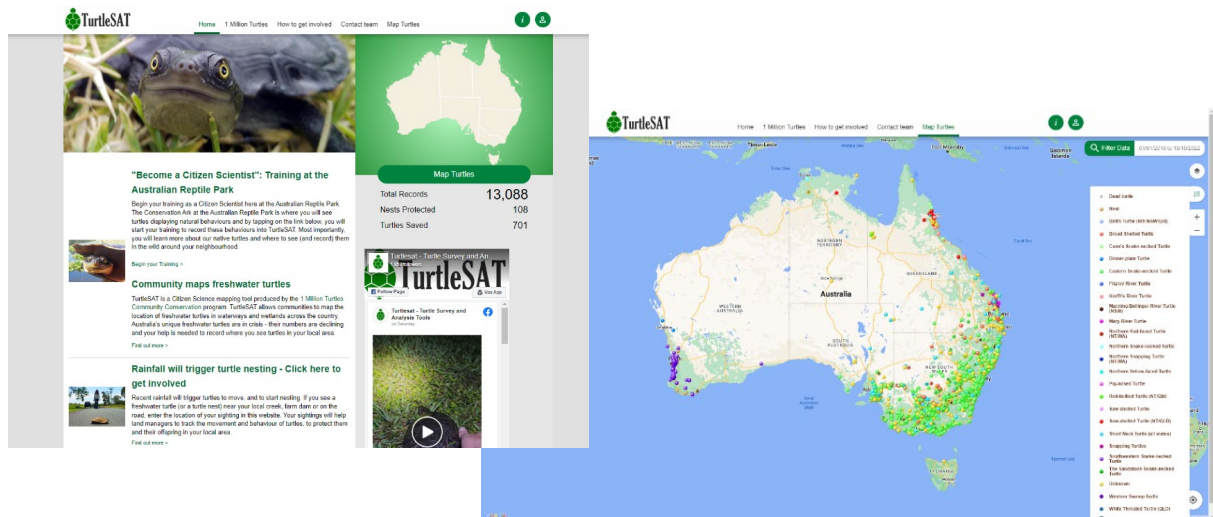


Figure 88. TurtleSAT webpage (left) and interactive map showing turtle data (right)

**WOMSAT:** [WWW.WOMSAT.ORG.AU](http://WWW.WOMSAT.ORG.AU)

A community platform for recording observations of bare-nosed wombats and evidence of sarcoptic mange. WomSAT is partnered with Western Sydney University.

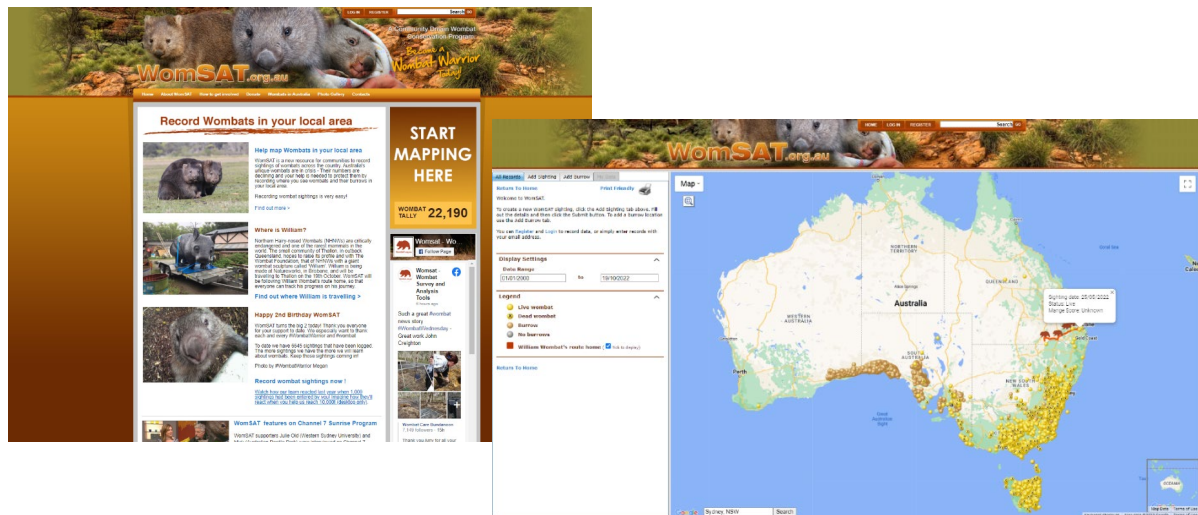


Figure 89. WomSAT webpage (left) and interactive map showing wombat data (right)

**CARPMAP:** [WWW.CARPMAP.ORG.AU](http://WWW.CARPMAP.ORG.AU)

A community platform for participating in an online mapping survey and questionnaire about common carp in Australia’s waterways. CarpMap is partnered with the Fisheries Research and Development Corporation (FRDC). See [Appendix 10](#) for the final CISS report on the CarpMap surveys and consultation.

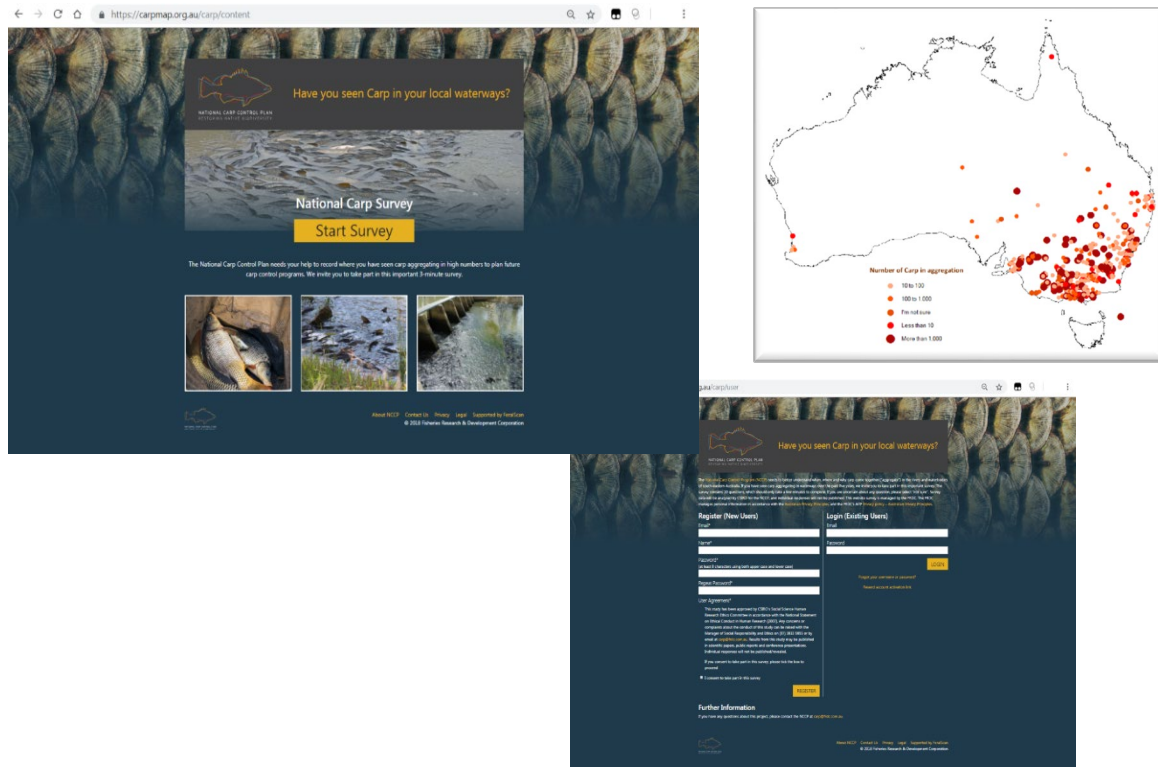


Figure 90. CarpMap webpage (left) and summary data (right)

**AUSTRALIAN PLATYPUS MONITORING NETWORK:** [PLATYPUSNETWORK.ORG.AU/HOME](http://PLATYPUSNETWORK.ORG.AU/HOME)

A community platform for participating in monitoring for Australian platypus within Australia’s waterways. The Australian Platypus Monitoring Network is partnered with the Australian Platypus Conservancy (APC).

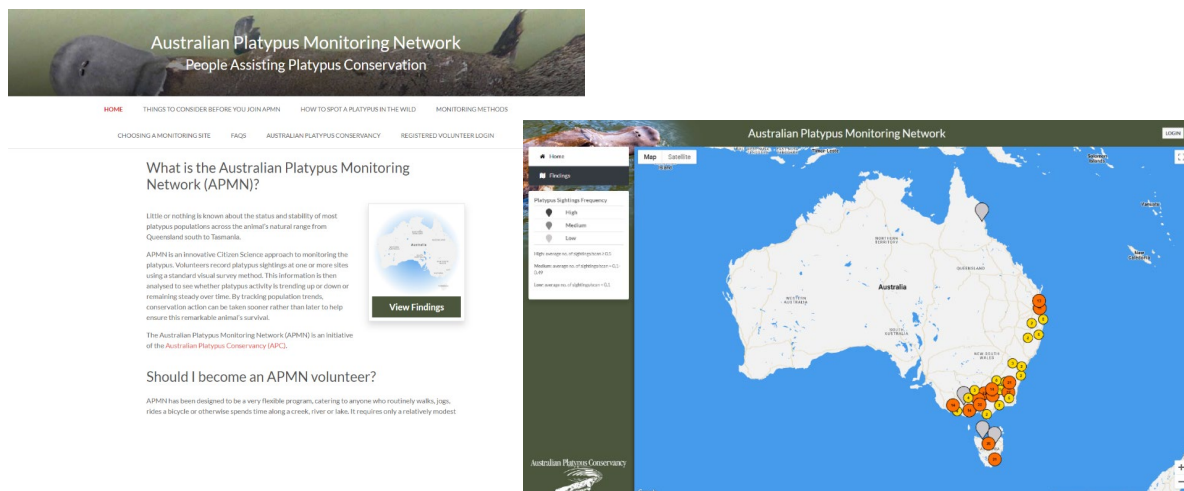


Figure 91. Australian Platypus Monitoring Network webpage (left) and summary data (right)

**WATERBIRD TRACKER:** [WWW.WATERBIRDTRACKER.ORG.AU](http://WWW.WATERBIRDTRACKER.ORG.AU)

A community platform for recording observations of waterbirds and feral pig predation of nests in RAMSAR listed wetlands. Waterbird Tracker is partnered with NSW Government.

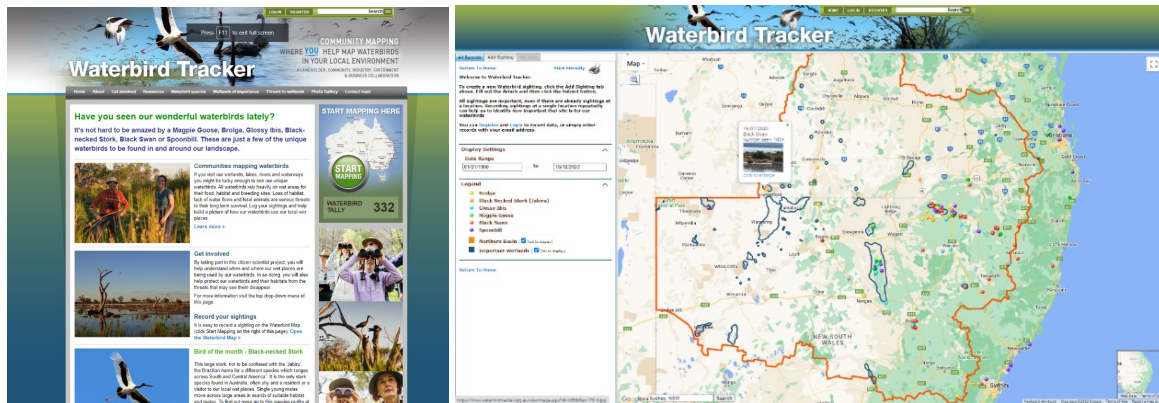


Figure 92. Waterbird Tracker webpage (left) and summary data (right)

## APPENDIX 4. CISS CASE STUDY: DRIVERS AND BARRIERS TO WILD DOG REPORTING IN LANDHOLDERS

McLeod L (August 2021) *Behaviourally effective communication and engagement in the management of wild dogs*, final report to the Centre for Invasive Species Solutions (P01-E-001).

Below is an extract from the final report covering case study 2: reporting wild dog sightings and impacts.

### CASE STUDY 2: REPORTING WILD DOG SIGHTINGS & IMPACTS

#### COM-B analysis and audience segmentation (Steps 4 & 5)

##### Methods

##### *Landholder barrier / driver (COM-B) survey*

A random digit phone survey was completed to assess potential barriers that may prevent landholders reporting wild dog sightings and impacts (N=186). This survey was conducted in accordance with the ethical standards of the Human Research Ethics Committee of the University of New England (Approval No. HE19-221). These surveys originally were planned to target landholders who lived in the Northern NSW (North Coast, Northern Tablelands and North West Local Land Services), however owing to major bushfires in the area at the time, the survey was extended to other areas of NSW known to have wild dog problems.

Information about the landholders' perceptions of the wild dog problem on their property, and participation in reporting, as well as sociodemographic information including age, gender, location, property size and main property uses was collected. Respondents were asked to rate their agreement (on a 5-point Likert scale) to 15 pre-identified capability, opportunity, and motivation behavioural (COM) variables to measure the predictability of these factors. These factors had been identified from:

- 1) the semi-structured interviews of stakeholders, and
- 2) the open-ended questions posed in the first landholder survey

The survey questions are presented in Appendix 6.

##### *Analyses*

Latent profile analysis (LPA) was implemented in MPlus 8.3 (Muthén & Muthén, 2019) to classify landholders into homogenous segments based on their responses to participation in wild dog management questions. Relative model fit was assessed using the Bayesian information criteria (BIC; Schwartz, 1978) relative entropy (Ramaswamy et al., 1993) and the Lo–Mendell–Rubin likelihood ratio test (LMR; Lo et al., 2001). A significant  $p$  value from the LMR test ( $p = 0.05$ ) indicated that the given profile solution fitted the data significantly better than the solution with one fewer profile groups. Differences between identified participation segments and COM variables, control behaviours, situational and demographic variables were tested using either a one-way ANOVA or Pearson's chi-squared test. All procedures except the LPA were conducted using SPSS 26 (IBM, 2019).

##### Results

##### *Respondent details*

The average age of the 186 survey respondents (58% male) was 58 years (range 18 to 85), which is slightly older than the average age (54 years) recorded for the NSW Regional adult population (Australian Bureau of Statistics, 2018). Respondents came from the Northern Tablelands Local Land Services (LLS) (N=51), North Coast LLS (N=45), South East (N=31), North West (N=24), Murray (N=22), Riverina (N=11), Western (N=2). The average property size of respondents was 1381 Ha (range 2 to 60,000), and the average years of residence was 28 years (range 1 to 82).

Over half of the respondents (97, 52%) earned their main income from their property. Over three quarters of the respondents (141, 76%) had some type of livestock enterprise on their property, mainly cattle, small livestock (such as sheep or goats), or horses. Thirty one (17%) respondents categorised their property as lifestyle or hobby, and the remaining 14 (7%) ran enterprises, that did not involve livestock, such as cropping, horticulture, and timber.

Half of the respondents (94, 50%) were not aware of wild dogs in their area. A further 18% (33) reported being aware of wild dogs in their area, but not having experiencing any problems on their properties. The remaining respondents (39%) reported wild dog problems on their property. Of these, 12 (7%) rated their problem as serious, 29 (16%) moderate, and 29 (16%) minor (Figure 3.1).

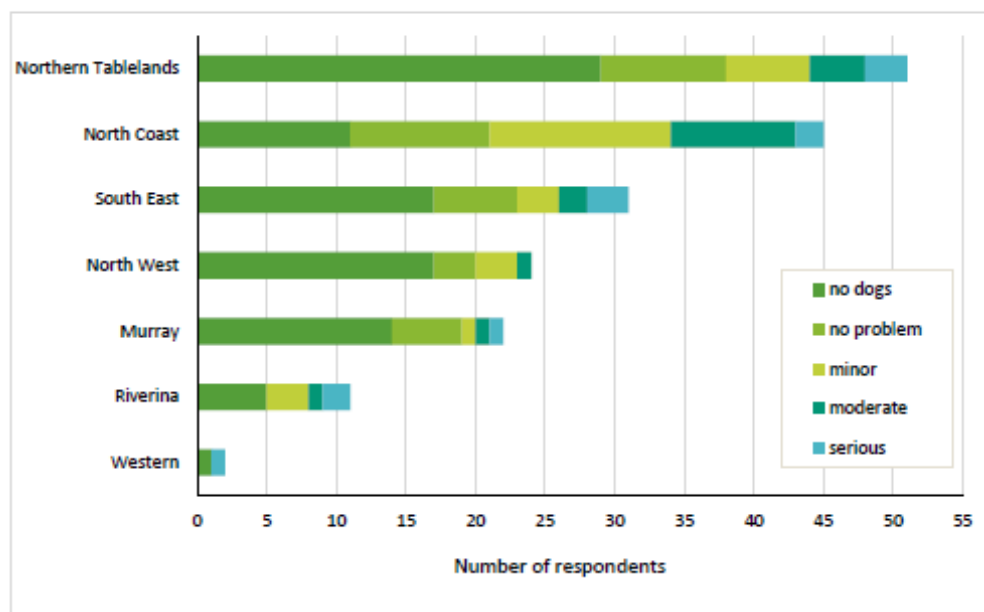


Figure 3.1: Perceived wild dog problem by respondents, categorised by their Local Land Service area.

Forty-four respondents (24%) indicated they had reported wild dog sightings and impacts in the past five years. Respondents who currently have a serious wild dog problem were significantly more likely to have reported 5 times or more in the past 5 years, however there were some of these respondents who had not reported at all (Figure 3.2). Respondents who currently have no dogs in the area, were significantly more likely to have never reported in the past 5 years. These reports were most commonly reported to the LLS (26 respondents), or neighbours (15 respondents). Other organisations / people that respondents mentioned included the Council (4), Regional wild dog coordinator (4), wild dog groups (4), National Parks (3), and Forestry (1). Respondents preferred to ring (36) or report in-person (20). Two respondents indicated they would ring, followed up by an email, and one respondent

texted. Only one respondent (from the North Coast LLS) indicated they had used Wild Dog Scan.

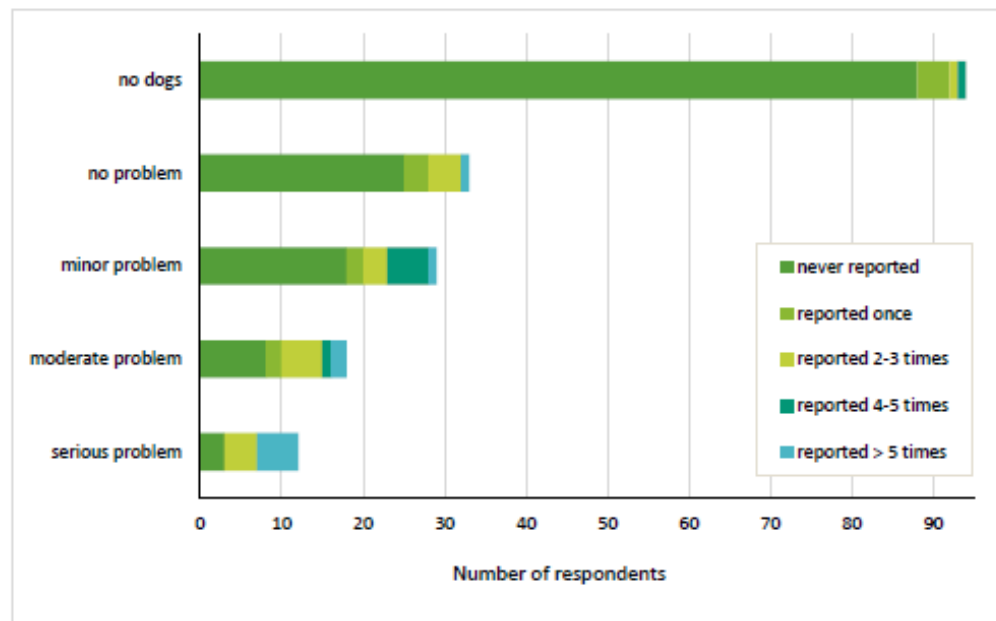


Figure 3.2: The reporting behaviour of the respondents over the past five years, categorised on their perceived wild dog problem.

Respondents were also asked how likely they were to report if they encountered wild dogs or their impacts in the future: 54% were very likely, 17% likely, 7% not committed, 6% unlikely and 17% very unlikely. Nearly half indicated their first preference would be to report to the LLS (86, 46%), followed by their neighbours (21%), the Council (12%) and the police (5%). Neighbours and LLS were the most frequent response for the respondent's second reporting preference (Figure 3.3). Respondents preferred to ring (175) or report in-person (56). Six respondents indicated they would ring, followed up by an email, and one respondent would use the internet. No respondents indicated they would use Wild Dog Scan.

Respondents were also asked how likely they were to report if they encountered wild dogs or their impacts in the future: 54% were very likely, 17% likely, 7% not committed, 6% unlikely and 17% very unlikely. Nearly half indicated their first preference would be to report to the LLS (86, 46%), followed by their neighbours (21%), the Council (12%) and the police (5%). Neighbours and LLS were the most frequent response for the respondent's second reporting preference (Figure 3.3). Respondents preferred to ring (175) or report in-person (56). Six respondents indicated they would ring, followed up by an email, and one respondent would use the internet. No respondents indicated they would use Wild Dog Scan.



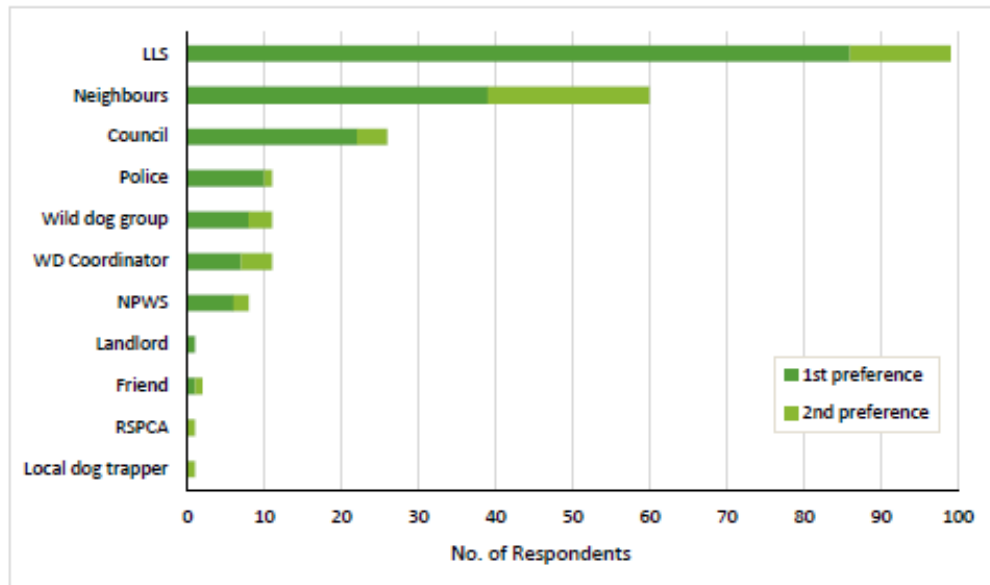


Figure 3.3: Respondents preference for any future reporting of wild dog sightings or impacts.

#### Audience segmentation

The results from the profiling analysis applied to the reporting of wild dog sightings and impacts are presented in Figure 3.4. Demographic and situational characteristics for each of landholder segment are shown in Table 3.1.

The profiling analysis produced 3 distinct groups:

- 1) *Non-reporters* (N=42) had rarely reported in the past, and were unlikely to report in the future. Members were a mixture of those that had experienced problems with wild dogs, and those that had not. They tended to be younger in age, and had resided on the properties for a shorter period than the other profiles.
- 2) *Potential reporters* (N=112) had rarely reported in the past. They are more likely not to have experienced any problems with wild dogs, however they are likely to report wild dogs and their impacts if they encounter them in the future. Members tended not to run small livestock on their property.
- 3) *Reporters* (N=32) commonly reported in the past, and were likely to report in the future. They are more likely to have experienced problems with wild dogs, and more likely to be running small livestock on their property.

Table 3.1: Situational and demographic characteristics of the landholder segments.

Variables	Non-reporters (N=42)		Potential reporters (N=112)		Reporters (N=32)		Segment differences	
	Mean	SD	Mean	SD	Mean	SD	F	r
Age	52.9 <sup>a</sup>	16.7	61.1 <sup>b</sup>	14.7	59.7 <sup>ab</sup>	15.6	4.4*	0.1
Property size (ha)	418	647	1284	4328	2983	10553	2.0	-
Years of residence	20.9 <sup>a</sup>	15.8	29.5 <sup>ab</sup>	20.1	32.0 <sup>b</sup>	23.1	3.7*	0.2
	N (%)	Z <sub>resid</sub>	N (%)	Z <sub>resid</sub>	N (%)	Z <sub>resid</sub>	χ <sup>2</sup> (df)	r
Perceived wild dog issue:							60.4***(8)	0.5
No dogs in area	21	-0.1	71	4.3	2	-5.5		
Dogs but not a problem	7	-0.2	21	0.4	5	-0.3		
Minor problem	4	-1.2	16	-0.6	9	2.1		
Moderate problem	8	2.3	2	-4.5	8	3.2		
Serious problem	2	-0.5	2	-3.2	8	4.7		
Main income source:							2.8 (2)	-
Property	21	-0.3	55	-1.0	21	1.7		
Other (off property)	21	0.3	57	1.0	11	-1.7		
Property enterprises:							15.6* (8)	0.2
Cattle only	16	0.1	41	-0.4	13	0.4		
Small livestock only	6	-0.4	13	-2.1	11	3.1		
Mixed livestock	8	-0.4	27	1.1	5	-0.9		
Farming - no livestock	6	1.7	9	0.0	0	-1.8		
Lifestyle / hobby	6	-0.5	22	1.3	3	-1.2		

\*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001. Means with different subscripts (in rows) differ significantly at p < 0.05 Tukey HSD. r = Pearson's correlation coefficient; r ≥ 0.5 indicates strong effect size, r = 0.3 indicates medium effect size, r = 0.1 indicates small effect size (Cohen, 1988). Z<sub>resid</sub> = Adjusted standardised residual, where Z<sub>resid</sub> > |2| is significant at p < 0.05

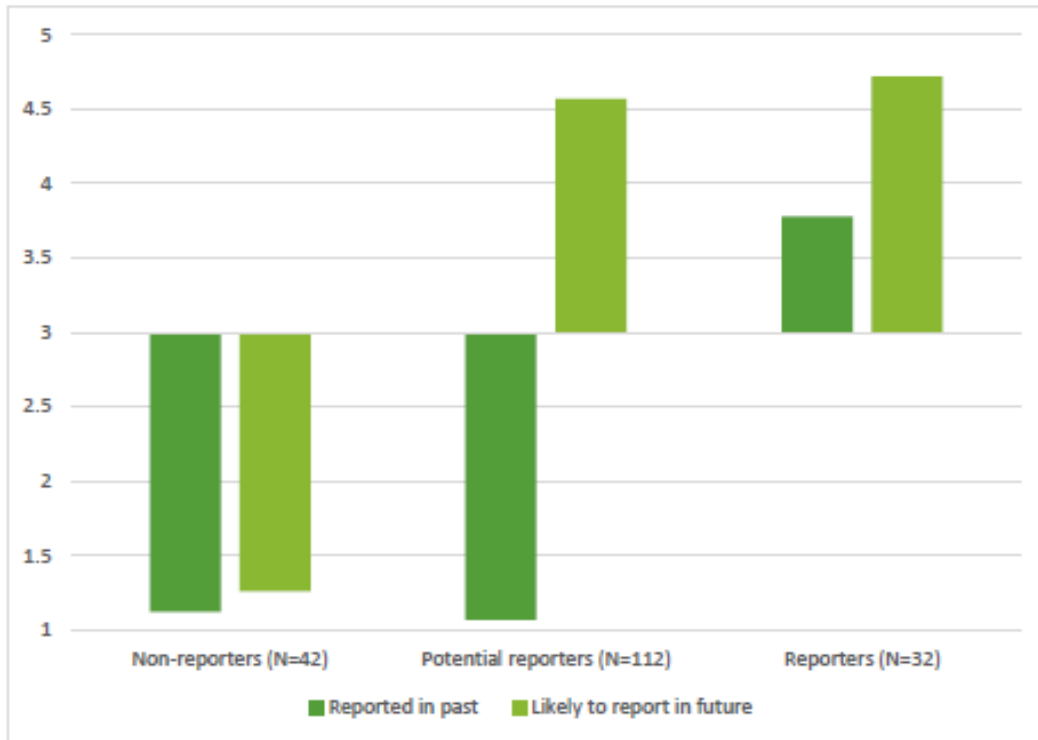


Figure 3.4: Three landholder segments based on reporting of wild dog sightings and impacts. Reporting scale: 1=never, 5=always.

#### COM-B predictor variables

To identify the specific barriers and drivers for reporting, we compared the respondents' responses to the 15 COM variables across the three segments. Results are presented in Table 2.2. We found significant differences between *Reporters*, *Potential reporters* and *Non-reporters* across 12 of the 15 COM variables.

There were two segments, *Non-reporters* and *Potential reporters*, whose members had not reported wild dog sightings or their impacts in the previous five years. Relative to *Reporters*, both these segments who had not reported wild dogs or their impacts, lacked the motivation as they tended not to have experienced wild dog problems on their properties, and the opportunity, as they perceived that reporting was too time-consuming. The main difference between *Potential reporters* and *Non-reporters* was that the former segment was more likely to report any wild dog sightings or impacts if they encountered them in the future.

Table 3.2: Differences between COM driver and barrier variables and the three identified landholder segments.

COM Variables	Non-reporters (N=42)		Potential reporters (N=112)		Reporters (N=32)		Segment differences	
	Mean	SD	Mean	SD	Mean	SD	F	r
<b>Capabilities</b>								
Have difficulty identifying a wild dog	2.2	1.5	2.4	1.4	1.9	1.1	2.1	-
Do not know who to contact	3.1 <sup>a</sup>	1.7	1.9 <sup>b</sup>	1.2	1.7 <sup>b</sup>	1.0	15.1 <sup>***</sup>	0.1
<b>Opportunities - physical</b>								
Too time-consuming	2.6 <sup>a</sup>	1.2	2.5 <sup>ab</sup>	1.0	2.0 <sup>b</sup>	1.1	6.8 <sup>**</sup>	0.1
Methods of reporting not convenient	2.7 <sup>a</sup>	1.1	2.2 <sup>b</sup>	0.9	1.9 <sup>b</sup>	1.1	10.3 <sup>**</sup>	0.1
<b>Opportunities - social</b>								
No-one they know reports	3.1 <sup>a</sup>	1.5	2.4 <sup>b</sup>	1.2	1.8 <sup>c</sup>	1.1	10.7 <sup>***</sup>	0.1
<b>Motivations</b>								
Perceive no wild dog problem on property	3.7 <sup>a</sup>	1.5	4.2 <sup>a</sup>	1.2	2.3 <sup>b</sup>	1.3	30.5 <sup>***</sup>	0.5
Believe wild dogs should not be harmed	1.5	0.9	1.5	0.7	1.4	0.6	0.3	-
Prefer to handle the problem themselves	3.8 <sup>a</sup>	1.4	2.5 <sup>b</sup>	1.3	2.0 <sup>b</sup>	1.2	19.2 <sup>***</sup>	0.1
Don't want strangers on their property	3.0 <sup>a</sup>	1.6	2.1 <sup>b</sup>	1.1	1.9 <sup>b</sup>	1.0	8.5 <sup>***</sup>	0.1
Believe they will be made to do costly control	3.0 <sup>a</sup>	1.4	2.5 <sup>b</sup>	1.0	1.9 <sup>c</sup>	1.1	8.0 <sup>***</sup>	0.1
Will be forced to use disagreeable methods	2.6 <sup>a</sup>	1.4	2.0 <sup>b</sup>	1.0	1.8 <sup>b</sup>	1.1	5.0 <sup>**</sup>	0.1
Believe control will harm their dogs	3.4 <sup>a</sup>	1.6	2.5 <sup>b</sup>	1.3	2.3 <sup>b</sup>	1.2	8.4 <sup>***</sup>	0.1
Believe authorities will not act anyway	3.1 <sup>a</sup>	1.4	2.3 <sup>b</sup>	1.1	2.5 <sup>b</sup>	1.4	6.3 <sup>**</sup>	0.1
Believe not their responsibility	2.4 <sup>a</sup>	1.3	1.7 <sup>b</sup>	0.9	1.5 <sup>b</sup>	0.8	10.5 <sup>***</sup>	0.1
Do not want to be perceived as a bad manager	1.5	0.8	1.6	0.7	1.5	0.7	0.2	-

Notes: Mean agreement scores for COM variable rating using scale: 1 = strongly disagree, 5 = strongly agree. \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001. Means with different subscripts (in rows) differ significantly at p < 0.05 Tukey HSD. r = Pearson's correlation coefficient; r ≥ 0.5 indicates strong effect size, r = 0.3 indicates medium effect size, r = 0.1 indicates small effect size (Cohen, 1988).

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From a motivational perspective, *Non-reporters* did not want other people interfering with their property. They preferred to handle the problem themselves, and they did not want to be made to conduct control activities that they perceived as costly, disagreeable, or would harm their own dogs. These *Non-reporters* did not believe it was their responsibility to report wild dogs or their impacts to the authorities. These authorities were perceived as not acting on the information provided anyway.

In terms of opportunity, *Non-reporters* perceived current methods of reporting as too time-consuming and inconvenient. They may not receive the social cues to report as they don't know anyone else who performs this behaviour. *Non-reporters* also identified that they lacked the knowledge about who to contact.

#### Key Takeaways:

*The primary barriers to reporting wild dog sightings and impacts were:*

- 1) *Wild dogs were not causing a problem on their property (i.e. no motivation)*
- 2) *Current methods of reporting were too time-consuming.*

*Additional barriers to reporting wild dog sightings and impacts for non-reporters were:*

- 1) *They don't know who to contact (i.e. lack knowledge - capability)*
- 2) *Current methods of reporting were inconvenient (i.e. reduced opportunity)*
- 3) *They don't know anyone else who reports (i.e. lack of social opportunity)*
- 4) *There was a lack of motivation as they did not want other people interfering with their property, they preferred to handle the problem themselves, and they did not want to be made to conduct control activities that they perceived as costly, disagreeable, or which would harm their own dogs.*
- 5) *They felt it wasn't their responsibility, and the authorities would not act on their information anyway (i.e. further lack of motivation).*

### Intervention development (Steps 6, 7 & 8)

Our results have identified the main drivers and barriers to the reporting of wild dog impacts to the appropriate authorities. This next step is to identify the main leverage points and the specific behaviour change techniques that will target these barriers and achieve maximum on-ground outcomes.

#### Identify main leverage points (Step 6)

Two segments of landholders whose members had not reported wild dog sightings or their impacts in the previous five years have been identified, each with their own COM (*capability, opportunity, motivation*) profile. Relative to *Reporters*, these two segments (*Non-reporters* and *Potential reporters*), lacked the motivation to report as they tended not to have experienced wild dog problems on their properties. They perceived current reporting methods as too time consuming.

In addition *Non-reporters* did not know who to contact, perceived current methods of reporting were inconvenient, and they did not know anyone else who reported. They indicated they were unlikely to report any wild dog sightings or impacts if they encountered them in the future as they did not believe it was their responsibility to report to the authorities, and the authorities would not acting on the information provided anyway. They did not want other people interfering with their property as they preferred to handle the problem themselves. They also did not want to be made to conduct control activities that were disagreeable, or would harm their own dogs. Suggestions for each of these identified COM factors are shown in Table 3.3.

#### Intervention development and feasibility (Steps 7 & 8)

With consultation with our research partners it was decided to focus the intervention on addressing the physical opportunity barriers identified by both segments, i.e. that current methods are too time-consuming and inconvenient, as well as the social barrier, i.e. the lack of social cues for reporting. However, instead of developing a new reporting tool, it was decided to evaluate current methods, and identify areas of improvement that would allow them to be perceived as more convenient, and less time consuming, as well as demonstrate to landholders that other landholders value reporting, and also participate.

A popular method of reporting is the online tool Wild Dog Scan™ (WDS). WDS is a free resource (available as a website or mobile App) for landholders, community groups and pest controllers. It has been developed through the Centre for Invasive Species Solutions as part of the FeralScan suite of citizen surveillance tools (<https://www.feralscan.org.au/>), and allows users not only to map wild dog activities, and document wild dog problems, but inform neighbours and local biosecurity authorities, and identify priority areas for control. Many authorities involved in wild dog management support and promote the use of WDS in their jurisdictions.

The practical feasibility of evaluating this tool was assessed by our research partners, using the APEASE criteria developed by Michie et al. (2014). It was affordable, practical, cost effectiveness, acceptable, and fair. No potential side effects could be identified.

Table 3.3: Linking identified COM drivers and barriers to appropriate behaviour change techniques to promote the reporting of wild dog impacts (after Hine et al., 2019).

COM Factor	Focus of intervention	Recommended behaviour change techniques
<b>Capability</b>		
Know whom to report	Awareness, instruction and training (if required)	Advise and instruct on how to report, as well as target training material and workshops on how to use preferred reporting tools (if required).
<b>Opportunity</b>		
Convenience / time-consuming	Modify the environment to make it easy and less time-consuming to report.	Make reporting methods easy and less-time consuming to access. Increase the flexibility of reporting. Provide incentives to report.
Social norm cues	Align objectives and communications with the preferences of the community.	Develop solutions that are socially acceptable in consultation with the community. Use credible sources that people associate with and trust. Provide feedback from 'important others' reporting behaviour.
<b>Motivation</b>		
Perception of problem	Improve awareness of wild dog problems experienced by others in their community. Build upon displayed general values (such as altruism, environmental concern, animal welfare) to encourage participation.	Provide information about problem using credible local sources that people associate with and trust. Adopt a deliberate perspective targeted to their values. Provide information on other similar people's experiences and participation. Draw attention to discrepancies between values and current behaviour to create discomfort.
Handle problem themselves, no outside interference	Highlight the positive aspects of reporting and the benefits of handling the problem as a group. Dispel any underlying misconceptions.	Frame information to emphasis the positive aspects of reporting. Use credible sources that people associate with and trust. Provide feedback from 'important others' on their experiences with reporting and the benefits achieved.
Made to do control that is costly, disagreeable or harmful	Dispel any underlying misconceptions, and convince people that reporting will produce positive outcomes for them and their community.	Improve awareness of reporting and its benefits by explaining misinformation and emphasising correct facts. Provide information and feedback from other people's experiences and benefits achieved.
Responsibility	Promote awareness of the consequences of actions on others and enhance personal responsibility for them	Adopt a perspective linked with their perceived social role to provide information linked to the consequences of not reporting. Use credible sources that people associate with and trust.
Authorities don't act	Dispel any underlying misconceptions. Promote awareness of the ways the authority does act.	Provide information about how the authority acts on the information, as well as feedback from other people's experiences and benefits achieved.

### Evaluation (Step 9)

Wild dogs pose a problem across much of the Northern Tablelands Local Land Service (NT LLS) region. As part of their wild dog management plan, 38 Wild Dog Control Associations (WDCAs), comprising landholders and key stakeholders from a range of government, non-government and industry organisations, have been formed to coordinate wild dog management activities. The NT LLS has been promoting the use of Wild Dog Scan (WDS) by these WDCAs and their members as the main recording and planning tool. WDS is a free resource (available as a website or mobile App) for landholders, community groups and pest controllers. It has been developed as part of the FeralScan suite of citizen surveillance tools (<https://www.feralscan.org.au/>), and allows users to map wild dog activities, document wild dog problems, inform neighbours and local biosecurity authorities, and identify priority areas for control.

The objectives of this project are to:

1. Measure the current uptake of WDS as a reporting tool in the NT LLS
2. To gain a better understanding of the factors influencing the adoption of WDS within this LLS region
3. To assist NT LLS and the designers of WDS to improve their promotional, educational and support services for WDS.

### Methods

A mixed methods approach was used for this evaluation.

- The WDS database was interrogated to gain an understanding of the use of WDS by NT LLS landholders.
- NT LLS landholders were surveyed using an online questionnaire (Appendix 7) to measure their self-reported use of WDS, and the factors that are influencing their adoption or non-adoption of this reporting tool (i.e. drivers and barriers).
- A small number of landholders from selected WDCAs and LLS staff were interviewed to allow for a further detailed exploration of the identified drivers and barriers. The selected WDCAs were a mixture of those that currently embraced WDS, those who only sometimes used WDS, and those who have not adopted the technology. Interviews, which lasted between 30 to 60 minutes, were conducted in accordance with the ethical standards of the Human Research Ethics Committee of the University of New England (Approval No. HE20-166) (Appendix 8).

### Analysis

For the online survey data, the differences between respondent groups and behaviours, COM variables, situational and demographic variables were tested using either a one-way ANOVA (for continuous variables) or Pearson's chi-squared test (for categorical data). All tests were conducted using SPSS 26 (IBM, 2019). Open ended responses were coded to classify emerging COM themes, and identify any new factors not previously considered.



The interviews were recorded (by consent) and later transcribed and summarised for further thematic analysis. This involved systematically coding the responses to identify common themes to gain a better understanding of the factors that impede or drive both reporting behaviour in general as well as the use of WDS.

## Results

### *WDS database records*

WDS was launched in the NT LLS in late 2015. Since then the number of wild dog sightings, damage and control efforts entries, along with the number of individual contributors have been increasing, (Figure 3.5). Currently there are 23,436 registered users (plus between 4 and 5,000 non-registered users) across Australia.

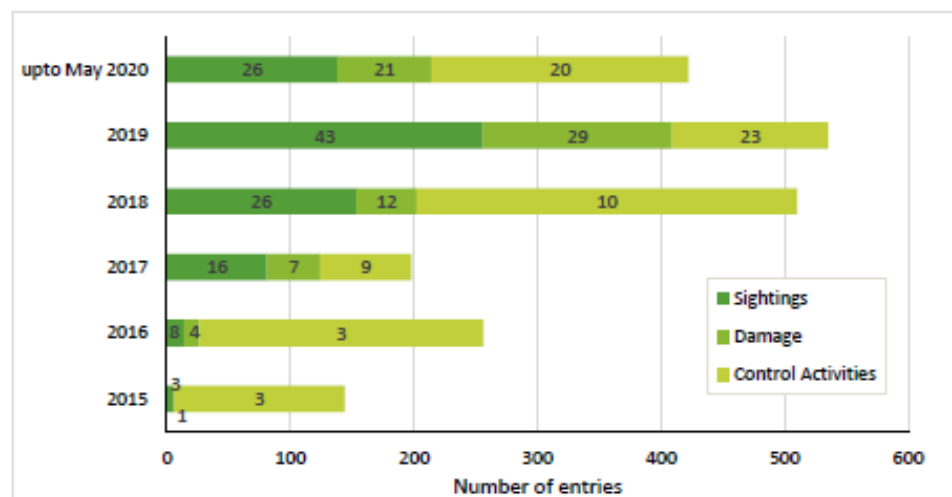


Figure 3.5: The total number of entries for wild dog sightings, damage and control activities entered in Wild dog Scan since 2015 from the Northern Tablelands Local Lands Services region. The data labels represent the number of individual contributors.

### *Landholder Online questionnaire*

One hundred and eighteen responses to the online survey were received, however 29 were not able to be used in the analysis due to inadequate completion of the questions, or obvious incorrect answers and 'flat-liner' responses. The average age of the 89 completed survey respondents was 57.7 years (SD 12.0; range 20 to 77), which is slightly older than the average age (54 years) recorded for the Regional adult population (Australian Bureau of Statistics, 2018). Sixty five respondents were male (73%), 24 female. The average property size of respondents was 1014 Ha (SD 1332; range 6 to 7,000 Ha), and the average years of residence was 26.1 years (SD 21.7; range 1 to 77). Eight three respondents owned their property, one leased, two managed the property, and two were employees, along with one dog trapper who worked across several properties.

Respondents were spread across 22 different WDCAs (Figure 3.6). Four respondents were unsure which WDCA they fell under. Fifty one of the respondents (57%) earned their main



Thirteen of the respondents (15%) were not aware of wild dogs in their area. A further 6 respondents (7%) reported being aware of wild dogs in their area, but not having experienced any problems on their properties. The remaining respondents reported wild dog problems on their property. Of these, 12 (13%) rated their problem as minor, 30 (34%) moderate, and 28 (31%) serious.

Seventeen (19%) respondents had never reported wild dog problems (despite four of them having experienced minor – serious wild dog problems). Six respondents who had not experienced any direct problems on their properties, had reported sightings.

#### *Reporting using Wild Dog Scan*

Three respondents were not aware of WDS, with the majority (97%) having heard of this reporting tool. Just over half (45) of respondents said they had used WDS to report wild dog sightings and impacts on at least one occasion. Respondent's use of WDS was significantly related to the seriousness of wild dog problems on their property, their main enterprise type, and their participation in aerial baiting programs (Table 3.4). Respondents in the Cataract River, Donnybrooke, and Pretty Gully WDCA were more likely to use WDS, whereas those from the Winterbourne and Yarrowitch-Tia WDCA were less likely to use WDS. There was no statistical difference in the use of WDS between respondent's age, gender, source of main income, awareness of WDS and participation in ground baiting, trapping and shooting control activities.

Although there was over half of the respondents reporting using the WDS tool, there was some confusion as to whom they were actually reporting (Figure 3.7). Nearly three quarters (33) believed their WDCA was one of the organisations that received the information, with six of these believing only their WDCA received the information. Just over half (26) believed the LLS was one of the organisations that received the information, with two believing they were reporting solely to the LLS. Twenty three believed they their neighbours were among the people receiving the information, with six of these believing this information went only to their neighbours. Thirteen believed the regional wild dog Coordinator also received the information. Three respondents believed that other organisations / people received the information, along with the LLS, WDCA and neighbours. Three respondents were not sure who received their wild dog report information.

**Table 3.4: Differences between demographic and situational variables, and participation in wild dog control activities of respondents and their use of the Wild dog Scan reporting tool.**

Variables	Use Wild dog Scan (N=45)		Do not use Wild dog Scan (N=44)		Differences	
	Mean	SD	Mean	SD	F	r
<i>Wild dog management<sup>1</sup></i>						
Independent baiting	1.9	1.8	1.4	1.7	1.7	-
Group ground baiting	2.1	1.8	1.7	1.6	1.3	-
Aerial baiting	1.9 <sup>b</sup>	1.8	1.0 <sup>a</sup>	1.6	6.4**	0.3
Shooting	2.2	1.7	2.1	1.7	0.1	-
Trapping	1.9	1.8	1.3	1.8	2.4	-
<i>Demographic variables</i>						
Age	55.6	10.7	59.9	13.2	2.9	-
<i>Situational variables</i>						
Property size (ha)	954	1098	1076	1550	0.2	-
Years of residence	29.3	20.6	22.9	22.5	1.9	-
Wild dog problem <sup>2</sup>	3.0 <sup>b</sup>	1.1	2.3 <sup>a</sup>	1.6	6.2*	0.3
	N (%)	Z <sub>resid</sub>	N (%)	Z <sub>resid</sub>	χ <sup>2</sup>	r
<i>Wild dog management</i>						
Fencing:						
Yes	19	1.0	14	-1.0		
No	26	-1.0	30	1.0		
Guard animals:						
Yes	5	1.2	2	-1.2	1.3	-
No	40	-1.2	42	1.2		
<i>Demographic variable</i>						
Gender:						
Male	32	-0.4	33	0.4	0.2	-
Female	13	0.4	11	-0.4		
<i>Situational variables</i>						
Main income source:						
Property	28	0.9	23	-0.9	0.9	-
Other (off property)	17	-0.9	21	0.9		
Property enterprises:						
Cattle only	10	-4.2	29	4.2	19.8***	0.4
Small livestock only	8	0.5	6	-0.5		
Mixed livestock	17	3.2	4	-3.2		
Farming - no livestock	4	1.4	1	-1.4		
Lifestyle / hobby	6	0.6	4	-0.6		
Wild Dog Scan aware:						
Yes	45	1.8	41	-1.8	3.18	-
No	0	-1.8	3	1.8		
Wild dog Associations <sup>3</sup> :						
Cataract River	4	2.0	0	-2.0	48.9***	0.3
Donnybrooke	5	2.3	0	-2.3		
Pretty Gully	4	2.0	0	-2.0		
Winterbourne	0	-2.6	6	2.6		
Yarrowitch-Tia	0	-2.1	4	2.1		

Notes: <sup>1</sup> Mean scores for management participation using scale: 0=never, 1= once, 2= twice, 3= 3 times, 4= more than 3 times. <sup>2</sup> Wild dog problem scale: 0=no problem, 4=serious problem. <sup>3</sup>Only WDCA showing significant differences are listed. \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001. Means with different subscripts (in rows) differ significantly at p < 0.05 Tukey HSD. r = Pearson's correlation coefficient; r ≥ 0.5 indicates strong effect size, r = 0.3 indicates medium effect size, r = 0.1 indicates small effect size Cohen (1988). Z<sub>resid</sub> = Adjusted standardised residual, where Z<sub>resid</sub> > |2| is significant at p < 0.05

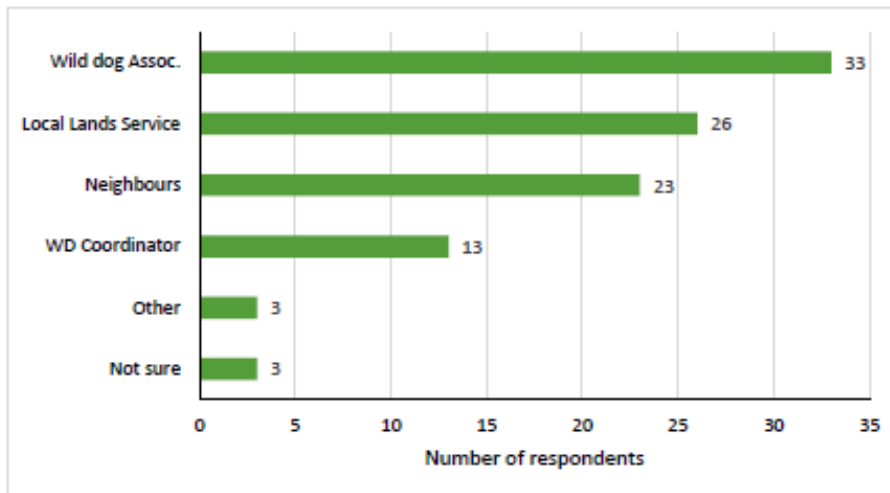


Figure 3.7: The organisations / groups users of Wild Dog Scan assumed to be receiving their reports of wild dog sightings and impacts.

A third of the respondents (15) who used WDS did so exclusively (i.e. they did not use any other reporting methods). The remaining users, along with other respondents relied on a combination of reporting methods. Half of the respondents (45) said they had used phone calls, a third (29) had made in-person reports, 12 had used emails and 5 had used other unspecified methods to contact neighbours, their WDCA, the LLS and the regional Wild dog Coordinator (Figure 3.8).

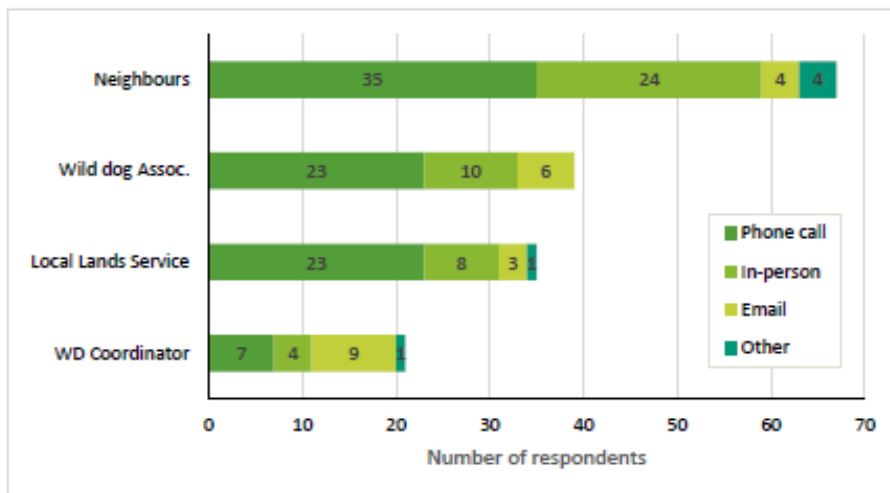


Figure 3.8: Methods, other than Wild dog Scan, used to report wild dog impacts.

### Barrier and driver factors to WDS adoption

Respondents were asked to rate their agreement with eight driver / barrier questions relating to the use of WDS. Respondents who currently do not use WDS were significantly more likely to be unsure how to use this tool, found it difficult to use, reported they did not have the means to use the reporting tool, and prefer to have a conversation with someone about wild dogs. These respondents are less likely to want to report wild dog activities on their property, and don't see the benefits of using WDS (Table 3.5).

Table 3.5: Differences of reporting behaviour and agreement with eight COM-B driver and barrier variables between respondents who use Wild dog Scan and those that do not.

COM Variables <sup>1</sup>	Use Wild dog Scan (N=45)		Do not use Wild dog Scan (N=44)		Differences	
	Mean	SD	Mean	SD	F	r
<i>Capability</i>						
Unsure how to use WDS	1.4 <sup>a</sup>	0.7	2.0 <sup>b</sup>	1.5	6.7**	0.3
WDS difficult to use	1.4 <sup>a</sup>	0.8	2.1 <sup>b</sup>	1.3	9.7**	0.3
<i>Opportunity-physical</i>						
No means to use WDS	1.2 <sup>a</sup>	0.8	1.8 <sup>b</sup>	1.3	6.1*	0.3
<i>Opportunity - social</i>						
Know no-one who uses WDS	1.6	1.0	1.6	1.0	0.1	-
<i>Motivation</i>						
Don't trust data safety	1.3	0.9	1.4	0.8	0.1	-
Don't want to report	1.0 <sup>a</sup>	0.3	1.5 <sup>b</sup>	1.1	8.4**	0.3
Prefer conversation	2.0 <sup>a</sup>	1.2	2.8 <sup>b</sup>	1.5	6.7**	0.3
Don't see the benefits	1.1 <sup>a</sup>	0.5	1.4 <sup>b</sup>	0.8	5.2*	0.3
Reporting over past 5 years <sup>2</sup>	3.2 <sup>a</sup>	1.1	1.6 <sup>b</sup>	1.7	27.3***	0.5
Future reporting intention <sup>3</sup>	4.8 <sup>b</sup>	0.4	4.5 <sup>a</sup>	1.1	4.2*	0.2

Notes: <sup>1</sup> Mean agreement scores for COM variables using scale: 0=do not agree, 1=slightly, 2=moderately, 3=agree, 4=highly agree. <sup>2</sup> report scale: 0=never, 1=once, 2=2-3 times, 3=4-5 times, 4=5times. <sup>3</sup> Intention scale: 0=not likely, 1=slightly, 2=somewhat, 3=likely, 4=highly likely. \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001. Means with different subscripts (in rows) differ significantly at p < 0.05 Tukey HSD. r = Pearson's correlation coefficient; r ≥ 0.5 indicates strong effect size, r = 0.3 indicates medium effect size, r = 0.1 indicates small effect size Cohen (1988).

Identified themes from the open-ended responses to the question "why they thought other landholders may be keen or hesitant to use WDS" are shown in Table 3.6. Emerging COM themes were very similar to the ones already know, and found to differ between users and non-users (Table 3.5), i.e. unsure how to use WDS, finding it difficult to use, limited means to access it, not wanting to report, preference for personal contact, and not perceiving the benefits. Respondents commonly referred to 'older' landholders when raising the hesitancy in using WDS or lack of 'tech savvy'. In our comparisons we found no statistical difference in the age between our sample of users and non-users of WDS (see Table 3.4), however this data was collected using an online sample, so there may be some bias toward the 'tech savvy'. Data privacy issues or lack of social cues were not suggested by any of the respondents as factors preventing landholders from using WDS. There were no new types of factors suggested.

Table 3.6: Results from the thematic analysis of the open-ended survey question.

Barriers to using Wild dog Scan	
<i>Capability</i>	<ul style="list-style-type: none"> <li>• Lack of confidence in using new technology</li> <li>• Lack of computer skills</li> </ul>
<i>Opportunity</i>	<ul style="list-style-type: none"> <li>• Other priorities</li> <li>• Time consuming</li> <li>• Don't have access to smartphone / computer</li> <li>• Poor phone and / or internet coverage</li> </ul>
<i>Motivation</i>	<ul style="list-style-type: none"> <li>• No wild dog problems / no perceived impact of wild dogs</li> <li>• Remembering to use it</li> <li>• Lack of instant feedback &amp; support evident when making personal contact</li> <li>• Couldn't be bothered to report / laziness</li> <li>• Don't see the need to report</li> <li>• Receive no feedback</li> <li>• Don't perceive the greater benefit</li> </ul>
Benefits of using Wild dog Scan	
	<ul style="list-style-type: none"> <li>• Instant access to information</li> <li>• Good way to track wild dog activity - a good perspective of the whole area</li> <li>• Can contact many people / groups with one action</li> <li>• Don't need everyone's contact details</li> <li>• Benefits all stakeholders / group members</li> <li>• Easy to use</li> <li>• Informed even when not on site</li> </ul>

#### *Landholders and LLS staff interviews*

Ten interviews were conducted to further explore the factors driving or impeding the adoption of WDS by landholders. Four LLS staff and six landholders (three from WDCA that currently embraced WDS, two from WDCA that only sometimes used WDS, and one from a WDCA who have not adopted the technology) took part in the interviews. Further discussion of these factors is presented below.

#### **Landholder capability**

Two common barriers to using WDS were landholder skills using the technology as well as their confidence in using it.

*"I had a crack at it first up and had difficulty completing. I am sure that it was my lack of computer skills and not the fault of the program" (L5).*

*"I hadn't used it for a while, and it took me some time to remember what to do" (L1).*

*"I have the wild dog scan on my laptop but have had trouble using it" (L4).*

*"My daughter helped me set it up. She's the main user but I am gaining more confidence. Now our neighbours call me, and we enter the data for them" (L2).*

The main interventions to assist with these kind of barriers include education, training and providing support. Three of the landholders had attended WDS training sessions offered by their WDCA, one 4-5 years previously and the others more recently. The other three were members of WDCA that had not offered any training. One landholder suggested that entering 'live data' during the training sessions, and demonstrating how it works in their own backyard would be more beneficial than *"slides on a screen"*. Another thought that having pop-up help functions *"similar to a cooking recipe"* that steps them through the procedure would be of great assistance when they were unsure or could not remember what to do.

#### **Landholder opportunity**

Not having access to a smartphone and / or computer are commonly expressed barriers to the use of WDS. However one landholder acknowledged that even though there may be *"a limited number of technophobes"* amongst his fellow landholders, in his experience most landholders did now own a smartphone, but were *"still overwhelmed by the amount of technology"* (L1), and *"probably not using it to the full capacity – I mean downloading apps and the like"* (S2).

Having poor mobile and / or internet coverage was another commonly perceived barrier. *"Even when we explain that they can put in the information in when there is no coverage, they still use their poor mobile coverage as an excuse"* (S3). Another problem that the LLS staff encountered was that the landholders would wait until they got back to the house to enter their data – hence the locations were registered as *"in their lounge-room instead of out in the paddock"*.

Time was another major barrier, landholders had many priorities and generally considered themselves as 'time-poor'. They perceived little opportunity to spend time learning how to use WDS, as well as then using it to report, particularly when they were not confident using it, so it seemed to take *"more time than it was supposedly saving"* (L4).

#### **Landholder motivation**

There are many benefits that WDS offers, including:

- Notifying multiple stakeholders with one action – *"Good way of alerting people in the area who you don't know or have contact for"* (L3), *"Reduces having to contact everyone, one notification instead of ten"* (S2).
- Instant access to information about wild dog activity in the local area – *"It is the only way some of us know about dog activity"* (L3).

However not all landholders *"see the dollar value straightaway, and it's hard to tell them"* (S1). One landholder thought WDS was *"brilliant and simple"* (L1) and was not sure why the uptake was so poor, but acknowledged that before the addition of the feedback alerts *"it*



was a hard sell" to other members in his WDCA - they couldn't see "what they got out of it". With the alert feedback everyone is "keen when they use and then see results" (S4).

An "excellent tool to keep track of what is happening in my area" (L2).

Although the alerts were an important way of informing landholders, they could not be the sole source of information.

"They (landholders) are overwhelmed by so much information these days, they don't look at it (the information)" (S2).

"Neighbour networks are an important source of information as well" (S1).

Some landholders were still unsure about their privacy.

"One landholder didn't want to report control measures for fear of reprisal, being judged" (S3).

"They (the landholders) don't understand fully about closed groups" (S4).

One of the biggest barriers discussed was not actually with the WDS per se, but with reporting in general. Several of the landholders mentioned that they had neighbours who "believe it (reporting) was not necessary" as they either were not affected by dogs, or took care of things themselves.

"Some landholders are not aware of or haven't experienced wild dog problems so there is no resonance to report or participate" (S1).

"My neighbours have fences to protect their stock" (L2).

The perceived lack of action by LLS or previous bad experiences also were seen as reasons not to report.

"I have placed numerous sighting reports etc and kills on wild dog scan there is enough data now to indicated serious problems with dogs, however I am the one chasing LLS to inform them, then get bait out, place traps and everything. I do it to try and protect my lively hood, but it seems all one way traffic" (L4).

"Some landholders feel that LLS doesn't act on the information" (S1).

For others there appeared to be more personal reasons.

"Some landholders are good at reporting, others see the benefits but still don't (report)" (S3).

"Some don't even tell neighbours they are having attacks" (S1).

"One landholder didn't want to decrease the price of their land" (S2).

Suggested ways to encourage uptake of WDS included:

- Promoting the "benefits, and building a case to increase the funding for their area" (S2).

- Increase the understanding and build a culture within LLS that reporting will lead to support and assistance with control. *“Many landholders expect control or support but don’t report, need a way to get this to resonate with them”* (L1).
- *“LLS needs to get the word out, keep momentum especially when (landholders) are not suffering predation”* (S2).

### Key Takeaways:

*The primary barriers to using Wild dog Scan were:*

- *Ability to use this tool – skill and confidence (reduced capability)*
- *Time availability – to learn new skills as well as to report (lack of opportunity)*
- *Access to compatible hardware (reduced opportunity)*
- *Perceived connection issues – phone and internet coverage (reduced opportunity)*
- *Don’t see the benefits of Wild Dog Scan (not motivated)*
- *Prefer contact / conversations with people (not motivated)*
- *Non-reporters – either don’t see the need, or too lazy (lack of motivation)*

Suggestions how to tackle these barriers are shown in Table 3.7.

Table 3.7: Linking identified COM drivers and barriers to appropriate behaviour change techniques to promote the uptake of Wild Dog Scan (after Hine et al., 2019).

COM Factor	Focus of intervention	Recommended behaviour change techniques
<b>Capability</b>		
Unsure how to use WDS Find it difficult to use	Awareness, instruction, training and support	Advise and instruct on how to use WDS, as well as targeted training material and workshops. Create built-in support to guide users, as well provide one-to-one support options.
<b>Opportunity</b>		
Time-poor	Make it easy and less time-consuming to learn and report.	Provide information on time-saving benefits of WDS. Combine training sessions with other activities to reduce time commitment. Provide incentives to use WDS.
Access to technology	Improve access to technology	Improve awareness of the required technology and its use, dispel any perceived misconceptions. Demonstrate and provide feedback from other credible users.
<b>Motivation</b>		
No wild dog problems	Promote awareness of other WDS functions aside from reporting.	Promote the benefits of being part of the group to keep up with latest developments.
Don't see the benefits	Highlight the positive aspects of WDS and the benefits of handling the problem as a group. Dispel any underlying misconceptions.	Frame information to emphasis the positive aspects of WDS. Use credible sources that people associate with and trust. Provide feedback from 'important others' on their experiences with WDS and the benefits achieved.
Don't want to report	Dispel any underlying misconceptions, and persuade people that reporting will produce positive outcomes for them and their community.	Improve awareness of reporting and its benefits by explaining misinformation and emphasising correct facts. Provide information and feedback from other people's experiences and benefits achieved.
Prefer one-on-one conversations	Provide feedback and support	Acknowledge reports and offer support to users, e.g. follow up reports with phone call.

### Review and reflect (Step 10)

This case study was conducted to investigate landholders' reporting of wild dogs and their impacts. It aimed to:

- 1) Identify landholders segments that are not reporting wild dogs and their impacts
- 2) Assess potential drivers and barriers that may influence landholders' reporting behaviour
- 3) Identify main leverage points within the identified segments and specific behaviour change tools that may be useful for targeting interventions
- 4) Guided by these findings, evaluate the current reporting tool Wild Dog Scan.

We identified three landholder reporting segments:

- 1) *Non-reporters* had rarely reported in the past, and were unlikely to report in the future. Members were a mixture of those that had experienced problems with wild dogs, and those that had not. They tended to be younger in age, and had resided on the properties for a shorter period than the other segments.
- 2) *Potential reporters* had rarely reported in the past. They were more likely not to have experienced any problems with wild dogs, however they were likely to report wild dogs and their impacts if encountered. Members tended not to run small livestock on their property.
- 3) *Reporters* commonly reported and were likely to report in the future. They were more likely to have experienced problems with wild dogs, and more likely to be running small livestock on their property.

Landholders who had not reported in the past three years (both *Non-reporters* and *Potential reporters*) each had their own COM (*capability, opportunity, motivation*) driver / barrier profile. Both *Non-reporters* and *Potential reporters* perceived no problems with wild dogs, and considered current reporting methods were too time-consuming. In addition, *Non-reporters* were unsure of who to contact, considered reporting was too inconvenient, and did not know of anyone else who reported. They did not believe it was their responsibility to report, and believed the authorities did not act on the advice anyway. Many *Non-reporters* did not want anyone interfering with their property, and did not want to be made to do control. If there was a problem they would handle any problem themselves.

By categorising the drivers and barriers using the COM model we were able to identify a range of behaviour change tools that could be used to increase the likelihood of reporting (summarised in Table 3.3). For the next phase of this case study instead of developing a new reporting tool, we focussed on evaluating a current one, Wild Dog Scan, to gain a better understanding of the factors influencing its uptake, and identify ways uptake could be improved. We selected the Northern Tablelands Local Lands Service (NT LLS) area within NSW as the study site.

We identified a number of COM barrier and driver factors influencing WDS uptake. Landholders' skill and confidence using the technology was a common barrier, along with the perceived reduced opportunity owing to poor phone and / or internet coverage. Spending time to learn how to use WDS, then remembering how to use it was also seen as a challenge for some landholders. Landholders were not motivated to use WDS as they did not perceive the benefit over their current methods, with many preferring to have contact with other people. However, two of the biggest barriers was not specifically targeted at the WDS tool per se, but at reporting in general. Wild dogs were not posing a problem for many landholders, so they had nothing to report. Other landholders were just not motivated to report (for the many reasons already discussed above), regardless of their wild dog problems or the reporting tool.

Wild Dog Scan is more than a reporting tool, and to increase its uptake, agencies and the developers need to promote, and demonstrate not only the benefits of its reporting functions, but those for planning and funding, as well as the social benefits. A many faceted approach is required to educate, train and support landholders. Not only more targeted training opportunities, and provision of information to improve awareness and dispel any perceived misconceptions, but real-time support functions to ease the cognitive burden and save time.

Reporting is a two way process, and to expect landholders' cooperation, agencies need to earn their trust. These agencies need to build a culture of acknowledging landholders' efforts and demonstrate that reporting will lead to support and assistance with wild dog problems.

## APPENDIX 5. DATA RECORDED BY COMMUNITIES ACROSS AUSTRALIA

Table 2. FeralScan user and user group trend stats over the 5-year project.

FY	Registered (and non-registered) users	Community groups	Total records
Project commencement (at 1 July 2017)	11,786	166	66,722
2017/18	13,956	261	90,430
2018/19	15,500	308	109,700
2019/20	19,176	449	213,267
2020/21	23,436	550	258,269
2021/22	38,805	606	303,643
2022 October	40,422	623	316,855

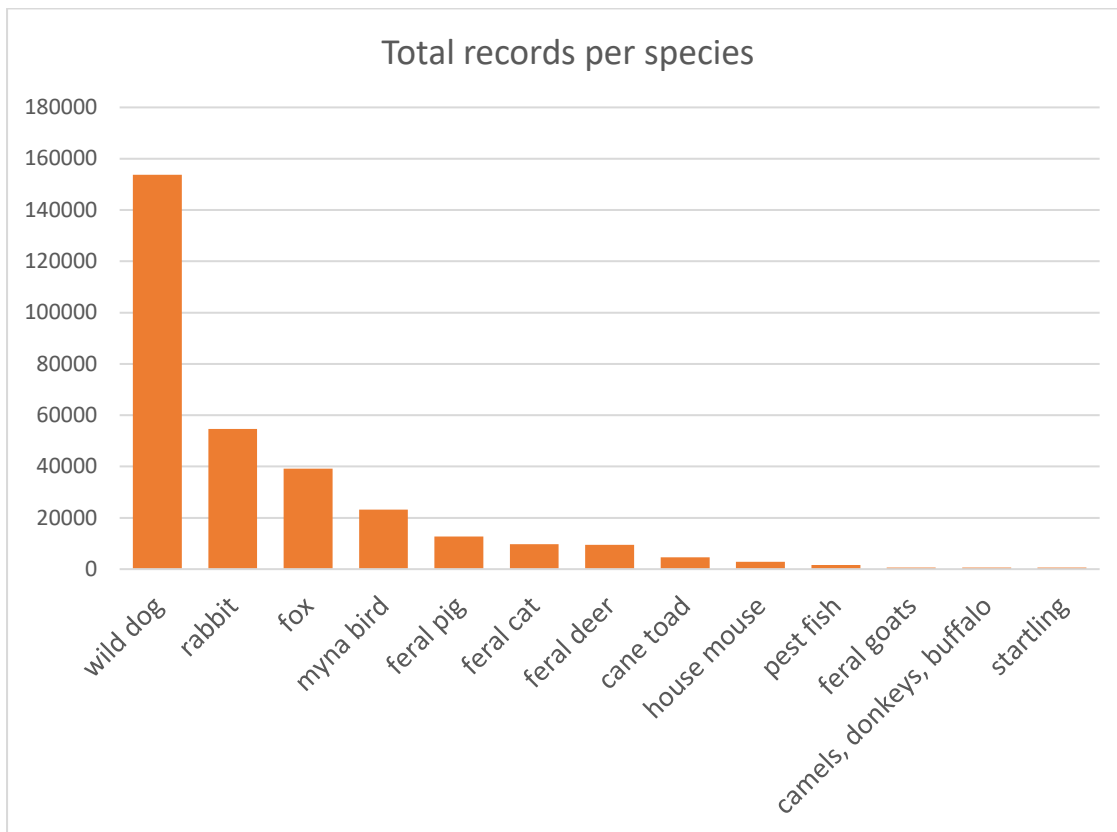


Figure 93. Species data recorded into FeralScan

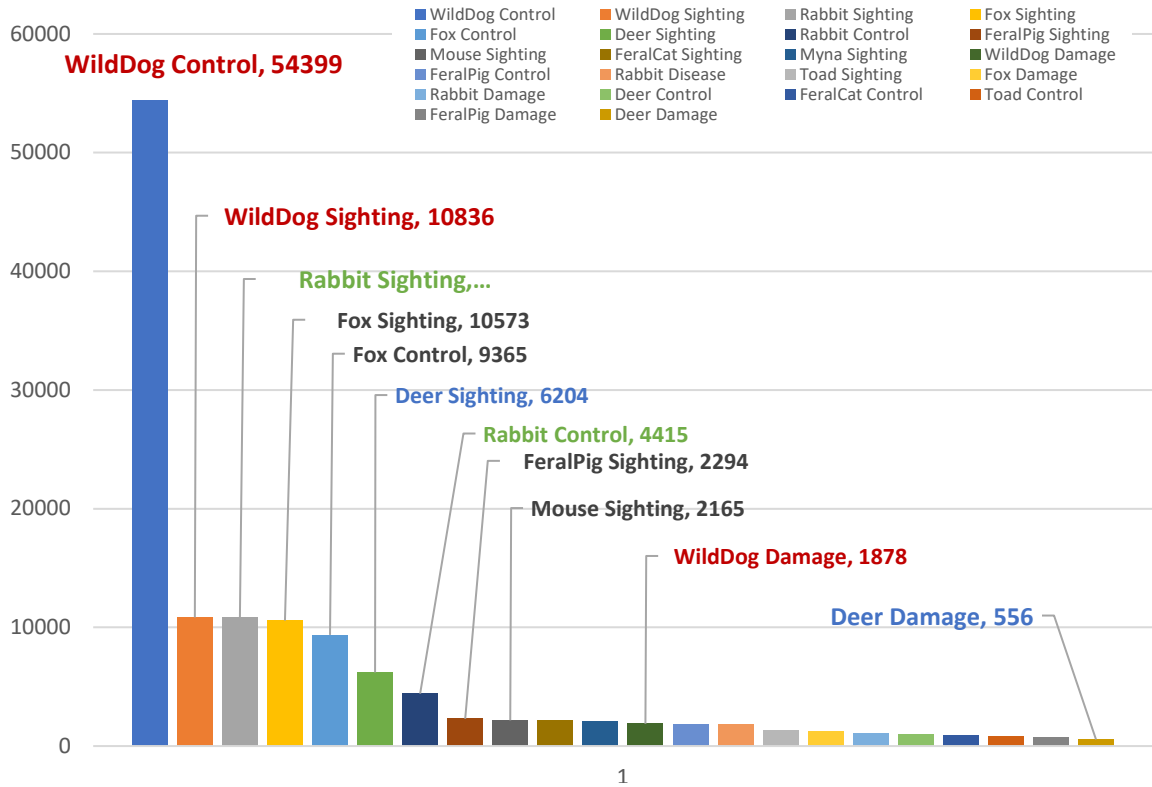


Figure 94. Species data (and type) recorded into FeralScan

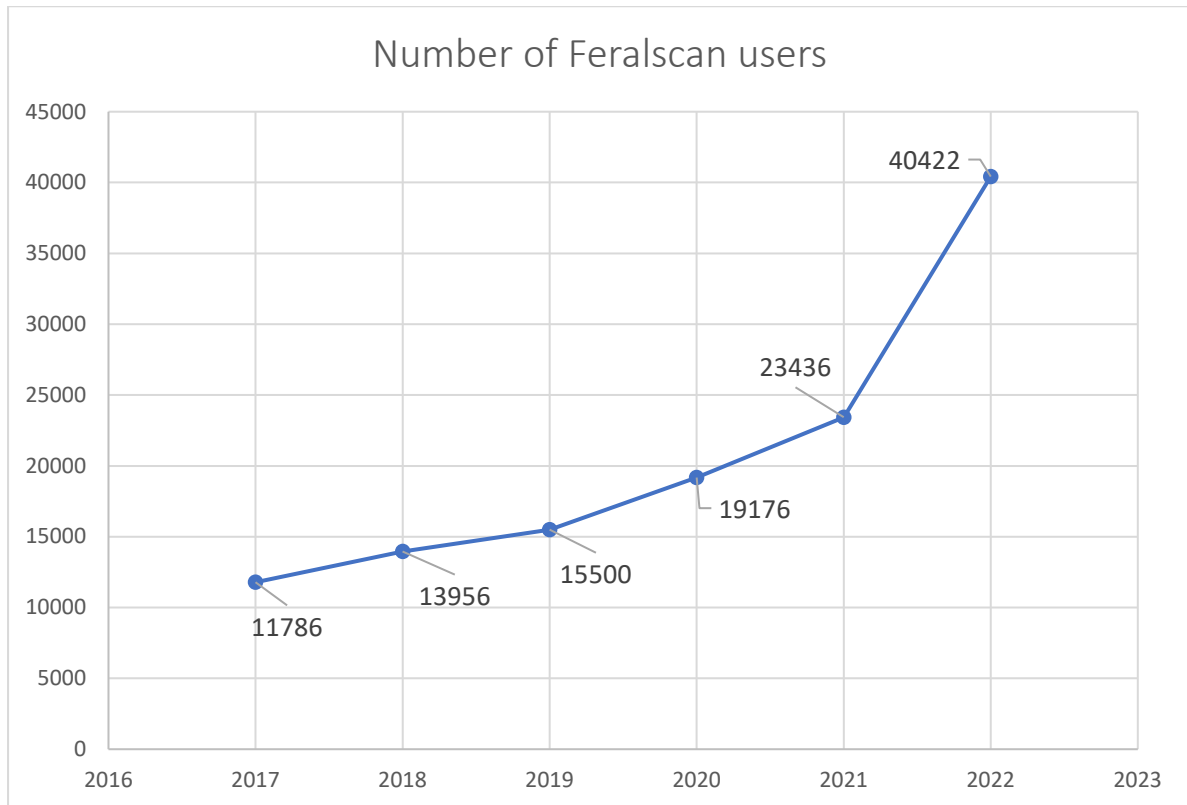


Figure 95. Registered and non-registered FeralScan users, showing over 28,600 new users since project commencement

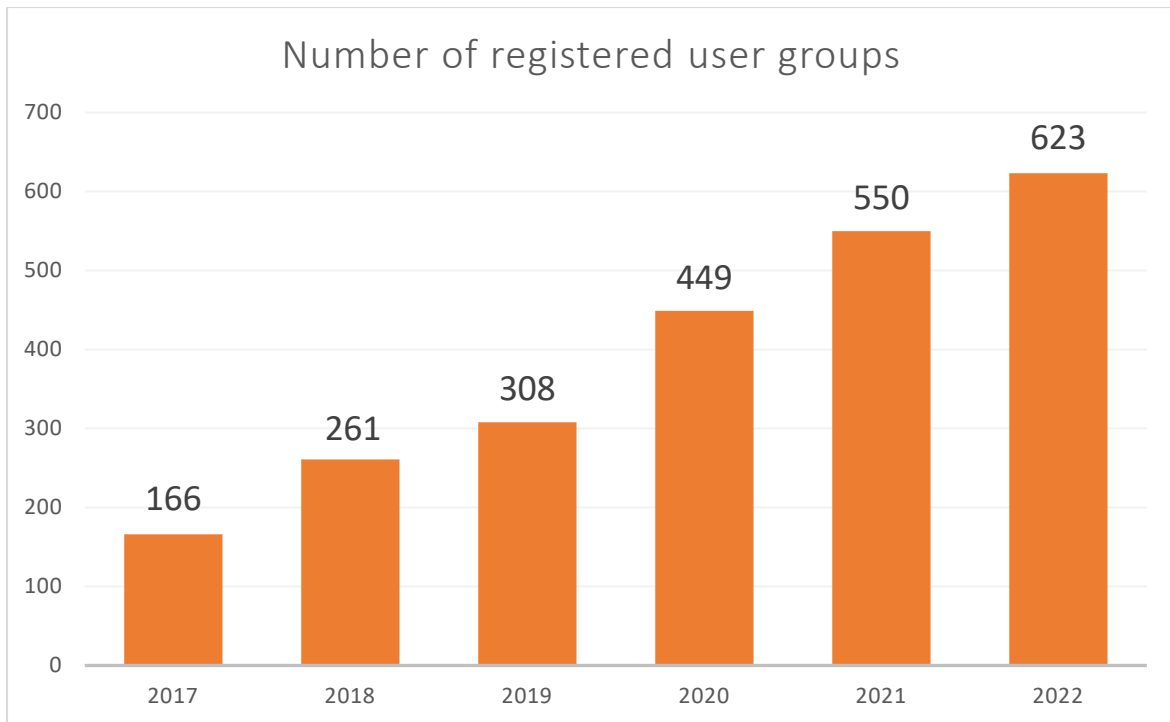


Figure 96. Trend in the number of user groups using FeralScan software during the project

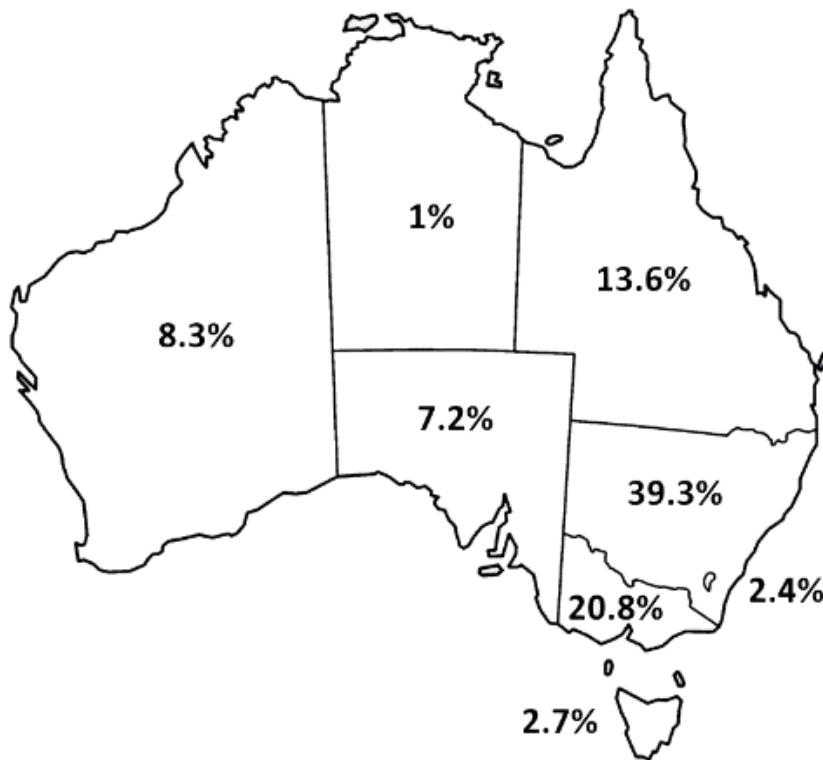


Figure 97. Map showing the number of private user groups by state/territory at project end



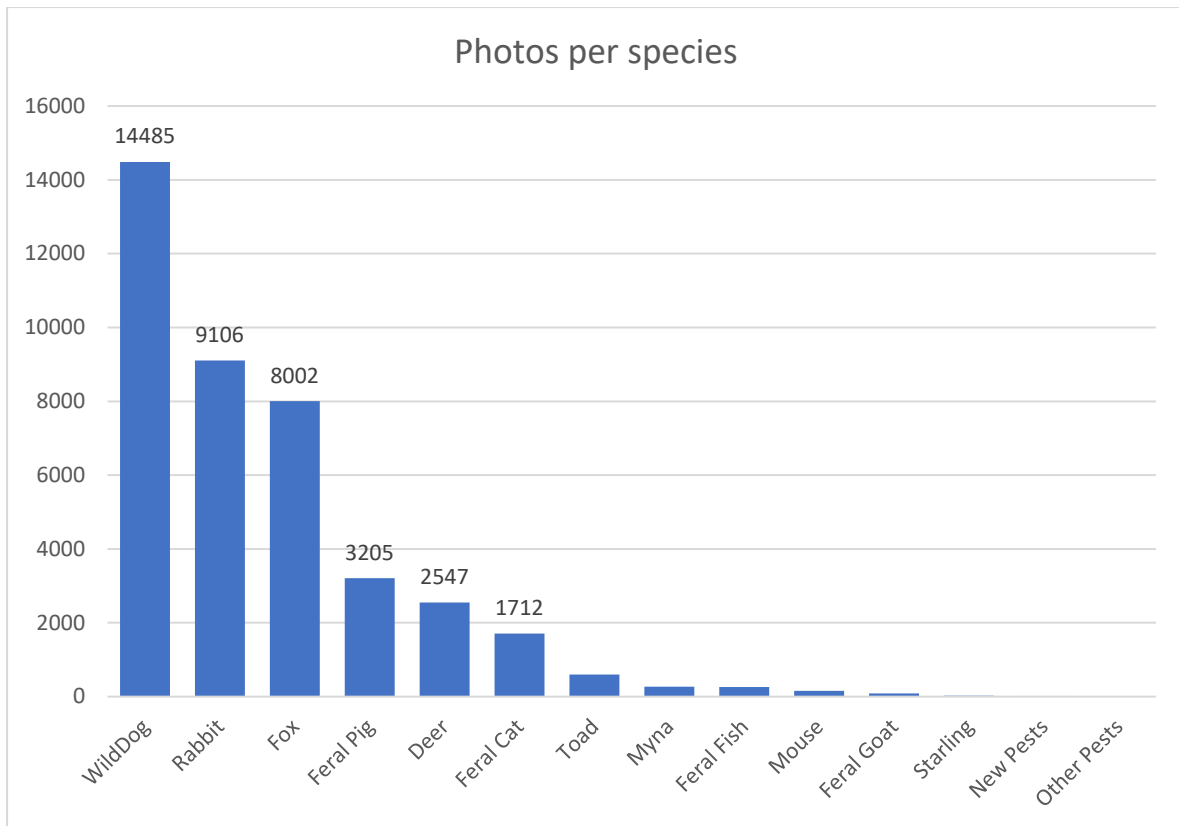


Figure 98. Photos submitted by users with records, by species (note the platform hosts 40,499 photos in total)

## APPENDIX 6. SPECIES RECORDS SHARED WITH ALA

COMMON NAME (SCIENTIFIC NAME) AND LINK TO ALA DATASET	TOTAL RECORDS	SHARING CONDITIONS
<a href="#">Rabbit (<i>Oryctolagus cuniculus</i>)</a>	41,179	
<a href="#">Fox (<i>Vulpes vulpes</i>)</a>	23,811	
<a href="#">Wild dogs (<i>Canis familiaris</i>)</a>	N/A	TBC
<a href="#">Common myna (<i>Acridotheres tristis</i>)</a>	21,450	
<a href="#">Feral cat (<i>Felis catus</i>)</a>	6,787	Generalised coordinates to 1 km to conceal location
<a href="#">Feral pig (<i>Sus scrofa</i>)</a>	5,605	Generalised coordinates to 10 km to conceal location
<a href="#">Fallow deer (<i>Dama dama</i>)</a>	2,905	Generalised coordinates to 10 km to conceal location
<a href="#">House mouse (<i>Mus musculus</i>)</a>	2,844	
<a href="#">Rusa deer (<i>Cervus unicolor</i>)</a>	1,124	Generalised coordinates to 10 km to conceal location
<a href="#">Carp (<i>Cyprinus carpio</i>)</a>	962	
<a href="#">Feral goats (<i>Capra hircus</i>)</a>	548	Generalised coordinates to 10 km to conceal location
<a href="#">Rusa deer (<i>Cervus timorensis russa</i>)</a>	542	Generalised coordinates to 10 km to conceal location
<a href="#">Feral camel (<i>Camelus dromedarius</i>)</a>	506	
<a href="#">Starling (<i>Sturnus (Sturnus) vulgaris</i>)</a>	478	
<a href="#">Red deer (<i>Cervus elaphus</i>)</a>	457	Generalised coordinates to 10 km to conceal location
<a href="#">Mozambique tilapia (<i>Oreochromis mossambicus</i>)</a>	241	
<a href="#">Cane toad (<i>Rhinella marina</i>)</a>	180	
<a href="#">Eastern gambusia (<i>Gambusia holbrooki</i>)</a>	175	
<a href="#">Redfin Perch (<i>Perca fluviatilis</i>)</a>	107	
<a href="#">Chital deer (<i>Axis axis</i>)</a>	105	Generalised coordinates to 10 km to conceal location
<a href="#">Gold fish (<i>Carassius auratus</i>)</a>	50	

COMMON NAME (SCIENTIFIC NAME) AND LINK TO ALA DATASET	TOTAL RECORDS	SHARING CONDITIONS
<a href="#">Oriental weatherloach (<i>Misgurnus anguillicaudatus</i>)</a>	25	
<a href="#">Hog deer (<i>Axis porcinus</i>)</a>	23	Generalised coordinates to 10 km to conceal location
<a href="#">Spotted tilapia (<i>Pelmatolapia mariae</i>)</a>	15	
<a href="#">Feral donkey (<i>Equus (Asinus) asinus</i>)</a>	14	
<a href="#">Feral buffalo (<i>Bubalus bubalis</i>)</a>	3	

## DESCRIPTION ON ALA WEBSITE

### *PUBLIC SHORT DESCRIPTION*

A free community pest animal recording tool.

### *PUBLIC DESCRIPTION*

FeralScan is a free resource for landholders, community groups, pest controllers, biosecurity groups and government organisations to monitor and record information about introduced pest animals. It provides both a citizen science tool and local pest management resource for the community.

Data generalisations: Feral goat 10 km Feral pigs 10 km Feral deer 10 km Feral Cat 1 km

ALA users/stakeholders can access a licensed and downloadable format of FeralScan data.

License: Creative Commons Attribution-NonCommercial 4.0 International (CC-BY-NC 4.0)

## APPENDIX 7. ASSESSING THE FEASIBILITY OF MOVING THE FERALS SCAN RESOURCE ONTO THE CISS SERVER

### REPORT FROM CISS COMMUNICATIONS MANAGER TO CISS REGARDING POTENTIALLY MOVING THE FERALS SCAN RESOURCE ONTO THE CISS SERVER, SEPTEMBER 2020.

#### BACKGROUND

Both the P01-E-002 and P01-E-008 projects have a shared milestone (13 and 8 respectively) which is to move the FeralScan suite of products onto CISS servers.

This was primarily a milestone dedicated to cost saving and having all CISS products on the same hosted server provider.

This milestone is now overdue for both projects and a meeting was held on 3 September 2020 with the web development teams contracted through CISS (Plural Technology) and NSW DPI (NewtonGreen Technologies) to progress it.

#### SUMMARY

Table 3. Summary of platform and system requirements for migration

Platform	FeralScan web application and MS SQL database	All other CISS web products including but not limited to: <ul style="list-style-type: none"> <li>• invasives.com.au</li> <li>• PestSmart</li> <li>• WeedsAustralia</li> <li>• community engagement portal</li> <li>• project report portal</li> </ul>
System	Microsoft Azure servers	Google Cloud servers
Specs	<ul style="list-style-type: none"> <li>• Web Server <ul style="list-style-type: none"> <li>- Windows Server 2019</li> <li>- Intel Xeon Platinum 8171M CPU @ 2.60GHz (2 CPUs)</li> <li>- 16 GB RAM</li> <li>- 126 GB SSD</li> </ul> </li> <li>• Database Server <ul style="list-style-type: none"> <li>- Windows Server 2019</li> <li>- Microsoft SQL Server 2019 Standard</li> <li>- Intel Xeon Platinum 8272CL CPU @ 2.60GHz (2 CPUs)</li> <li>- 16 GB RAM</li> <li>- 126 GB SSD</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Web Server <ul style="list-style-type: none"> <li>- specs can be provided on request</li> </ul> </li> </ul>

#### ISSUE

The FeralScan site is different to our current WordPress sites housed on the CISS servers, in that it also has a large registered user database, and hosts a pest database system. Therefore, the CISS servers would need to factor that into the move.

## *RECOMMENDATIONS*

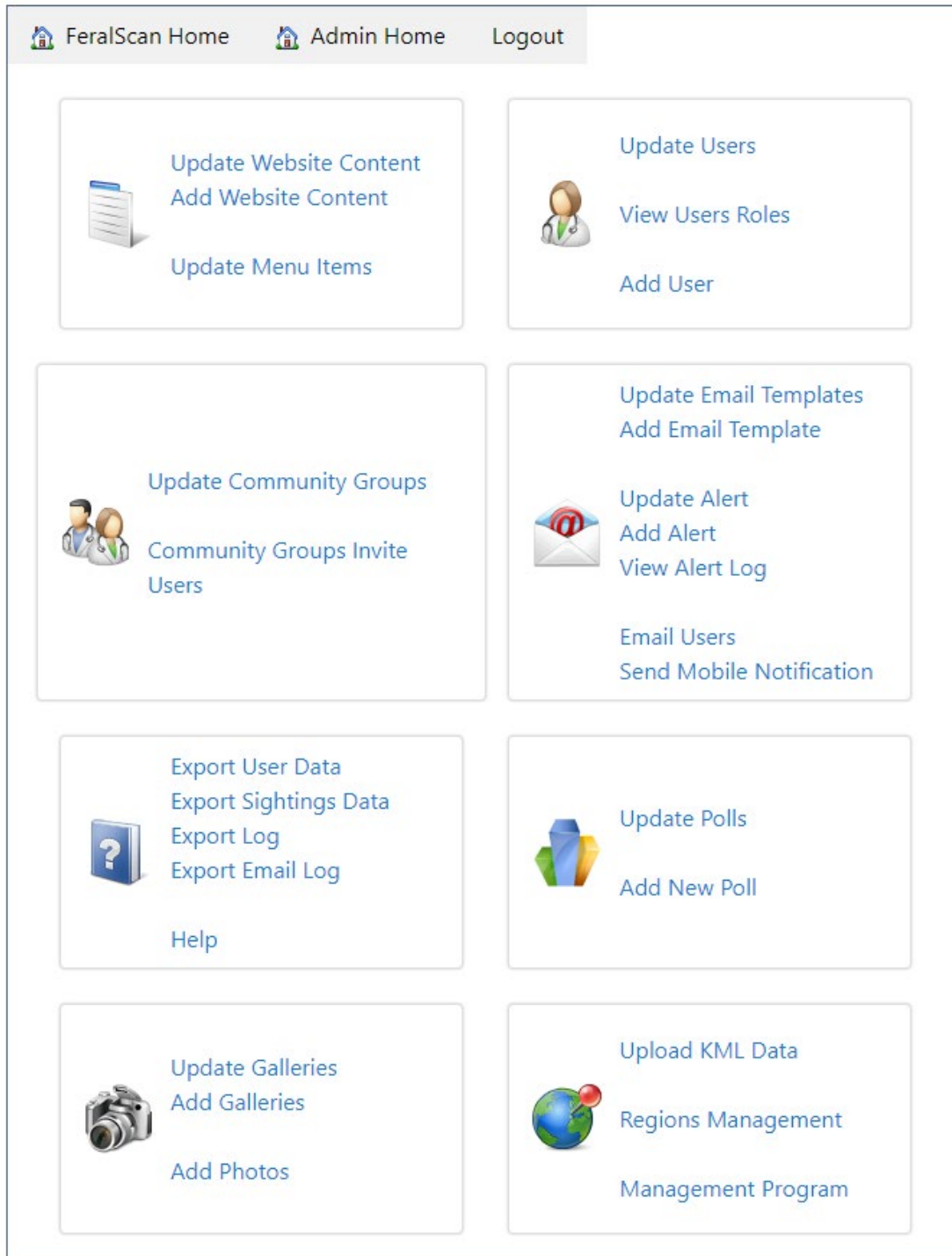
1. It is recommended that Milestone 13 (P01-E-002) and Milestone 8 (P01-E-008) are not progressed and be removed from our project details.

Reasoning: (1) the costs involved in moving the FeralScan platform would not at this stage be considered a cost saving measure, (2) continued cost of hosting on CISS servers, and (3) the potential downtime involved to FeralScan during the process.

2. Post–June 2022, future maintenance/server costs of CISS web platforms should be paid for via CISS headquarters, so that project budgets can be spent on upgrades and day-to-day running of the platforms.
3. Any future web update and upgrade projects should consider where they will be housed prior to being built, as it can be difficult to move products once they are built.
4. The project leaders continue to explore opportunities to improve the management and integration of FeralScan and Invasive Animals Limited/CISS-hosted digital technologies across existing servers.

## APPENDIX 8. PURPOSE-BUILT FERALS SCAN ADMIN WEBSITE

The purpose-built FeralScan resource administration website facilitates the management of all website content, alerts, notifications, data access arrangements, image galleries, registered user databases, newsletters, polls, spatial data layers and mobile app notifications.



# APPENDIX 9. FINAL REPORT ON THE INTEGRATION OF FERALS SCAN DATA INTO THE ALA PORTAL

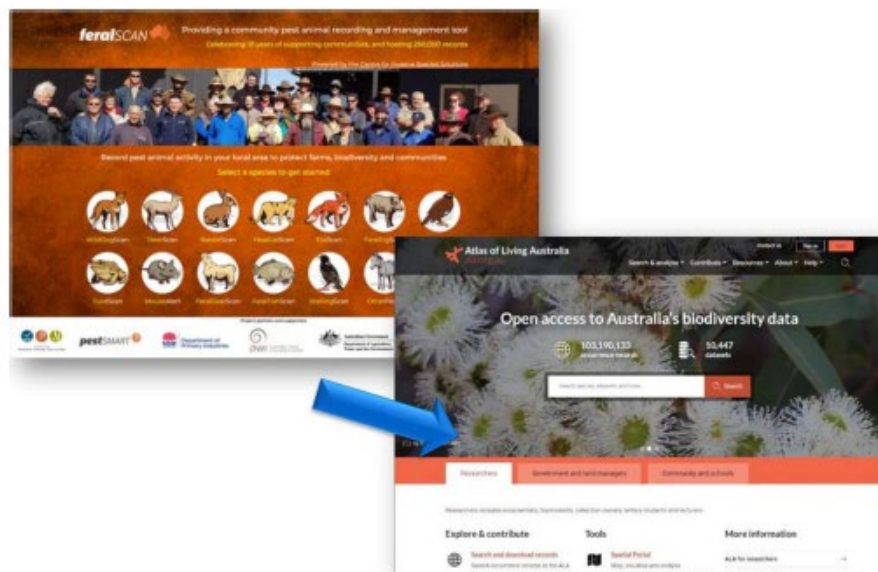
West P (2022) *Integration of FeralScan pest animal datasets into the Atlas of Living Australia (ALA) portal*, final report to the Department of Agriculture, Water and the Environment, NSW Department of Primary Industries and the Centre for Invasive Species Solutions.

## Integration of FeralScan pest animal datasets into the Atlas of Living Australia (ALA) portal.

Final report for the Department of Agriculture, Water and the Environment

Prepared by the NSW Department of Primary Industries and the Centre for Invasive Species Solutions.

Peter West - NSW Department of Primary Industries  
June 2022



## Summary

Introduced pest animals (such as rabbits, foxes and feral pigs) occupy all areas of Australia, and information about their extent, numbers and impacts to agriculture and the environment is important for their effective management. An opportunity exists to increase the accessibility of existing information about established pest animals through an important partnership between two leading invasive species data custodians.

The Centre for Invasive Species Solutions (CISS) is Australia's collaborative research centre focusing on research, development, innovation, and extension to enhance invasive species management. The Centre hosts and manages the highly popular national FeralScan platform (available at <https://feralscan.org.au/default.aspx>) used by farmers, communities, land managers and biosecurity groups across the country. It contains 300,000+ records and photographs - which represents Australia's largest single information source about the extent and numbers of established pest animals.

The Atlas of Living Australia (ALA) (available at <https://www.ala.org.au/>) is a national collaborative, digital, open infrastructure program that brings together biodiversity data from multiple sources. ALA contains the most comprehensive dataset of Australian biodiversity, for scientists, policy makers, environmental planners, land managers, industry, and the public. It is hosted by CSIRO and receives funding support from the National Collaborative Research Infrastructure Strategy (NCRIS).

This project was specifically undertaken to connect the FeralScan community platform with the Atlas of Living Australia (ALA) portal, for the purpose of efficiently sharing pest animal information collected through FeralScan with the ALA. This partnership will provide for the first time, the capacity for pest animal distribution and abundance data to be accessed and used by government to inform policy and pest management programs.

## Introduction

Introduced terrestrial pest animal species occur throughout all regions of the Australian mainland and many islands. They impact on agricultural production, the environment, biodiversity, threatened species, people, communities and cultural values. Communities and land managers often have an extensive knowledge of their local area, and the pest species that are present.

FeralScan (available at <https://feralscan.org.au/default.aspx>) is a free nationally available pest animal recording program for farmers, communities, professional pest controllers and biosecurity organisations. It is hosted by the Centre for Invasive Species Solutions, and it has been developed and is managed by the NSW Department of Primary Industries. FeralScan provides a user-friendly platform for all Australians to record the presence of pest species in their local area. Users can record information about pest animal numbers, impacts and management actions. The species that are included in FeralScan including introduced rabbits, foxes, feral goats, feral deer (6 different established species), feral pigs, cane toads, feral cats, wild dogs (including dingoes, and hybrids), house mice, pest fish species, introduced starlings, common myna (also called Indian myna), feral camels, feral donkeys,



feral buffalo, red-eared slider turtles, and American corn snakes. FeralScan will soon include a larger range of introduced pest species.

Over 45,000 Australian's have registered to be users of FeralScan to record and report information about pests in their local area. The main reasons that people record information about established pest animals include:

- Help inform their local community or landholder network
- Document on-farm pest activity and control activities
- Report to local authorities, including government, and
- Contribute to a citizen science initiative.

Data collected about the known locations of established pest animal species can guide local control programs, regional investments, national planning and policy development.

## Objectives

This project aimed to establish new arrangements and data-handling procedure to share data (reports about the extent and numbers of pest animals) contained within FeralScan with the Atlas of Living Australia. The specific objectives were:

1. Identify pest animal data contained within FeralScan that can be shared with ALA
2. Develop and formalize a new data-sharing arrangement to enable past, current and future FeralScan data to be shared with ALA
3. Implement a data-sharing procedure for sharing data from FeralScan with ALA into the future.

## Methodology

This project involved technical specialists from CSIRO representing ALA, the NSW DPI, CISS, and an external ICT consultant. CISS engaged the ICT consultant, NewtonGreen Technologies for the project – as they are the current business designing and developing the FeralScan Platform.

The project involved initial consultation with project partners to identify the scope of work required, the project timeframe, and the expectations from project partners. The project also involved several meetings and discussions between project members.

Consultation included:

- Initial scoping of works and project planning, involving CSIRO-based ALA representatives, CISS, NSW DPI, and ICT business NewtonGreen Technologies. This included clarification who would be involved in undertaking the required works, the tasks required for the project, and discussion on managing sensitive data.

- Discussions with ALA and the ICT consultant about prototype testing with a rabbit test dataset.
- Discussion with ALA representatives about the sensitive species information contained in FeralScan and agreement on fields/attributes to share with ALA.
- Meetings with the ICT consultant about amendments required to the FeralScan data model establishment of new user administrative role for ALA, new user-role web-API (application program interface) and key, and new data added to APIs.
- An additional meeting was held on 9 June between the ICT consultant (NewtonGreen Technologies) and ALA to finalise the process for completing the supply of data to ALA, including the management of sensitive data, management of data classified as private, final changes to API's, scientific name classifications, and handling obsolete data.

## Timeframe

The project was commenced in April and completed in June 2022. The ICT consultant was engaged to develop secure web APIs in consultation with the project members to enable data sharing with the ALA portal.

## Work performed

The following work was undertaken to setup a long-term sharing arrangement for FeralScan data importation into the ALA portal.

### 1. FeralScan data model and API setup

- Series of enhancements to the FeralScan data model to enable data extraction for ALA for past, current and future data. This included changes to ensure ALA can determine a scientific name for each record.
- A new user role was added in FeralScan for ALA. This role was configurable against one or more species, record types, and regions to allow the right datasets to be shared with ALA.
- Add the ability for the FeralScan administrator to generate an API key for a specific FeralScan user – matched to the above ALA user role.
- Add a new set of data retrieval APIs for ALA. A series of new secure FeralScan data retrieval APIs were required to include species, record type, and date-range values as input, and return the requested data in JSON format.
- Review - A thorough review of each datapoint was conducted and all sensitive or obsolete datapoints were removed from APIs to ensure the datasets returned to ALA are correct and don't contain identifying information.
- Implement the authorisation mechanism to ensure the APIs are only accessible when a valid API key is used. The APIs required an authenticated session based on an API key generated for a particular FeralScan user account.
- Implement logging and error handling to ensure visibility over shared data and timely issue resolution.

## 2. Retrieval and importation of FeralScan data by ALA

- Preparation of a sample dataset from FeralScan for testing the ALA data importation process – and verification that the data-sharing approach is suitable.
- Cross-checking sample dataset within ALA portal
- Assistance provided to ALA to use the new APIs to retrieve FeralScan data
- Confirmation of an agreed interim solution for managing sensitive species data (such as feral cats, deer, pigs and goats) within ALA, until such time as sensitive data standards can be applied to pest animal datasets across ALA.
- Confirmation of new API's being finalized within ALA to contain only fields of data for ALA to import, with non-essential data filtered by FeralScan
- Confirmation of scientific name classifications, and associated tables
- Confirmation that full datasets will be supplied
- Confirmation that all existing FeralScan data sets for integration with ALA were prepared in a usable format (eg. data were clean, met ALA's Darwin Core data standards, abides by privacy requirements and IP considerations).

## Project deliverables/outputs

This project has produced the following deliverables:

1. A new agreement and arrangement for near real-time sharing of established pest animal occurrence data collected through the national FeralScan community resource with the Atlas of Living Australia (ALA), via a series of secure web API's. This will enable the sharing of previous, current and future data and ensure FeralScan data is accessible to ALA and associated government, industry, research and community stakeholders.
2. Sharing of occurrence data from FeralScan with the Atlas of Living Australia (ALA) including reports by farmers, landholder groups, pest control professionals, land managers, community volunteers, and research organisations. The species included in this sharing arrangement include established pest animals, namely rabbits, feral cats, foxes, feral pigs, feral goats, cane toads, feral deer species, house mice, wild dogs (including dingoes and hybrids), feral camels, pest fish species, Indian myna birds, common starlings, and new emerging pest threats, such as American corn snakes. Additional species added to FeralScan in future years will be automatically shared with ALA.
3. Recommendations for the application of sensitive data standards to established pest animal datasets managed by ALA, and the inclusion of sensitive FeralScan data into ALA. This project has identified the opportunity to share sensitive data, including data classified as private by FeralScan Users, as well as information about control programs undertaken by land managers.

## Recommendations

At the time of preparing this report, the final steps for completing the Data-Sharing with ALA include:

1. Deciding on the best way to display FeralScan data contained within the ALA platform; and
2. Minor adjustments to the secure web API's to transfer data in the future with ALA based item (1) including frequency of data exchange, managing obsolete and updated data, and managing new data collected by FeralScan in the future.

The project team will continue to support ALA to apply suitable data handling standards to FeralScan data, and make minor adjustments only as needed.

## Appendix

### 1. Prototype testing of rabbit occurrence data imported into ALA

The screenshot shows the Atlas of Living Australia (ALA) web interface. The header includes the ALA logo and navigation links. The main content area displays search results for 'Occurrence records' with 40,809 records returned for the 'Data resource: Feral Scan'. A sidebar on the left allows users to narrow results by taxon, occurrence, location, record, assemblies, and attribution. The main area features a map of Australia with numerous red dots representing sightings. The map includes a legend, a search bar, and a 'Download map' button. The footer contains the ALA logo, a 'Record a Sighting' button, and a 'Explore the Spatial Portal' button.

## 2. Prototype FeralScan data summary in ALA

**Atlas of Living Australia**  
ala.org.au

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Home > Data Resources > Feral Scan

### Feral Scan

Metadata | Usage stats | Metrics

**Description**  
RabbitScan is a free resource for landholders, Landcare groups, community groups, local Councils, professional pest controllers and biosecurity groups. It has been designed by landholders for communities, and is very easy to use.

**Citation**  
No citation information available.

**Digitised records**  
No records can be accessed through the Atlas of Living Australia.  
Metadata last updated on 2022-05-31 14:54:34

Contact  
Jo Roth  
Web site  
Visit the data resource's website

**Record a Sighting**  
Upload your observations, identify species, and contribute to the ALA.

**Explore the Spatial Portal**  
Visualise and analyse relationships between species, location and environment.

## 3. Example – Prototype rabbit occurrence record summary integrated into ALA

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Home > Occurrence records > Record: Feral Scan - 19108 (Cryptolegus cucullatus)

### Occurrence record: Feral Scan - 19108

OCCURRENCE of *Cryptolegus cucullatus* (Linnaeus, 1758) | Rabbit recorded on 2018-08-01T00:00:00Z

Flag an issue | Contact curator | Compare 'original vs processed' values | Copy record id | API

**Dataset**

Data partner	Feral Scan
Data resource	Feral Scan
Catalog number	19108
Occurrence ID	19108
Record type	OCCURRENCE
Collector	Rodwell, John Supplied as 'John Rodwell'
Specimen type	(?Rodwell, John)
License	UNSPECIFIED
Presence/Absence	PRESENT
recorded by ID	14346 (14346)
Dataset / Survey name	(RabbitScan)

**Event**

Occurrence date	(Date not supplied) Year: 2018, Month: 8, Day: 1 Supplied date '2018-08-01T00:00:00Z'
Date precision	DAY

**Taxonomy**

Date loaded: 2022-05-31  
Date last processed: 2022-05-31

## APPENDIX 10. WORKSHOPS, WEBINARS AND PRACTICAL FIELD DAYS

### INDEX OF FERALSCAN END USER AND PARTNERSHIP MEETINGS

Throughout the project, the Project Coordinator represented CISS and NSW DPI through a series of 312 training and consultation events with end users and partners, including field days, face-to-face workshops, formal and informal training sessions, online webinars, community meetings, committee/society meetings, AGM meetings, syndicate meetings and others. These events are listed below.

1. Dalton region Landcare Group Training meeting and consultation (rabbits and feral pigs) 2018
2. Wangaratta Springhurst and Byawatha Landholder meeting (rabbits, wild dogs, feral pigs) 2018
3. Riverina LLS Biosecurity meeting (Wagga Wagga) 2018
4. Rabbit Control Field Day (Portarlinton, Bellarine Peninsula, Vic) 2018
5. City of Greater Geelong agency meeting/training (rabbits) 2018
6. Gunning District Landcare community meeting/training (rabbits, pigs, foxes) 2018
7. Torquay City Council agency meeting/training (rabbits) 2018
8. Hunter LLS Biosecurity staff training meeting– wild dog management 2018
9. Feral deer meeting with Hume landholders (Wangaratta) 2018
10. Warburton feral deer and wild dogs community training meeting 2019
11. NSW LLS FARMS Project – data management meeting 2019
12. Northern Tablelands LLS staff training wild dogs 2018
13. South Perth – WA DPIRD staff and regional biosecurity group training meeting 2018
14. Blackwood Biosecurity Group training meeting – feral pigs, deer Manjimup – 2018
15. Carnarvon Rangelands Biosecurity Group wild dogs training meeting –Geraldton 2018
16. DPIRD (South Perth) agency training - 2018
17. WildDogScan training meeting with SA Government (Adelaide) training meeting, 2018
18. Central Tablelands LLS NRM training meeting 2018
19. NSW State Pest Animal Committee – FeralScan presentation 2019
20. Australasian Wildlife Management Society Conference (Katoomba) presentation 2018
21. Australian Citizen Science Association Conference (Adelaide) 2018
22. North Bendigo Landcare Group rabbit management field day (August 2018)
23. Beechworth landholder meeting – Wild dog + rabbit management (August 2018)
24. Training session with the Victorian Government (Wodonga, August 2018)
25. Training program in Carnarvon (WA) with AWI and DPIRD (August 2018)
26. Wild dog licensed pest management technician training (Dalwallinu WA, September 2018)

27. WA Department of Biodiversity, Conservation and Attractions (DBCA) staff training (teleconference, December 2019)
28. WA DPIRD Biosecurity Executive Officers teleconference FeralScan updates and consultation– (February 2019) Conferences and symposiums
29. Videoconference training with PIRSA staff (October and November 2018)
30. WildDogScan training with PIRSA staff (Port Augusta, February 2019)
31. Invasive species program training with PIRSA staff (Adelaide, February 2019)
32. Wild Dog landholder group training with south-east NSW delegates (February 2019)
33. NSW DPI and NSW LLS displays/exhibit at the Australian National Field Days (25–27 October 2018)
34. NSW DPI Research institute open day – FeralScan display (September 2018)
35. Hunter LLS wild dog control field day (Mount Olive, November 2018)
36. Mudgee landholder meeting with Central Tablelands LLS (November 2018)
37. NSW Vertebrate Pest Management Symposium (Coffs Harbour, 16–18 October 2018)
38. RabbitScan training via teleconference with Western Landcare and Western LLS (Lake Mungo) 2018
39. FeralScan community and Council training sessions via teleconference (Maryborough, November 2018)
40. Government staff training with the Tasmania Department of Primary Industries, Parks, Water and Environment) (February 2019)
41. Cumnock community event with Central Tablelands LLS and Landcare Jan, 2019
42. Yeoval community event with Central Tablelands LLS and Landcare Feb, 2019
43. Bathurst community event with Central Tablelands LLS and Landcare Feb, 2019
44. Orange community event with Central Tablelands LLS and Landcare Feb, 2019
45. Rylstone community event with Central Tablelands LLS and Landcare Feb, 2019
46. Mudgee community event with Central Tablelands LLS and Landcare Feb, 2019
47. Wyangala community event with Central Tablelands LLS and Landcare Feb, 2019
48. Oberon community event with Central Tablelands LLS and Landcare Feb, 2019
49. Glen Davis community event with Central Tablelands LLS and Landcare March, 2019
50. Cranbury community event with Central Tablelands LLS and Landcare March 2019
51. Community training events with NSW LLS (11 events held across regional NSW with NSW DPI/LLS staff 2018-2019)
52. NSW Landcare Conference (Redfern, Sydney, March 2019)
53. Feral Deer research and management masterclass (Quirindi, March 2019)
54. Feral Deer research and management masterclass (Jindabyne, April 2019)
55. Queensland Pest Animal and Weed Symposium presentation (Main Beach, May 2019)
56. Australian Biosecurity Symposium conference presentation (Gold Coast, June 2019)

57. Peel Harvey Biosecurity Group training and DPIRD staff training (WA) 2019
58. WildDogScan and FeralScan training of wild dog management staff from PIRSA and regional managers (Port Augusta, Feb 2019)
59. FeralScan and DeerScan training of PIRSA and invasive species program staff (Adelaide, February 2019)
60. DeerScan training with the Feral Deer Control Coordinator, Invasive Species Unit (PIRSA) (May–June 2019)
61. SA Arid Lands (SAAL) NRM region staff training (teleconference, July 2019)
62. Murray-Darling Basin NRM region staff training (teleconference, July 2019)
63. Training with the SA Wild Dog Control Planning Coordinator, Invasive Species Unit (PIRSA) (June 2019)
64. DeerScan training with Nillumbik Shire Council staff (Feb 2019)
65. FeralPigScan training with Conservation Ecology Centre staff (Feb 2019)
66. DeerScan training with Cardinia Deer Management Coalition community members (Feb 2019)
67. RabbitScan training with Northern Bendigo Landcare Group (Feb 2019)
68. RabbitScan training with Bellarine Landcare Group representatives (March 2019).
69. FeralScan training with DBCA staff (teleconference, Feb 2019)
70. FeralScan and WildDogScan training with wild dog licensed pest management technicians, supported by DPIRD (Dalwallinu, July 2019)
71. FeralScan training and video-teleconference with DPIRD staff, supported by DPIRD (Bunbury WA, July 2019)
72. FeralScan training with Peel Harvey Biosecurity Group, supported by DPIRD and Peel Harvey Biosecurity Group (Mandurah, July 2019)
73. FeralScan training with Peel Harvey Biosecurity Group, supported by DPIRD and Peel Harvey Biosecurity Group (Waroona, July 2019)
74. FeralScan training with Peel Harvey Biosecurity Group, supported by DPIRD and Peel Harvey Biosecurity Group (Pinjarra, July 2019)
75. FeralScan training with Peel Harvey Biosecurity Group, supported by DPIRD and Peel Harvey Biosecurity Group (Harvey, July 2019)
76. Teleconference training with Carnarvon Rangelands Biosecurity Group staff (July 2019)
77. WildDogScan training with NSW LLS, NSW Office of Environment & Heritage and Corrowong Tombong Merriangaah Byadbo Wild Dog Management Group landholders (February 2019)
78. NSW Landcare community education and training event (Cumnock, Feb 2019)
79. Landcare NSW community education and training event (Orange, March 2019)
80. NSW Landcare Coordinators Conference (Redfern, Sydney, March 2019)
81. NSW LLS and Landcare education and training event (Glen Davis, March 2019)
82. Landcare NSW community education and training event (Oberon, March 2019)



83. Landcare NSW and NSW LLS education and training event (Wyangala, March 20-19)
84. Landcare NSW community education and training event (Mudgee, March 2019)
85. FeralCatScan training with North Coast LLS staff for Landcare (May 2019)
86. Landcare NSW community education and training event (Gooloogong, April 2019)
87. DeerScan training community workshop with Cumberland Land Conservancy, Greater Sydney Landcare and Greater Sydney LLS (Penrith, May 2019)
88. FeralScan training with Central Tablelands LLS education and training event (Lithgow, May 2019)
89. Hargraves-Hill End Wild Dog Control Association AGM (Hargraves, May 2019)
90. FeralScan training with Upper Murrumbidgee Landcare education and training event (Braidwood, May 2019)
91. FeralScan and WildDogScan education and training event with Hunter LLS (May 2019)
92. DeerScan and WildDogScan training with NSW LLS and South East LLS staff (Goulburn, May 2019)
93. NSW DPI –FeralScan project presentation (May 2019)
94. NSW LLS regional pest control coordinators training/presentation (Mudgee, May 2019)
95. NSW DPI and NSW LLS displays at Mudgee Small Farm Field Days (July 2019)
96. WildDogScan training with wild dog control association, supported by Northern Tablelands LLS and AWI (Armidale) June 2019
97. WildDogScan training with wild dog control association (Walcha), supported by Northern Tablelands LLS and AWI June 2019
98. WildDogScan training with wild dog control association (Tenterfield) ), supported by Northern Tablelands LLS and AWI June 2019
99. WildDogScan training with wild dog control association (Chandlers River) ), supported by Northern Tablelands LLS and AWI June 2019
100. FeralScan education and training event with Western LLS (video conference) June 2019
101. DeerScan training with Tweed Landcare Deer Prevention Project participants (July 2019)
102. FeralScan training with Council staff (Maryborough, February 2019)
103. Australian National Field Days (Borenore) October 2019
104. Victorian Government Feral Pig and Wild Dog field day (Gelantipy) October 2019
105. FeralScan training with Litchfield Council staff (teleconference, July 2020)
106. FeralScan training for Christmas Island and Norfolk Island Parks Australia staff (May and July 2020)
107. Peel Harvey Biosecurity education and training event (Mandurah) April 2020
108. Peel Harvey Biosecurity education and training event (Pinjarra) April 2020
109. Peel Harvey Biosecurity education and training event (Waroona) April 2020
110. Mudgee Small Farms Field Days exhibit/ presentation to public July 2020
111. Leschenault Biosecurity Group education and training event April 2020

112. Tenterfield wild dog control association meeting/training May 2020
113. Armidale wild dog control association meeting/training May 2020
114. Walcha wild dog control association meeting/training May 2020
115. Chandlers River Wild Dog Control Association meeting/training May 2020
116. Carnarvon Rangelands Biosecurity Association videoconference training May 2020
117. NSW Vertebrate Pest Management Course Presentation/training June 2020
118. Presentation to Mining companies based in Singleton, Hunter Valley NSW June 2020
119. Central Tablelands Landcare wild deer management workshop June 2020
120. Greater Sydney LLS pest coordinators meeting, June 2020
121. Cape Otway, staff training with Conservation Ecology Centre Jan 2020
122. Council and government training session 1 with Conservation Ecology Centre (Colac) Jan 2020
123. Council and government training session 2 with Conservation Ecology Centre (Colac) Jan 2020
124. Community education and training at Forrest, Vic, with Conservation Ecology Centre Jan 2020
125. Community education and training with West Macquarie Pest Control Group, Jan 2020
126. Greater Sydney LLS and Central Coast Council staff training Jan 2020
127. Community education and training with Dapper Wild Dog Control group (Wellington) January 2020
128. Central West Pest Controllers LLS group meeting (Dubbo) Jan 2020
129. Glen Innes Natural Resources Advisory Committee and Northern Tablelands LLS (Glen Innes) Jan 2020
130. Community education and training with Moona-Winterbourne Wild Dog Control Association (Walcha) Jan 2020
131. Pest controller training with wild dog controllers with Western LLS Jan 2020
132. Community education and training with Barnard River Wild Dog Control Association AGM Jan 2020
133. Community education and training with landholder's (Burruga) Jan 2020
134. WildDogScan training with Licensed Pest Management Technicians (video-conference) (Dalwallinu) Feb 2020
135. Government staff training for DPIRD (Bunbury) videoconference Feb 2020
136. Community education and training with Dapper wild dog control group landholder training (March 2020)
137. Community education and training with Glen Alice landholders (March 2020)
138. Exhibits with NSW LLS and Landcare at the Boorowa Show (March 2020)
139. Vertebrate Pest Management Training accredited training course – NSW DPI (Tocal, March 2020)

140. Presentation to the NSW African Swine Fever Taskforce (April 2020)
141. Central Tablelands LLS staff training (April and August 2020)
142. South East LLS biosecurity staff training (April 2020)
143. Hunter LLS staff training) (July 2020)
144. SA Arid Lands (SAAL) NRM landholder training for groups south of the Wild Dog Barrier Fence (Port Augusta, May 2020)
145. SA Arid Lands (SAAL) NRM landholder and agency training for groups North of the Wild Dog barrier Fence (Port Augusta, May 2020)
146. Vertebrate Pest Management Training accredited training course – NSW DPI (Tocal, August) May 2020
147. Barrier Area Rangelcare Group (Western NSW) landholder training (teleconference, August 2020)
148. DeerScan training with King Island NRM Board (teleconference, April 2020)
149. FeralCatScan training with Kangaroo Island NRM Board (teleconference, May 2020)
150. Warrego-Paroo wild dog group training (teleconference, August 2020)
151. Mindah wild dog group training (teleconference, August 2020)
152. 60-70 informal individual landholder training sessions (video and teleconferences, March–August 2020)
153. FeralScan training session with Central Tablelands LLS Biosecurity staff August 2020
154. FoxScan information session and video production with Gunning District Landcare and South East LLS September 2020
155. FeralCatScan training session with Kingsborough Council (Tas) Sept 2020
156. WildDogScan information session with landholders (Koonibba, SA) September 2020
157. FeralScan training session with North Coast LLS Biosecurity staff December 2020
158. FeralScan training and planning session with Western LLS October 2020
159. FeralScan training session with City of Parramatta local government Octo 2020
160. FeralScan training session with Western LLS and landholders, October 2020
161. FeralScan training session with Parramatta River Catchment Group (Biodiversity and Education) Nov 2020
162. FeralScan training session with Dunedoo wild dog control group and Central Tablelands LLS Biosecurity staff Nov 2020
163. FeralScan Community education and training with NSW Landcare Coordinators, Jan 2021
164. FeralScan planning and information session with Central Tablelands LLS Jan 2021
165. WildDogScan monitoring meeting with Central Tablelands LLS, Jan 2021
166. FeralScan training session with Northern and Yorke Landscape Board (PIRSA) Jan 2021
167. RabbitScan training session with residents and landholders of French Island, Vic, Jan 2021

168. WildDogScan training session with Balonne Shire Council (Qld) January 2021
169. FeralScan training session to Northern and Yorke Landscape Board, PIRSA (SA) Jan 2021
170. FeralScan training session with Kent Shire Council (WA) Feb 2021
171. FeralScan session with NSW Vertebrate Pest Management Training - NSW DPI accredited training course – Tocal March 2021
172. FeralScan training session with Kimberley Rangelands Biosecurity Association (WA) March 2021
173. ToadScan data access session with NSW DPI – March 2021
174. FeralScan training session with NSW LLS and Landcare (Mittagong) March 2021
175. WildDogScan monitoring meeting with the National Wild Dog Management Facilitator, National Wild Dog Action Plan – March 2021
176. FeralScan information session with Manningham City Council (Vic) March 2021
177. FeralScan information session with Central West NRM Working Group – March 2021
178. WildDogScan monitoring meeting – Central Tablelands LLS – March 2021
179. WildDogScan workshop with Hargraves Wild Dog Control Association and Central Tablelands LLS – March 2021
180. FeralScan presentation at the Australasian Vertebrate Pest Conference, April 2021
181. WildDogScan meeting with NSW Farmers Association wild dog coordinators, April 2021
182. MouseAlert data management meeting with NSW DPI April 2021
183. WildDogScan info session with Blackwood Biosecurity Group (WA), April 2021
184. WildDogScan training workshop with South East LLS (Bombala), April 2021
185. WildDogScan training workshop with South East LLS (Jindabyne), April 2021
186. WildDogScan training workshop with South East LLS (Cooma), April 2021
187. WildDogScan training workshop with South East LLS (Adaminaby), April 2021
188. WildDogScan training workshop with South East LLS (Shannons Flat), April 2021
189. WildDogScan Professional Wild Dog Controller Program meeting with Northern Tablelands LLS (NSW), April 2021
190. FeralPigScan information session with the National Feral Pig Coordinator (National Feral Pig Action Plan), May 2021
191. DeerScan information session with the National Feral Deer Coordinator (National Feral Deer Action Plan) and North Rivers Feral Deer Coordinator (Tweed Shire Council), May 2021
192. FeralScan and NewPests reporter information session/workshop (red-eared slider turtles) with Macarthur Herpetological Society, May 2021
193. RabbitScan information session with Surf Beach Sunderland Bay Council (Vic), May 2021
194. FeralScan planning meeting with National Feral Pig Coordinator (National Feral Pig Action Plan), May 2021

195. DeerScan information session with City of Gold Coast Council (Qld), June 2021
196. DeerScan information session/meeting with National Feral Deer Coordinator support June 2021
197. DeerScan information session with Northern Rivers Deer Management group, June 2021
198. FeralScan workshop with Hawksbury-Nepean Landcare Network, June 2021
199. DeerScan and deer management meeting with South East LLS, July 2021
200. DeerScan and deer management meeting with Game Services Tasmania, July 2021
201. DeerScan training session with Cardinia City Council (Vic), July 2021
202. Presentation to Centre for Invasive Species Solutions Board,, August 2021
203. DeerScan and FeralScan training session with Cardinia community (Vic), July 2021
204. Education and training with Barrier Area Rangecare Group landholder training, July 2021
205. Education and training with Warrego-Paroo wild dog group training, July 2021
206. Education and training with Warrego-Paroo wild dog group training, July 2021
207. Vertebrate Pest Management Training accredited training course – NSW DPI in Tocal, Sept 2021
208. Central Tablelands LLS online training, Sept 2021
209. Balonne Shire Council (Qld) team training, Sept 2021
210. Greater Sydney LLS staff training, Sept 2021
211. Education and training with Greater Sydney LLS training (two sessions), Sept 2021
212. South East Shannons Flat Wild Dog Control Association, Sept 2021
213. South East Rocky Plain / Snowy Plain Wild Dog Control Association, Sept 2021
214. South East Adaminaby Wild Dog Control Association, Sept 2021
215. South East LLS online training 1, Sept 2021
216. South East LLS online training 2, Sept 2021
217. NSW LLS state operations GIS staff training
218. WA Department of Water and Environmental Regulation, Sept 2021
219. Yarra ranges community volunteers (Vic), Sept 2021
220. FeralScan use training with Greater Sydney LLS, Sept 2021
221. SA Government deer monitoring video interviews
222. Greater Sydney region staff (NSW National Parks and Wildlife Service), Sept 2021
223. Education and training with Hunter LLS online staff training 1, Sept 2021
224. Education and training with Hunter LLS online staff training 2, Sept 2021
225. Education and training with North Coast LLS online training, Sept 2021
226. Far North Queensland community Education and training with feral pig group, Oct 2021
227. Education and training with North Coast LLS online training 1, Oct 2021

228. Education and training with North Coast LLS online training 2, Oct 2021
229. Education and training with North Coast LLS online training 3, Oct 2021
230. Fox control education and training with field day Gunning District Landcare and South East LLS, Oct 2021
231. Greater Sydney LLS video interviews, Nov 2021
232. Central Tablelands LLS online training, Nov 2021
233. National Feral Pig Stakeholder Forum, Nov 2021
234. Greater Sydney Northern Beaches Council community education and training, Nov 2021
235. North Coast LLS online community training Dec 2021
236. Western LLS online community training Dec 2021
237. North Coast deer monitoring team meeting, data management Dec 2021
238. Western LLS online training, Dec 2021
239. Western LLS online training, Dec 2021
240. Murray LLS online training, Dec 2021
241. Murray LLS online training, Dec 2021
242. Central Tablelands LLS online training, Dec 2021
243. Central Tablelands LLS online training, Dec 2021
244. Ecological Society of Australia presentation and poster session open forum, Jan 2022
245. Greater Sydney Landcare and local council staff training (multiple events) Jan 2022
246. Tasmanian DPIPWE staff training Jan 2022
247. North West LLS online community training, Feb 2022
248. South East LLS online community training, Feb 2022
249. Ceduna (SA) landholders and wild dog controllers, online training Feb 2022
250. South East LLS online training, Feb 2022
251. Victorian Fox control group, online training Feb 2022
252. Central Tablelands LLS online training, Feb 2022
253. DeerScan information session – City of Gold Coast council staff training Feb 2022
254. DeerScan information session – Northern Rivers Deer Management group, Feb 2022
255. FeralScan workshop – Hawksbury Nepean Landcare Network, Feb 2022
256. DeerScan and deer management meeting – South East LLS, Feb 2022
257. DeerScan and deer management meeting – Game Services Tasmania, Feb 2022
258. DeerScan training session – Cardinia Council (Vic), March 2022
259. Hebden Wild Dog Control Association meeting, March 2022
260. Hunter region pest animal management stakeholders meeting (including mining companies) (Muswellbrook) April 2022

261. North East Singleton wild dog control association meeting April 2022)
262. Mt Arthur Wild Dog Control association / Denman and District AGM, April 2022
263. Central Tablelands LLS, videoconference training April 2022
264. Combined workshop with NSW DPI, Landcare NSW and NSW LLS (Michelago), community education and training, April 2022
265. Education and training event, Colinton community Fire Shed, NSW, April 2022
266. Northern Tablelands LLS staff training, April 2022
267. Community training workshop with Glen Innes Natural Resources Advisory Committee (Glen Innes, NSW), April 2022
268. Community training for the Baldersleigh and Yarrowyck wild dog groups, April 2022
269. Community education and training/feral deer information workshop (Hastings), May 2022
270. Community education and pest control workshop with Wollombi Landcare group, May 2022,
271. Feralscan training with Dangerlane wild dog group, May 2022
272. Online FeralScan webinar series with North West LLS, multiple community meetings. May 2022
273. Online webinar series with Western LLS Louth, Tilpa and White Cliffs divisions, May 2022
274. Online webinar with North West LLS Tamworth, May 2022
275. Online webinar with North West LLS Wanaaring, May 2022
276. Northern Tablelands LLS biosecurity officer and pest controller staff training, June 2022
277. Pest management workshop with South East LLS, Landcare NSW and landholders, Cooma. June 2022.
278. Northern Beach Council staff training, June 2022
279. Greater Sydney LLS FeralScan training, June 2022
280. Greater Sydney LLS staff and landcare training, June 2022
281. South East LLS staff Feralscan training, June 2022
282. Wingecarribee Shire Council, online Feralscan training, June 2022
283. Bass Coast Shire Council (Vic), online RabbitScan staff training and community education and training June 2022
284. Quilpie Shire Council (Qld) staff training, June 2022
285. Barwon Water Corporation (Vic) staff training, June 2022
286. National Wild Dog Action Plan Committee, consultation and presentation, June 2022
287. Atlas of Living Australia, consultation and data management discussion, June 2022
288. Northern Rivers cane toad management stakeholders meeting (NSW), June 2022
289. National Fish Working Group with the Environmental and Invasives Committee (EIC), presentation to committee, June 2022

290. Australian Government's Wild Otways Initiative (Vic) and Corangamite Catchment Management Authority (Vic), online education and training event, June 2022,
291. NSW Vertebrate Pests Management Course training (NSW), June 2022
292. Corrowong Tombong Merriangaah Byadbo Wild Dog Management Group online meeting (NSW), June 2022,
293. NSW Vertebrate Pests Management Course training (NSW) June 2022
294. Corinella district landcare groups, Bass Coast Shire Council (Vic) June 2022
295. FeralPigScan training with Capricorn Pest Management Group, June 2022
296. Cross Border Feral Deer management group (Qld/NSW) consultation and training, June 2022
297. NSW Vertebrate Pests Management Course training (NSW) July 2022
298. Esperance Biosecurity Group (WA), online training and consultation, July 2022
299. Box Flat Wild dog group online training (SA), July 2022
300. Online community deer webinar with South East LLS (Wattamolla), July 2022
301. Eastern region deer network (Vic) online training and discussion, July 2022
302. DeerScan and FeralScan online training session – Cardinia community (Vic), July 2022
303. FeralScan private-group management meeting (SA PIRSA) July 2022
304. DeerScan meeting with the National Feral Deer Action Plan Support Coordinator, July 2022,
305. CERES tag-FeralScan data sharing and connection meeting, July 2022
306. Feral herbivores webinar with South Australian Arid Lands (SAAL), community education and training webinar, July 2022
307. FeralPigScan monitoring and management meeting with Fitzroy Basin Association, Qld, July 2022
308. Northwest LLS biosecurity officer online FeralScan training, July 2022
309. Capricorn Pest Management Group FeralPigScan online webinar community education and training session 1, July 2022
310. Capricorn Pest Management Group FeralPigScan online webinar community education and training session 2, July 2022
311. Capricorn Pest Management Group FeralPigScan online webinar and community educational training session 3, July 2022
312. Online training with Rabbit-Free Australia, August 2022



**APPENDIX 11. IMAGES FROM THE PROJECT COMMUNITY ENGAGEMENT EVENTS**









## APPENDIX 12. FINAL CISS REPORT ON THE CARPMAP SURVEYS AND CONSULTATION

West P (2019) *Carp questionnaire survey and mapping tool – CarpMap: empowering the community to be a part of the national solution to Carp through the National Carp Control Program*. Final report to the Fisheries Research and Development Corporation (FRDC), Centre for Invasive Species Solutions.



FINAL REPORT

# Carp questionnaire survey and mapping tool: CarpMap

Empowering the community to be part of the national solution to Carp through the National Carp Control Program

Centre for Invasive Species Solutions and  
Peter West - NSW Department of Primary Industries

10 May 2019

FRDC Project No 2018/112

Version 1.0

1 July 2013

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Carp Questionnaire Survey and community mapping tool – CarpMap – Empowering the community to be part of the national solution to Carp through the National Carp Control Program

FRDC Project No 2018/112

2019

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Web: [www.frdc.com.au](http://www.frdc.com.au)

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## Executive Summary

This project was undertaken during 2018-19 by the Centre for Invasive Species Solutions and NSW Department of Primary Industries, in consultation with FRDC and research staff from the CSIRO.

The project arose out of the need to better understand carp aggregation behaviour to inform the NCCP epidemiology modelling. Detailed population data is required to inform a strategic release plan for the carp biocontrol, and to identify possible consequences of the release.

The primary objective of this project was to design and deliver a national carp questionnaire survey (via a new carp community portal) for FRDC and CSIRO to consult community users to gather information about historical carp aggregations within inland waterways, and to supply survey and questionnaire results to FRDC.

The project undertook the following:

1. Developed a dedicated and purpose-built mapping, monitoring and recording system (using mobile platforms) for carp aggregations, and monitoring the consequences of carp control.
2. Utilised existing FeralScan [www.feralscan.org.au](http://www.feralscan.org.au) technology to support a dedicated National Carp survey and mapping tool.
3. Deployed a Carp Questionnaire Survey designed by FRDC and CSIRO as a citizen science survey of members of the community (including key waterway users)
4. Provided NCCP and CSIRO project partners with access to all Carp Questionnaire Survey data from the community about historical carp aggregations.

This main output of the project is a new community mapping website named CarpMap (available at [www.carpmap.org.au](http://www.carpmap.org.au)) (built on the existing FeralScan community platform [www.feralscan.org.au](http://www.feralscan.org.au)) in September 2018, for deploying the Questionnaire Survey to waterway users. This was designed to potentially accommodate for future collection and mapping of carp data and for community engagement. This provided the platform for deploying the national Carp Questionnaire Survey, capturing participant statistics, and housing survey responses in associated databases.

The CarpMap website and survey provided an effective means of capturing community information about historical carp aggregations, and also enabled community participants to provide historical photographic evidence of carp aggregations in waterways.

The survey was completed by 568 participants over 6 months, after 637 initially registered to participate. All survey data were supplied to CSIRO and FRDC as requested for assessing progress and promotion of the survey, and for subsequent detailed analysis by CSIRO.

This project has demonstrated the capacity of online survey tools to support community-based reporting of carp aggregations in inland waterways. If carp biocontrol become a reality in Australia, the CarpMap website and survey tool could easily be re-deployed to encourage community-based reporting of carp mass fish-kill events. This could enhance the real-time collection of carp biocontrol results from community groups and waterway stakeholders.

The CarpMap website is available for use beyond the current project, and could be promoted further as a means of gathering further community information about carp behaviour in inland waterways.

### Keywords

CarpMap, [www.carpmap.org.au](http://www.carpmap.org.au), national carp survey.



## Introduction and background

This project arose out of the need to better understand carp aggregation behaviour to inform the NCCP epidemiology modelling. A trial survey was completed for the Lachlan catchment in conjunction with CSIRO. This trial provided the basis for this project.

The National Carp Control Plan (NCCP) was established to explore the possible release of the carp virus, Cyprinid herpesvirus 3. The NCCP is a \$15 million program under the Fisheries Research and Development Corporation (FRDC), delivered on behalf of the Australian Government. The objectives of the NCCP include using the best available science to develop a smart, safe, effective and integrated approach to controlling carp impacts, by working together and incorporating feedback from the Australian community.

One of the potential tools for controlling carp impacts is a biocontrol agent (ie, Cyprinid herpesvirus 3). If approved for use as a biocontrol for carp in Australia's waterways, detailed information will be required to plan the release of the virus, and to mitigate any adverse impacts. More specifically, detailed population data will be required (initially in 2018, and for several years) to inform a strategic release plan for the carp biocontrol, and to identify possible consequences of the release. This project will address these needs by developing and delivering web mapping technology for community users across the Murray-Darling Basin (utilizing established NCCP & FRDC networks, community groups, and stakeholder organisations).

This project involved 3 stages

Stage 1 - Develop and deploy a national Carp Questionnaire Survey via a carp community portal to gather information from the community about historical carp aggregations.

Stage 2 - Develop a CarpMap website and mapping tool (desktop and optimised for mobile devices) for people to record carp aggregations once the Questionnaire survey is no longer required. This item will proceed if the CarpMap website becomes redundant.

Stage 3 - Develop an operational tool (phone app) for community members to report observations of carp control outcomes from the field (funded separately in 2019/20 - and contingent on carp biocontrol approvals). Note, this item was not funded in the current project.

This will centralize historical and current carp population and behaviour data together for researchers and operational agencies.

## Objectives

This project included 9 specific objectives:

1. Develop a dedicated and purpose-built mapping, monitoring and recording system (using mobile website platforms) for carp aggregations, and monitoring the consequences of carp control.
2. Utilise the existing FeralFishScan [www.feralfishscan.org.au](http://www.feralfishscan.org.au) technology, and the FeralScan web platform (and associated services), to provide the base technology for a dedicated national carp survey, and carp mapping tool.

3. Develop and deploy a Carp Questionnaire Survey (survey designed by FRDC/CSIRO) as a citizen science survey to enable members of the community (including key waterway users) to record historical carp aggregations or concentrations.
4. Develop a dedicated database for Carp Questionnaire Survey responses, integrated within the FeralScan database, and displays relevant results on a carp activity map via the carp website.
5. Provide NCCP stakeholders with access to Carp Questionnaire Survey and Mapping tool, data recorded by community and waterway user groups.
6. Supply a real-time monitoring dashboard of carp data for stakeholders to examine trends in carp information (including charts and tables) recorded into a community mapping tool.
7. Establish database of public participants involved in carp monitoring for future FRDC community programs and communications.
8. Develop notifications for Project team members to be alerted to addition of new data in the carp mapping program, and provide editing tools to enable attributes of the data to be amended by project staff if required, such as Project Scientists. Note: this will be via email notifications.
9. Provide image gallery of carp aggregation images from the community (geotagged to records), and displayed for project team members only in an internal Gallery.

### Milestones of project

31-8-2018	Contracts signed Project commencement and website design specifications set Website software development commenced Development of carp questionnaire survey and website
29-09-2018	Draft website and questionnaire submitted for approval
05-10-2018	User acceptance testing (UAT) completed and go live of survey website, subject to approvals
31-01-2019	Finalised questionnaire survey and website provided for community usage Website completion by software developers Website rollout Provision of data to FRDC and relevant stakeholders/steering committee
01-04-2019	Agreed questionnaire and survey provided indefinitely, subject to approvals
20-04-2019	Final reporting on project

## Method

This project included 6 distinct development and implementation components, as follows:

Item 1. Project commencement and website design specifications. This involved consultation with FRDC about immediate and medium-term data gathering requirements. This included development of design specification, and seeking of quotes from technical service providers.

Item 2. Development of Carp community Questionnaire Survey to gather information from the community about historical carp aggregations in local waterways.

Item 3. Development of a carp mapping portal to deploy the Questionnaire Survey, and an engagement website (utilising the existing FeralScan system architecture) and road-test through NCCP and FRDC. This used existing platform technology but was a distinct stand-alone carp website with appropriate NCCP branding, style design, and carried key messages consistent with NCCP website content. This was accessible from the NCCP website <http://www.carp.gov.au/> and allowed seamless transition from the NCCP website to the carp mapping tool.

Item 4. Questionnaire survey, website and mapping tool rollout and promotion:

A) The Questionnaire survey was deployed from new carp web site and landing page. This included some instructions for users to help people to participate, and an email address authentication tool to maximise the reliability of user supplied survey results.

B) Website – The website was a stand-alone service, and was linked to from existing NCCP/FRDC websites, plus CISS communications tools (eg. newsletters).

C) The proposed app will be considered for future field-based recording of carp data. Note, this item was not funded in the current project or contract.

Item 5. Provision of data to FRDC and relevant stakeholders, including statistical analysts and project scientists. This occurred throughout all stages of the project, and included a full export and supply of all data at project completion to ensure FRDC/NCCP and project partners had ready access to all datasets.

Item 6. Provision of dashboard monitoring data to project partners.

### Data collection fields

The project data collection fields were defined by CSIRO and NCCP staff, and detailed in the Technical Specifications document. They included:

- User details (registered or non-registered user specifications)
- User/contributor information (name, email address, mobile phone number)
- Carp Aggregation datasets
- Year, month
- Closest township (for location validation purposes)

- Location of carp aggregation
- Waterway type
- Waterway condition, eg in flood, high flow, normal flow, low flow, drying, etc
- Duration of carp spawning event
- Number of carp seen during aggregation event, eg <10, 11-100, 101-1000, >1000
- Carp aggregation reasons (spawning, migration, etc)
- Comments/Notes
- Photo upload (with terms and conditions)
- Following the deployment of the Questionnaire survey and mapping portal, additional data fields will be added to enable the carp mapping program to record
- Location of carp control (including biocontrol)
- Observations of the consequences of carp control (such as mass fish kill events) These will be tied to a series of custom-designed Alert Notifications to enable operational agencies to receive notifications about incidents and respond accordingly.

## Functionality

The CarpMap resource was purpose-built to incorporate the following functionality:

1. Offline/online usability for mapping carp and habitat parameters regardless of network coverage
2. Submission and retrieval of data when internet connection is re-established
3. Easy method of recording carp activity and submission of detailed field data
4. Photo capturing tools, GPS geo-location services and navigation assistance
5. Real-time tracking for navigation, and real-time display of carp data
6. Synchronisation of web and application data into one database
7. Web-data sharing of all carp data with FRDC and NCCP stakeholders in an agreed format for analysis
8. Dashboard of live records collected by community users and stakeholders, summarised into tables and charts for easy interpretation
9. Heat map of carp aggregation hotspots, including aggregations and/or die-off events.

Note: Items 8 and 9 were not undertaken during the project because it was decided that the continuous delivery of survey data to FRDC and CSIRO project staff was adequate, especially given initially low levels of public response. Item 9 would be far more relevant for post carp virus release scenarios.

## Outputs & Outcomes

This project aimed to deliver

1. New National Carp Questionnaire Survey tool for community user groups.
2. New community mapping website (built on the architecture provided by the existing FeralScan community platform) in September 2018, for deploying the Questionnaire Survey and for future collection and mapping of carp data from the field, communication of carp information to community and industry stakeholders, and for community engagement to promote participation in ongoing carp surveillance.

3. New Dashboard (for internal stakeholders) for collating, charting and summarizing data collected within the carp survey and mapping activities. This will provide NCCP project partners and stakeholders with the capacity to examine, analysis and interpret data recorded by community, and see trends in data throughout the Program, such as numbers of new carp breeding aggregation recorded by community participants in various regions of the MDB.

4. Instructions to support people to participate in the survey and mapping activities. This will be accessible for mobile web users.

5. New domain for the NCCP community carp mapping platform, namely [www.carpmap.org.au](http://www.carpmap.org.au) for the interactive National Carp Mapping resource.

6. New Alert notifications for carp data from community participants, such as notifications to local and regional stakeholders about carp data and photos recorded by community participants.

The proposed software would be purpose-built to provide users with an online Survey Questionnaire and mapping program, plus offline capable Mobile App for recording carp activity (funded separately, and contingent on carp biocontrol approval).

## Extension

This project did not include any specific marketing of the Carp mapping program by CISS other than by using existing CISS and FeralScan communications and promotion tools to encourage an existing network of FeralScan users Australia-wide and CISS partners to participate in the new carp surveying and mapping program.

There is no formal consultation with this project. Some stakeholders were involved in user acceptance testing. The survey was seeking responses from many citizens. Feedback to survey participants was provided.

## Project team member activity

Project software development and deployment was coordinated by:

Mr Peter West - National Coordinator of FeralScan via [www.feralscan.org.au](http://www.feralscan.org.au) since 2011. Senior Research Officer at NSW Department of Primary Industries and Project Leader for the Centre for Invasive Species Solutions.

This project was implemented with support from CSIRO and FRDC, as below:

- Questionnaire Survey design will be supplied from Dr Peter Durr, CSIRO
- Consultation of stakeholders, user-groups and key organisations Dr Jamie Allnutt, National Carp Control Plan, Project Manager FRDC.

## Data type and management

Data was collected in real time through the survey questionnaire and stored within a database associated with the FeralScan platform. This data was automatically sent to CSIRO research partners

at regular intervals throughout the project. The data will remain on the FeralScan database consistent with CSIRO ethics approvals. All survey data will be retained by the CSIRO.

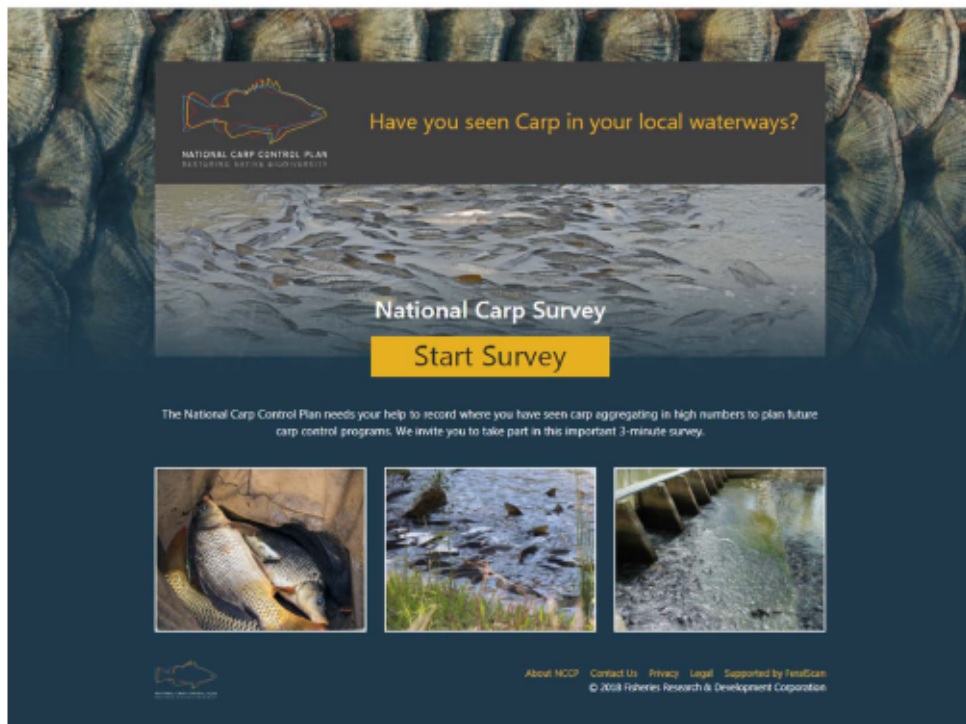
## Results

All survey project data from the Questionnaire Survey were supplied to Dr Peter Durr (CSIRO) and Jamie Allnutt (FRDC) for analysis and reporting.

A total of 568 members of the public completed the CarpMap survey during the project term.

This project provided 7 main outputs, which included:

1. New community mapping website (built on the architecture provided by the existing FeralScan community platform) in September 2018, for deploying the Questionnaire Survey and for future collection and mapping of carp data from the field, communication of carp information to community and industry stakeholders, and for community engagement to promote participation in ongoing carp surveillance.



The image is a promotional banner for the National Carp Survey. It features a background of a stone wall with a central image of a pond filled with carp. The text is as follows:

**NATIONAL CARP CONTROL PLAN**  
REGULATED SPECIES AUTHORITY

Have you seen Carp in your local waterways?

**National Carp Survey**

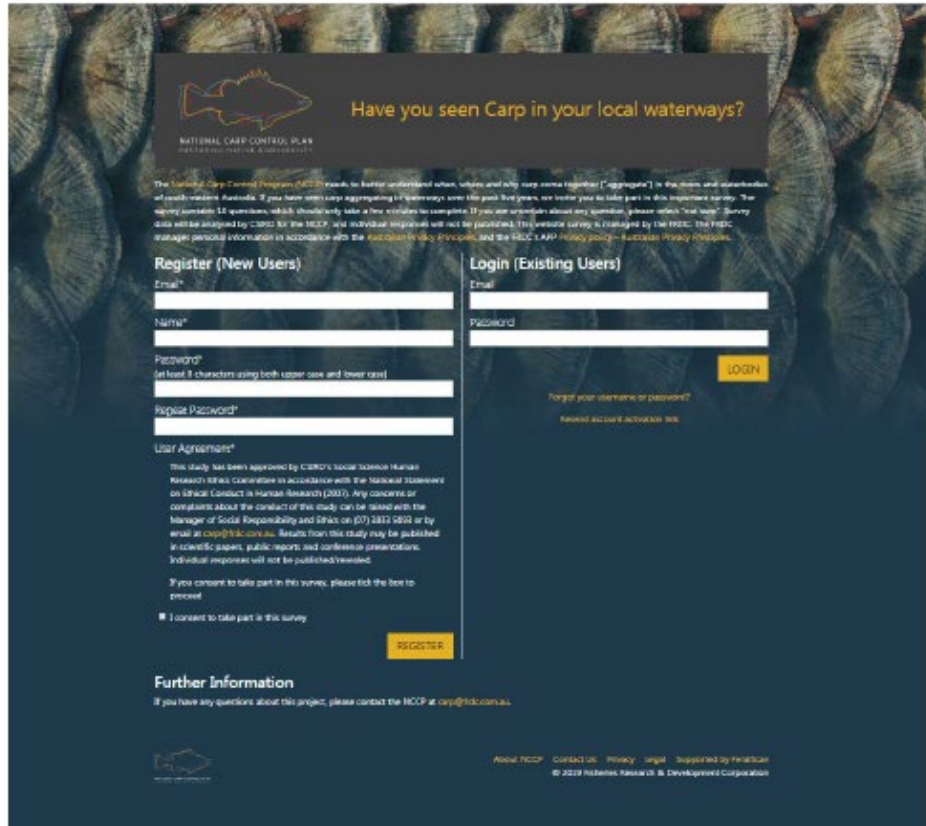
**Start Survey**

The National Carp Control Plan needs your help to record where you have seen carp aggregating in high numbers to plan future carp control programs. We invite you to take part in this important 3-minute survey.

Below the text are three small images: a carp in a net, a pond with many carp, and a close-up of a carp's head.

About NCCP | Contact Us | Privacy | Legal | Supported by FeralScan  
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2. New Survey platform that can be maintained into the future and adapted as required for post-virus release needs.



3. New National Carp Questionnaire Survey tool for community user groups through a new website [www.carpmap.org.au](http://www.carpmap.org.au)

Click the map to mark the location of the aggregation event



Where on the waterway did the event occur?

- Below a weir (or other barrier)
- Above a weir (or other barrier)
- Mid-river (i.e. away from a weir or barrier)
- In an irrigation channel
- In a permanent wetland or billabong
- In a lake
- In a temporary (ephemeral) wetland
- In a farm dam or urban pond
- Other:

What was the condition of the waterway during this event?

- In flood
- High flow
- Normal flow
- Low flow
- Drying out
- Other:

What is your best guess for how long the event lasted for (in days)?

What is your best guess of the number of carp within this aggregation or concentration event?

- Less than 10
- 10 to 100
- 100 to 1,000
- More than 1,000
- I'm not sure

Why do you think this event occurred?

- Carp were spawning or getting ready to spawn
- A fish passage barrier impeded carp migration
- Carp were trying to move to warmer water
- Carp were trying to avoid poor quality water
- Carp were aggregating to feed
- In response to low of water
- Carp were concentrated due to the waterway drying
- I'm not sure

If you have any other observations about this event please note them here

If you have photos of the event, please upload them here (max 2)



Drop files here or click to select files to upload.

Is there another aggregation event you have observed in the past 5 years that you would like to describe?

- Yes
- No

SUBMIT



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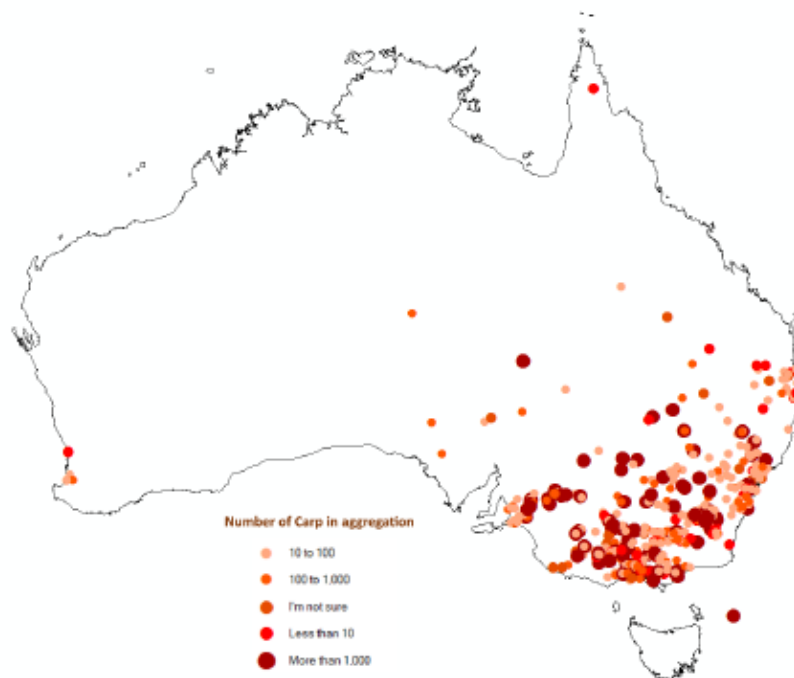
4. Instructions to support people to participate in the survey and mapping activities. This will be accessible for mobile web users. These were stated on the website as:

The **National Carp Control Program (NCCP)** needs to better understand when, where and why carp come together ("aggregate") in the rivers and waterbodies of south-eastern Australia. If you have seen carp aggregating in waterways over the past five years, we invite you to take part in this important survey. The survey contains 10 questions, which should only take a few minutes to complete. If you are uncertain about any question, please select "not sure". Survey data will be analysed by CSIRO for the NCCP, and individual responses will not be published. This website survey is managed by the FRDC. The FRDC manages personal information in accordance with the **Australian Privacy Principles**, and the FRDC's **APP Privacy policy – Australian Privacy Principles**.

5. New domain for the NCCP community carp mapping platform, providing an interactive National Carp Mapping and survey resource that can be used into the future for carp surveys.

The survey was completed by 568 participants, with many reporting seeing aggregations involving over 100 carp. Figure 1 below reveals that some survey participants reported carp aggregations incorrectly at the time of completing the survey – with some survey results appearing at locations outside the range of carp in Australia.

**Figure 1. Map displaying location of 568 surveys, and number of carp observed in completed surveys by the respondent.**



6. Survey participants database – containing contact information for 637 survey participants. Please note, not all survey participants proceeded to complete the survey after initially registering.

7. Questionnaire survey data and results for 568 completed surveys during the project term from members of the public.

### Summary of project data supplied to FRDC at project completion

1. Export of all questionnaire survey results supplied April 2019
2. List of survey participant contact details
3. Image gallery of carp map images supplied during the survey

This project did not proceed with the following items.

- Dashboard of live records collected by community users and stakeholders, summarised into tables and charts. This item was not undertaken during the project because it was decided that the continuous delivery of survey data to FRDC and CSIRO project staff was adequate, especially given the low levels of public responses to the survey
- Heat map of carp aggregation hotspots, including aggregations and/or die-off events. Spatial data from the survey was continuously supplied to the FRDC and CSIRO project members for analysis and examination during the project, and a heat map was deemed unnecessary. Given low levels of public participation, it was also determined that a heat map might be misleading. The heat map would be far more relevant for post carp virus release scenarios, where spatial display of mass fish kill event localities would provide real-time reporting to FRDC and stakeholders.
- New Alert notifications for carp data from community participants, such as notifications to local and regional stakeholders about carp data and photos recorded by community participants. This was developed for the Project Coordinator to monitor survey participation, but was not produced for local or regional stakeholders, as this was not determined to be necessary at informing local communities or stakeholder groups about survey participation. This would be far more applicable to post-virus release scenarios whereby notification of local stakeholders and community representatives may support timely local management responses.

## Conclusion and recommendations

The objectives of this project were to design and deliver a website survey and questionnaire tool for FRDC and CSIRO to consult community users regarding carp aggregations in inland waterways. The survey was completed by 568 participants, after 637 initially registered to participate. All data were supplied to CSIRO and FRDC as requested for detailed analyses.

Some survey results were entered for locations that are outside the known range of carp in Australia, possibly as a result of participants mapping their own location, not the location of the carp aggregation event.

This project has demonstrated the capacity of online survey tools to support community-based reporting of carp aggregations in inland waterways. If carp biocontrol become a reality in Australia, the CarpMap website and survey tool could easily be re-deployed to encourage community-based reporting of carp mass fish-kill events. This could enhance the real-time collection of carp biocontrol results from community groups and waterway stakeholders.

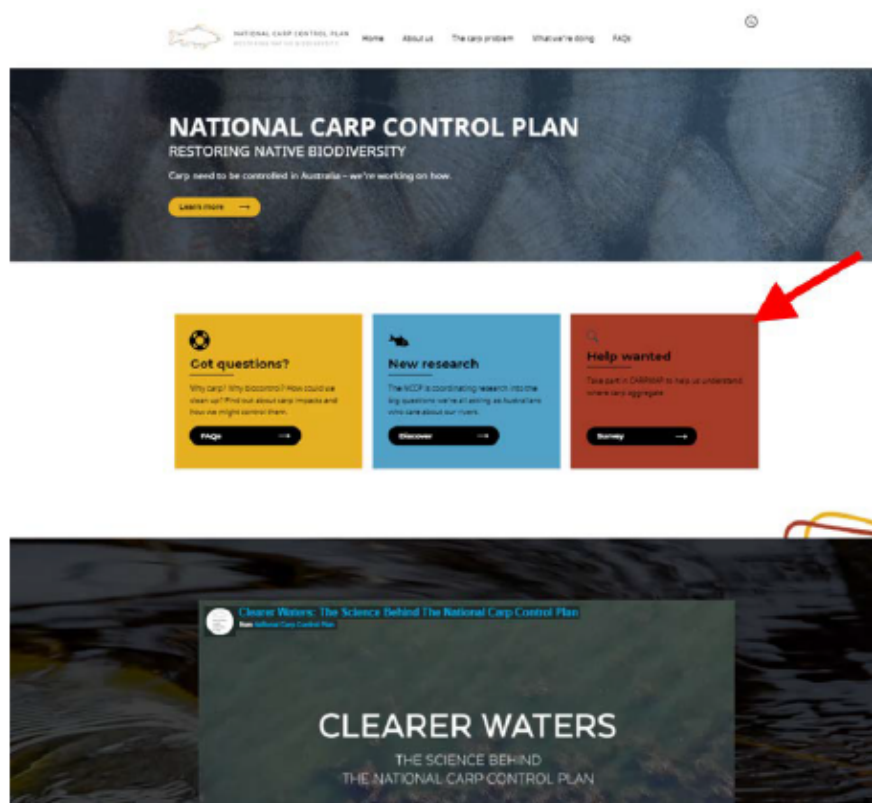
## Extension and Adoption

The CarpMap survey was primarily promoted through the FRDC communication channels, including media, newsletters, website cross-promotion, etc. The Centre for Invasive Species Solutions supported FRDC to promote community awareness of the survey using public newsletters, the PestSmart website, and through the existing FeralScan website.

The CarpMap website is available to be used beyond the term of the current project, and could be promoted further as a means of gathering further community information about carp behaviour in inland waterways prior to, and after future carp biocontrol.

### Project coverage

Promotion of the CarpMap questionnaire and survey was primarily coordinated by FRDC through existing organisation avenues and networks. For example, the survey was promoted via the NCCP website - <http://www.carp.gov.au/>



## Project materials developed

This project developed the CarpMap website, containing the questionnaire survey platform.

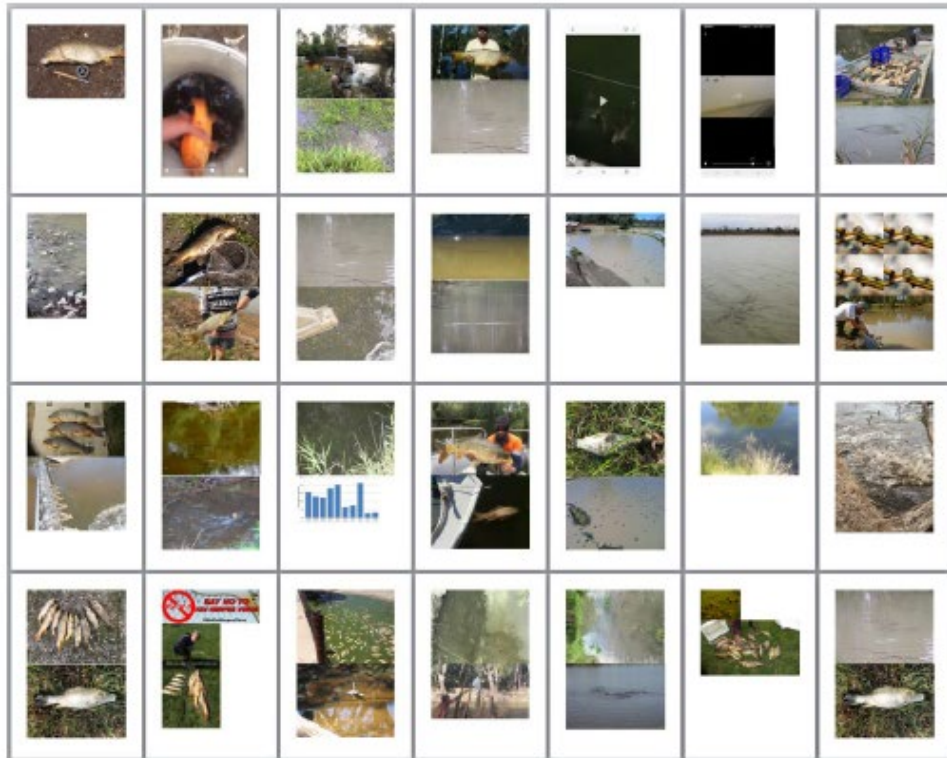
The website is <https://carpmap.org.au>

Supporting this website is a content management system and carp survey database, housed in NSW and administrated by the Centre for Invasive Species Solutions.

The CarpMap website can potentially be utilised beyond the project term during the remainder of the CISS collaboration (until mid-2022).

# Appendices

Appendix 1. Questionnaire survey images supplied by respondents.



## APPENDIX 13. PUBLICATION OF A FIELD GUIDE TO INTRODUCED PEST ANIMALS

West P (2018) *Guide to Introduced Pest Animals of Australia*, CSIRO Publishing. Available at <http://www.publish.csiro.au/book/7538/#details>



### GUIDE TO INTRODUCED PEST ANIMALS OF AUSTRALIA



## APPENDIX 14. APP INSTRUCTIONS PROVIDED TO USERS

### WildDogScan mobile app instruction

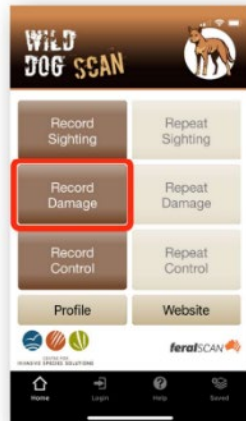


#### How to record wild dog attacks into the WildDogScan App

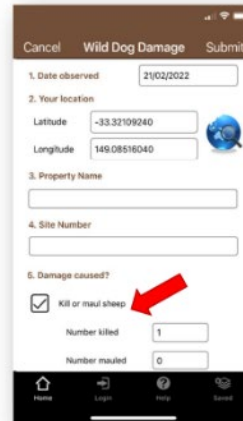
##### 1. Select wild dog



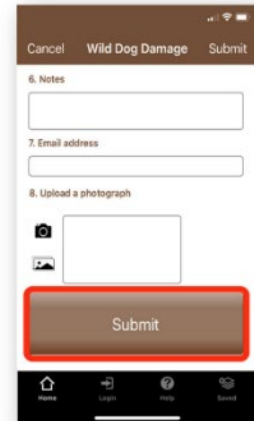
##### 2. Select Damage



##### 3. Answer the questions



##### 4. Submit your report



Your entries can be viewed on the WildDogScan Map

Download the App, or record information using the website [www.wilddogscan.org.au](http://www.wilddogscan.org.au)



For assistance, contact [feralscan@feralscan.org.au](mailto:feralscan@feralscan.org.au) Ph - 0407 622 191

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