



CENTRE FOR
INVASIVE SPECIES
SOLUTIONS

ANNUAL REPORT 2022-23



COLLABORATION

INNOVATION

IMPACT

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.

The Centre for Invasive Species Solutions gratefully acknowledges the financial and in-kind contributions made by its members, associate members and partners.

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

The Centre is governed and managed by Invasive Animals Ltd with an independent skills-based Board of Directors. Bruce Christie is the Chair of the Board and Andreas Glanznig is the Centre's Chief Executive.

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Front cover images from left: Using drone technology in the fight against invasive species, a red fox (*Vulpes vulpes*), and an Australian agricultural scene.

Back cover images from left: koala: now on the list of endangered species, wild dog predation puts strain on populations already under pressure, ivy (image credit: Andrew Mitchell), and collaborative research efforts continue to drive new ways to manage invasive pests and weeds.

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SECTION 1

STRATEGIC OVERVIEW

1.1 MESSAGE FROM THE CHAIR

“There is nothing so powerful as an idea whose time has come.”

Victor Hugo

Invasives Animals Limited (IAL) started life in 2005 as a Cooperative Research Centre (CRC) because there was a need for a national approach to research, development and extension (RD&E) for invasive species.

After twelve very successful years of cooperation and collaboration, we became the Centre for Invasive Species Solutions (a not-for-profit company) and continued our important mission.

In October 2022, we presented the Centre’s achievements from its first five years. They are substantial! Assessed by an independent economist, our net current benefit was calculated at \$435.5m with a Cost-Benefit Ratio of 5.0 to 1 on the investments made over the five years.

Impressive, but at the same time not enough. The threat of invasive species has not diminished and more than ever we need better and more coordinated RD&E.

But even that won’t be enough.

If we are going to make an impact on invasive species nationally across the environmental and production areas of biosecurity and biodiversity, we need a coordinated national approach, inclusive of all stakeholders, that addresses all aspects of invasive species, not just RD&E.

This year the Board, in consultation with its members, has been working through options to identify where the Centre can most add strategic value to Australia’s biosecurity system into the future.

These options include closing the Centre altogether, continuing to concentrate on RD&E alone or expanding our role to provide national coordination and leadership in invasives species.

From my experience over the last thirty plus years, working across all parts of the biosecurity continuum, I’m more convinced than ever that the invasive species area needs a national body like that which exists in the agricultural biosecurity sectors: Animal Health Australia and Plant Health Australia.

We need an Environment and Invasives Biosecurity Australia, and the Centre for Invasive Species Solutions is how we can make that a reality.

With your support, the Centre can easily evolve into Environmental and Invasives Biosecurity Australia.



The Centre is already:

- **An Independent, not-for-profit member-based organisation** whose existing members are key to national environmental biosecurity. We include the Australian and all State governments and the ACT, NRM Regions Australia, and Conservation non-government organisations (NGOs), such as the Invasive Species Council. We can leverage the Centre’s legal structures, governance and membership network and expand our membership to include additional conservation NGOs, indigenous land management, natural resource management (NRM) and regional land management organisations, businesses and industry bodies.
- **Our cross-sectoral members, partnerships and networks** can accelerate connectivity and delivery of outcomes not only for environmental biosecurity but the greater national biosecurity system.
- **Centre know-how has already been leveraged** to produce the national incident response plans and select pest emergency response manuals.
- **Our national community engagement model, systems and networks can be readily leveraged** to provide nationally coordinated environmental biosecurity programs, such as surveillance and training.
- **Our R&D capability can be leveraged** to develop new tools and systems to enable efficient surveillance (e.g. building on AI-enabled weed detection, eDNA pest detection), incursion response tools and systems, and containment/management tools.
- **Thought leadership** through our existing partnerships with Animal Health Australia, Plant Health Australia, and Invasive Species Council.

With your support, the Centre can easily evolve into Environmental and Invasives Biosecurity Australia, with responsibilities for the national coordination of invasive species emergency preparedness and response, surveillance, community awareness, motivation and action, research and innovation and cross-sectoral coordination and collaboration between governments, industry, NRM and regional organisations, research organisations and community groups.

The Board and Centre management have put a lot of thought into how we can help the national invasive species biosecurity system function better and we look forward to doing so.

With your support, we aim to consolidate our strategic planning by March 2024 so that the Centre can chart a clear path forward in the 2024-25 financial year.

Finally, I would like to thank two long-standing retiring Directors, Murray Rankin and Peter Noble, for service to the Centre. Murray has been a director since 2013 and over the decade provided invaluable strategic advice on both the Invasive Animals CRC as well as the Centre, and ensured high standards of governance as Chair of the Audit and Risk Committee. Peter Noble joined the Board in 2015 and similarly made a major contribution to company governance including as Chair of the Governance and Remuneration Committee and guiding the formation and startup of the company’s tax-deductible Trust.

Losing this pair will leave a huge hole, however, I am also very excited to see the quality of the two new directors who have been nominated by the selection committee to replace them.

Thank you.

Bruce M Christie
Chairman

1.2 MEMBERS & PARTNERS

MEMBERS


Australian Government
Department of Agriculture,
Fisheries and Forestry


Government
of South Australia


NSW
GOVERNMENT


Queensland Government


VICTORIA
State
Government


CSIRO


ACT
Government


Tasmanian
Government


GOVERNMENT OF
WESTERN AUSTRALIA


mla
MEAT & LIVESTOCK AUSTRALIA

ASSOCIATE MEMBERS


invasive
species council


NRM
REGIONS
AUSTRALIA


Nature
Foundation


RABBIT-FREE
AUSTRALIA


WOOLPRODUCERS
AUSTRALIA

PORTFOLIO NO. 1 PARTNERS


THE UNIVERSITY
of ADELAIDE


awi
Australian Wool
Innovation Limited


UNIVERSITY OF
CANBERRA


Department of
Conservation
Te Papa Atawhai


LA TROBE
UNIVERSITY


MU
Murdoch
University


une
University of
New England



European rabbits (*Oryctolagus cuniculus*) have become Australia's most widespread and destructive environmental and agricultural vertebrate pest, dispersed across two thirds of Australia and the cause of an estimated \$217m in agricultural losses each year.

1.3 CEO's SNAPSHOT



Our 2022-23 Annual Report shows the Centre evolving while continuing to add value to Australia's national biosecurity system through the development and rollout of better pest and weed surveillance and management tools. These solutions are calibrated to tackle the ongoing threats invasive species pose to our environment, agricultural sector and way of life.

Collaboration has been central to the new solutions we've produced and deployed. These solutions include the Acoustic Detection Array to detect starling incursions into Western Australia and a national digital e-commerce surveillance tool to track exotic pests and weeds. Meanwhile, FeralScan exemplifies the continuing strong adoption of our existing tools: over 30,000 Australians and 650 landholder and community groups are benefiting from this asset to improve community-based, community-led vertebrate pest management.

Our report also shines a spotlight on tools well advanced in the development pipeline, like the Feral Deer Aggregator, PAPPutty™ lethal paste for leg hold traps, registration of Eradicat® into the new jurisdiction of SA, NT and Qld, and completion of an initial evaluation of a potential new rodenticide to complement zinc phosphide.

In addition, 22 peer-reviewed scientific publications and 56 technical reports were added to our impressive body of research during the financial year, demonstrating that research excellence and better tools go hand-in-hand to improve best practice management. See the impressive outputs achieved during the life of our RD&E Portfolio No.1.

We also ramped up our extension and engagement activities with both online and in person forums. With 650 people taking part in National Feral Cat and Fox Management Online Forum workshops, it's clear there's strong interest in best practice management advances.

Looking ahead, easy-to-use technologies to identify and report new and emerging invasive species will become a central part in strengthening community involvement in Australia's biosecurity early warning system. For example, WeedScan, being developed through the Centre, is a great example of how computer vision and machine learning technology can be both developed and implemented through a national collaborative effort. Led by NSW and CSIRO and involving the States (especially Queensland, South Australian and Victorian government partners), WeedScan will provide one national digital ID app able to be integrated into existing State Weed Spotter programs. It will also empower Landcare groups, producers, and citizens to find and report new weeds earlier. Once launched, WeedScan will be a tangible example of 'shared responsibility' in practice, and a leading example of an efficient, federated approach to improve weed surveillance and management.

Finally, I would again commend the tireless efforts of our small management team and partner researchers dedicated to creating better pest and weed solutions and accelerating their uptake throughout Australia.

Andreas Glanznig
CEO



CSIRO weed botanists travelled the length and breadth of Australia capturing 120,000 weed images to train the AI model driving WeedScan. Image credit: Andrew Mitchell.

1.3 CEO's SNAPSHOT

WE'RE DELIVERING BETTER SOLUTIONS TO AUSTRALIA'S GROWING PEST AND WEED PROBLEMS.

This financial year saw most of the Centre's Portfolio No. 1 projects completed, with some exceptional achievements and highlights that reveal the power of collaboration.

5.0 to 1 2.97:1

The Centre's Benefit-Cost Ratio return on investment over five years.

The leveraging ratio for the Commonwealth Government's investment in Portfolio No. 1 between July 2017 and September 2022.

\$545.3 m

Portfolio No. 1 Total Expected Net Benefits.

\$435.5 m \$109.8 m

Net present value.

Portfolio No. 1 investments (present value terms).

Figures drawn from Portfolio No. 1 independent evaluation by ACRE Economics using a 30-year investment period after last year of investment.



Collaboration with **22 members**, associate members and partners.

Efforts of over **150 researchers** across **31 projects**.



31 Projects completed



104 Technical reports



6 PHD students
1 Masters student
2 Postdoc researchers



108 Scientific publications

Produced **14 tools** including:



Feral Deer Aggregator



Acoustic Detection Arrays



ThermEye™ thermal imagery analysis algorithm



Computer-based solutions for surveillance and eradication

1.4 INVASIVE SPECIES SOLUTIONS TRUST

The financial year has been one of much activity. The case statements (material designed to share costed opportunities with potential donors) have been completed, applications have been made to 13 different Philanthropic Trusts and the message of the importance of supporting the Trust has been taken on the road to events like the National Farmers Federation Annual Conference.

Major news during the year was the discovery at the University of Adelaide: proof of concept for a world-first genetic biocontrol strategy known as a ‘gene drive’ in a mammal (mouse) was achieved. In working to support this research, the Fundraising Manager has built upon the case statement developed in 2022-23 by creating an explanatory video and a shortened social media video. This will support a special presentation at the South Australia Health and Medical Research Institute (SAHMRI) in October 2023.

Our case statements tell the story of the importance of the work undertaken by the Centre, and outlines projects developed as part of the Invasive Species Solutions suite of potential programs to provide the opportunity for philanthropic investors to become involved. The five main areas chosen for donor consideration are:

- Partnerships to predator-proof Australia
- Opportunities to control the impact of invasive weeds
- Engaging all Australians to play their part in biosecurity
- Genetic biocontrol and what it can offer in the future
- Building future research capacity by supporting future research leaders.

In addition to telling stories of the work being done by the Centre, opportunities are offered ranging from \$5,000 to sponsor the inclusion of a new weed on the WeedScan app through to being a partner in a four-year partnership valued at \$11.5 million. Extra opportunities include the sponsorship of the proposed Kids’ Conference associated with the Australasian Vertebrate Pest Conference in 2024.

The Trust is supporting world-first ‘gene drive’ technology in a mammal (mouse) based on a breakthrough by researchers at the University of Adelaide.

Using the budgets and stories of the case statements, the Fundraising Manager was able to reach out to 13 philanthropic trusts to share our story and seek funds. In total \$595,000 worth of funds were sought for projects including education, weeds and biosecurity. At this point we have been successful with two opportunities. We received an opportunity to advertise through LinkedIn and after discussion with Cadia Cares Foundation (part of Newcrest Mining), an application was successfully submitted for our first supporter of a new weed within the WeedScan app.

If you are able to work with us to lessen and control the impact of invasive species on our threatened species, our environment and our primary producers, please contact:

David Picker, Head of Strategic Partnerships
(02) 6201 2877
david.picker@invasives.com.au



Our case statements bring the Centre’s vital work to life.

Case statements for the Trust outlining opportunities in biosecurity, biocontrol and invasive weeds.



The Trust secured the support of Cardia Cares Foundation (part of Newcrest Mining) as the inaugural sponsor of a new weed - Sticky nightshade (*Solanum sisymbriifolium*) - within the WeedScan app.



1.5 THE YEAR IN REVIEW

JULY 2022

Advances in feral deer management
Research undertaken through the Centre confirmed the viability of a deer-specific feeder in the fight to manage feral deer.



AUGUST 2022

New e-commerce surveillance database
Centre-backed research saw the development of the Digital Surveillance for Illegal Wildlife Trade database.



SEPTEMBER 2022

Draft 20-year National Weed Biocontrol Pipeline Strategy
Report calls on stakeholders to have their say on a long-term approach to weed biocontrol in Australia.



Balanced Researcher Program celebration event
Held at the Academy of Sciences' Shine Dome in Canberra, 27 participants presented their research and celebrated their successful participation in the program.



OCTOBER 2022

Portfolio No. 1 celebration
This event showcased the Centre's first five-year RD&E collection, shining the light on the power of collaboration in delivering better solutions to our growing pest and weed problems.



NOVEMBER 2022

Government House Open Day
The Centre showcased its work at an Open Day at Government House, Canberra.



FEBRUARY 2023

Feral deer information sessions
The Centre and the National Deer Management Coordinator held public online information and Q&A sessions on the Draft Feral Deer Action Plan.

Planning Guide for Feral Cat Management in Australia released
The 24-page resource is designed for land managers, community groups, pest control professionals, and biosecurity organisations.

Planning Guide for Fox Management in Australia released
This 28-page guide provides a decision-making and control framework.

MARCH 2023

Rabbit R&D Forum
Rabbit Webinar for on ground managers and researchers was held in conjunction with Rabbit Free Australia.



National Wild Dog Management Symposium
Held in Armidale, the Symposium was a platform to engage and network to gain greater knowledge of research, legislation and delivery of contrasting wild dog management programs between jurisdictions.



MAY 2023

Best-Practice Management of Wild Dogs in Peri-urban Environments
Report provides landholders with management tools to manage wild dogs in challenging settings.

19th Australasian Vertebrate Pest Conference location and date announced



JUNE 2023

Health and wellbeing recognition
General Manager, Lucie Hassall and Finance and Office Manager, Shan Southwell, received the ACT Government's Healthier Work program recognition (Silver), reflecting the Centre's integrated approach to improving standards in health, safety and wellbeing.



National Feral Cat and Fox Management Online Forum
• Each topic attracted between 50 and 160 online participants
• Over 650 people attended one or more workshops
• Attendees from government, environment/community groups, pest control officers, researchers and farmers
• Positive feedback, with future forums planned



Funding boost for National Pest Animal Management Coordination Program
Federal government funding announcement that will advance the activities of the Centre's National Feral Cat and Fox Management Coordinator Program and the National Wild Dog Action Plan.



1.6 STRATEGY & APPROACH

THE CENTRE IS FOCUSING ON FOUR STRATEGIC AREAS, DESIGNED TO LEAD TO EIGHT STRATEGIC SHIFTS.



WE ARE A COLLABORATION OF



9 Government Departments
And CSIRO

5 Universities

5 Not-For-Profit Organisations

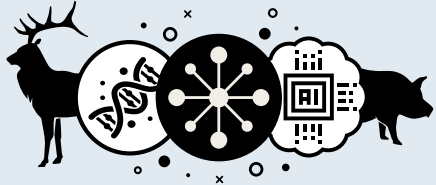
And 2 Research and Development Corporations...

...working together to reduce the impact feral animals, weeds and pathogens by creating innovative solutions.

We coordinate applied and blue-sky research on invasive species

Building better tools and systems to control invasive species

- New biocontrol agents
- Genetic biotechnology ‘proofs of concept’
- Novel toxins
- Management strategies that work
- Web scrapers to monitor illegal trade in plants and wildlife on e-commerce sites



And improving management practices and invasive species planning with


- The PestSmart and Weeds Australia websites that provide Australians with up-to-date practical management information.
- The FeralScan website and suite of apps that allow Australians to record pest management activity at a local level.
- A world-first computer vision ID app and website that will allow Australians to identify and manage invasive weeds. We call it WeedScan and it’s coming soon.
- A network of National Coordinators that support communities across Australia to manage wild dogs, feral cats, foxes and deer.






And why do we go to all this effort?

So that...



Australian's can take **effective, coordinated action** on feral animals, weeds and pathogens.




There are **fewer incursions** of new invasive species.



The **control measures** are effective, efficient and humane.



There is **less chance** that Australia's threatened species will become extinct.



The cost of managing invasive species drops and **farm productivity** rebounds.

SECTION 2

**RESEARCH,
DEVELOPMENT &
ENGAGEMENT**

2.1 RESEARCH ENGAGEMENT MODEL

OUR APPROACH

The Centre’s Research, Development and Engagement (RD&E) Model

This model has been developed and refined during the many years of the Centre’s history and has been instrumental in the design of our initiatives. It covers all the key points in the value chain from need identification through to engagement and adoption of Best Practice Management (BPM) via a distributed network of member, partner and other organisations.

Inputs and activities	OUR COLLABORATIVE RD&E APPROACH AND SYSTEM END USER CENTRE, ITERATIVE DESIGN, PARTNERS COVER KEY POINTS IN VALUE CHAIN,SYNERGISTIC PROJECT CLUSTERS		
Objective	Policy analysts, researchers	Coordinators	Land managers
	Efficient access and application to BPM invasives knowledge	Adoption and promotion of BPM planning and engagement approaches	Adoption of BPM skills, practices and tools
	OUTPUTS	OUTPUTS	OUTPUTS
	Journal articles	Strategic planning tools	New tools and methods
	Technical reports	Decision support tools and systems	National management standard operating procedures
	Reviews and syntheses	FeralScan and WeedScan community monitoring and management systems	Best practice management toolkits
		Community Engagement Hub (Community Invasives Action)	Glovebox guides and manuals
Our e-extension platform (e.g. PestSmart and Weeds Australia)	Knowledge Centre	Coordinator Planning Resources	Manager Toolkits
Leadership and capacity building	Researchers	National Coordinators	Demo days/training sessions
Train-the-trainer/ training	PhD candidates	Masterclasses	VET courses
	Balanced Researcher Program	Regional facilitators	
		VET courses	

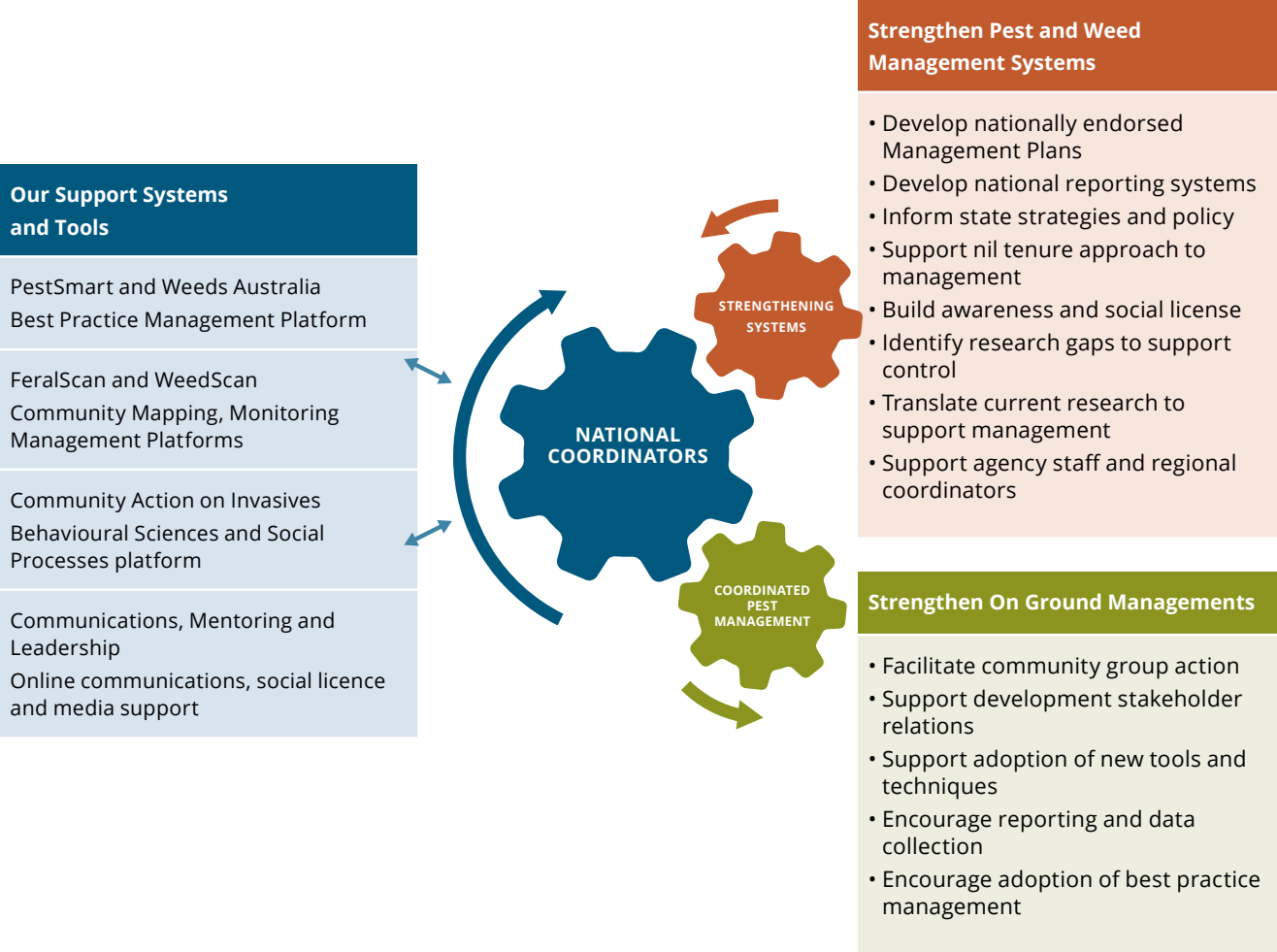
The Centre continues to build on the work of Portfolio No. 1 with RD&E initiatives continuing across the domains of vertebrate pests and weeds.

INNOVATION DOMAIN 1: DETECTION AND INCURSIONS RESPONSE
This domain focuses on RD&E associated with new vertebrate pest and weed threats arising from illegal importation and keeping, escape from legal keeping, and as hitchhikers in the international movement of goods and people.
INNOVATION DOMAIN 2: INTEGRATED LANDSCAPE MANAGEMENT
This domain focuses on RD&E associated with established vertebrate pests and weeds that continue to cause considerable impact to Australia’s agricultural industries, the environment, and the well-being of its communities.
INNOVATION DOMAIN 3: BIOCONTROL
Classical biological control of vertebrate pests and weeds using self-disseminating viral and living agents has served Australia well as the basis of cost-effective continental scale management. The Centre’s Biocontrol domain currently includes five projects, two of which are major new projects that will continue to implement the 20-year rabbit biocontrol pipeline. The other projects are associated with RD&E of biocontrol options for tilapia and the possibility of using genetic technologies for pest animal management.
INNOVATION DOMAIN 4: MANAGEMENT TOOLS AND SYSTEMS
The Centre Management Tools and Systems Domain is associated with funding optimal, cost-effective pest animal and weed management tools.
INNOVATION DOMAIN 5: COMMUNITY ENGAGEMENT AND EDUCATION
Invasive species detection and management relies on adoption of best practice strategies. Landholders, governments and other stakeholders must be sufficiently motivated and empowered, and have the capacity and capability, to change behaviours/ practices and adopt new approaches and tools.

2.1.1 NATIONAL COORDINATOR MODEL

OUR NATIONAL COMMUNITY ENGAGEMENT COORDINATION MODEL

The Centre’s National Coordination model brings together national management coordinators and digital best practice management and community management platforms to strengthen national, state and regional management systems and on-ground management outcomes.



NATIONAL COORDINATORS: MANAGING WILD DOGS, FERAL CATS AND EUROPEAN FOXES

The Centre hosts two National Coordinators: Gillian Basnett as National Feral Cat and Fox Management Coordinator and Greg Mifsud as National Wild Dog Management Coordinator.

Together, during 2022-23, our National Coordinators continued to:

- increase community awareness of invasive species and their impacts
- increase and improve adoption of invasive species best practice management with initiatives such as the release of new planning and glovebox guides, and updating the PestSmart management toolkits

- foster increased collective action and community engagement for invasive species management
- oversee effective resource allocation in invasive species management and RD&E through better coordination, communication, and prioritisation.

The highlights below demonstrate how our National Coordinators strengthen the Centre’s support systems and tools, engage in strategic events and produce key planning, reporting and management outcomes.

HIGHLIGHTS: NATIONAL FERAL CAT AND FOX MANAGEMENT COORDINATOR

WA Feral Cat Symposium

Gillian Basnett and Dr Tony Buckmaster, the Centre’s Principal RD&E Manager attended and presented at the two-day WA Feral Cat Symposium in February organised by the WA Feral Cat Working Group. More than 310 participants, including representatives from all states and territories, 18 ranger groups, various research bodies, pest and land managers and community members, considered practical on-ground action. The event created the opportunity to hear about projects from across Australia. The symposium presentations are available at <https://wafcwg.org.au/2023-symposium-home/>



Gillian Basnett presenting at the WA Feral Cat Symposium. Image credit: WA Feral Cat Working Group.

National Feral Cat and Fox Management Online Forums

During May and June, the National Feral Cat and Fox Management Coordinator team ran a series of feral cat and fox management online forums. Topics ranged from management tools, effective community engagement, community groups in action and invasive species planning.

Over 650 different people attended one or more forums with participants including federal and state agency staff, environment groups, pest control officers, researchers, farmers and other community members. Overall feedback was positive, with participants eager for additional forums in the future. All forums can be viewed on the Centre’s YouTube channel where they have received nearly 25,000 views in the first four months of streaming.



One of the most popular videos on the Centre’s YouTube channel.

2.1.1 NATIONAL COORDINATOR MODEL

HIGHLIGHTS: NATIONAL WILD DOG MANAGEMENT COORDINATOR

National Wild Dog Action Plan Symposium

Held in Armidale in March, this event put wild dog management in the spotlight with more than 50 operational, agency and research staff in attendance. The Symposium provided an opportunity for participants to gain knowledge of the research, legislation and delivery of contrasting wild dog management programs between jurisdictions.

National Wild Dog Management Coordinator Greg Mifsud said of the event, "Wild dog management could be a contentious space and there was extensive discussion about the current challenges in delivering effective management program."



Ian Evans, Australian Wool Innovation and Greg Mifsud at the Symposium in Armidale.

Less Predators More Lambs project

Funded by Meat & Livestock Australia, the producer demonstration site is supported in partnership with the Centre's National Wild Dog Management Coordinator, and the Australian Wool Innovation Community Wild Dog Control Coordinator.

The aim of the project is to improve lamb survival within participating flocks and demonstrate best practice in sheep management practices and predator control. The National Coordinator continued to provide ongoing support to the project, providing technical advice and best practice management techniques.

WA Wild Dog Management and Communications Workshop

In March, 55 delegates - ranging from biosecurity groups, landholders and licenced pest management technicians - attended a three-day workshop at Mellenbyne Station (430km north-east of Perth), with the spotlight on seeking outcomes that could be transferred to the Western Australian Best Practice Manual For Wild Dog Control.

The National Coordinator explored the subject of wild dog mythology as well as the use of PAPP as a lethal trap device on foot hold traps.



Delegates at the WA Wild Dog Management and Communications Workshop in WA.

Benefits of our National Community Engagement Coordination Model

An independent evaluation of the Centre's National Coordinator Model for wild dogs, feral deer, and feral cats and foxes for the period 2017-18 to 2022-23 by Talia Hardaker (ACRE Economics) found the total investment was \$5.55 million (present value terms). The investment generated total expected net benefits of approximately \$107.27 million. This gave a net present value (NPV) of \$101.71 million and a benefit-cost ratio (BCR) of about 19.3 to 1.

Sensitivity analyses showed if it was assumed the benefits of the overall Centre RD&E investment were just 1.39% less, the investment criteria for the National Coordinator Model still were positive. This demonstrates the positive benefits of the National Coordinator Model over the situation where the Model did not exist.

The results of the case study evaluation of the National Coordinator Model are highly positive. National Coordinator Model investment has achieved exceptional success within the Centre's RD&E funding. The results should be viewed favourably by the Centre's management, funding partners including Department of Agriculture, Fisheries and Forestry and state government, invasive species managers, and other stakeholders.

DIGITAL SUPPORT SYSTEMS AND TOOLS

The Centre makes practical resources, including new planning and best practice guides, available for land managers to manage invasive species according to best practice through dedicated websites: PestSmart, FeralScan, Weeds Australia and Community Invasives Action. Read more about the reach and impact of these initiatives at Section 3.3.

Meanwhile, the Best-practice Management of Wild Dogs in Peri-urban Environments is written for landholders and land managers struggling to manage the impact of wild dogs on Australia's urban fringe. It details the key aspects of the biology and ecology of peri-urban wild dogs, as well as information on their impacts and management approaches.

Planning and Best practice Guides released

The Centre released three new guides to help communities across Australia come to grips with feral cats, foxes and wild dogs in peri-urban environments.

The Planning Guides for Feral Cat and Fox Management in Australia both met the huge interest in controlling these invasive species by providing practical assistance with a framework for communities to make decisions and select management options that suit their circumstances.



Cover images of the Centre's new guides.

Predation by cats is a recognised threat to over 200 nationally threatened species and 37 listed migratory species (of which nine are also listed as threatened).

2.2 OUR RESEARCH, DEVELOPMENT & ENGAGEMENT

During 2022-23, the Centre’s RD&E efforts concentrated on finalising the four uncompleted projects remaining in Portfolio No. 1 while administering the ongoing Centre-managed projects separate to those managed under the Portfolio.

Our projects ranged from:

- developing cutting-edge AI technology for weed identification
- progressing gene drive technology in mammals
- expanding on already solid and reliable on-ground coordination for the management of wild dogs, feral cats and foxes through National Coordinators, and the FeralScan National Digital Platform.

The successful completion of the remaining four Portfolio No. 1 projects ended the RD&E phase of the Portfolio with the final reporting phase now completed.

The Centre firmly believes that research outputs should continue along the implementation pipeline to increase the capacity of organisations to effectively manage invasive species. Many of the Centre’s outputs are now actively used for their intended purpose, and in some cases, for other purposes.

An example of this is the Acoustic Detection Array, which was developed for detecting starling incursions in Western Australia. The Centre has licenced the use of the algorithm to a range of organisations, including conservation organisations, which will retrain the algorithm to detect rare and threatened species.



Automated detection allows for a rapid biosecurity response. Image credit: WADPIRD.

Acoustic Detection Array national deployment	
Organisation	Species attempting to detect
WA Department of Biodiversity, Conservation and Attractions	Threatened bird species included Western ground parrot
SA Department of Environment and Water	Bassian thrush and Australasian bittern
Territory Natural Resource Management Inc (NT)	Purple-backed fairywrens and grasswrens
Zoos SA	Threatened pseudophryne frogs

The Centre is committed to ensuring that best practice management is both developed and disseminated to ensure all land managers can access knowledge on the best available techniques for managing the invasive species on their land. This knowledge and products are being disseminated through a range of methods including National Coordinators, management guides, and the PestSmart website which includes glovebox guides, fact sheets, and where available, the up-to-date Codes of Practice and Standard Operating Procedures for invasive species. See Section 2.1.1 for more.

The Centre continued to progress outputs that were close to release at the conclusion of the Portfolio. The Feral Deer Aggregator will now enter the commercialisation phase to ensure its availability to land managers to use as another feral deer management tool.

Meanwhile, the expansion of the registration of Eradicat® to South Australia, Northern Territory and Queensland is progressing: the Department of Primary Industries and Regions South Australia and Western Australia’s Department of Biodiversity, Conservation and Attractions lodged an application with the Australian Pesticides and Veterinary Medicines Authority following the conclusion of the Portfolio project.

The role of the Centre’s RD&E is to drive new knowledge around the current and future management of invasive species. Moving beyond Portfolio No.1, the Centre is successfully accomplishing this in several ways, including research into world-first gene drive strategy in laboratory mice in conjunction with NSW Department of Primary Industries, CSIRO and the University of Adelaide.

The mouse is an ideal starting point for this technology as a target pest species capable of causing extensive damage to both agriculture and the environment. A recent breakthrough by the University of Adelaide is the first time a new genetic tool has been identified that is able to induce female infertility into a mouse population. While this tool has been developed for mice, it shows that there is potential for gene drives to be developed for other invasive mammal species. This species-specific technology creates the opportunity for the control and potential eradication of several vertebrate pests in a safe and controlled way.

2.2 OUR RESEARCH, DEVELOPMENT & ENGAGEMENT

OUR WEEDS MISSION

THE PROBLEM: WEEDS COST AUSTRALIA ABOUT \$5 BILLION EVERY YEAR. Together with other invasive species, they have been a major contributor to the extinction of native species endangerment since the 1960s. Today they impact on 80% of national threatened species. Twenty new weeds naturalise in the environment each year or one every 18 days.	
THE SOLUTION	
Integrated weed management RD&E Enables national coordinated approach to develop, trial, demonstrate and adapt best practice tools and management via a connected national network of demonstration and adaptation sites. Builds on the Centre's cross-sectoral national invasive grasses RD&E business plan, and new State coordinators.	Weed biocontrol RD&E Increase improved agricultural productivity from weed biocontrol. Builds on momentum from Rural R&D for Profit Program weed biocontrol projects implemented through the Centre's new 20-Year Weed Biocontrol Pipeline Strategy.



The Centre's RD&E extends to tackling Australia's priority weeds. Moving beyond Portfolio No.1, the Centre is accomplishing through WeedScan, an artificial intelligence model trained by CSIRO. It recognises 459 weeds species, including 270 priority weed species, across Australia and takes the guesswork out of identifying, reporting and mapping priority weeds. WeedScan moved to beta testing with users across Australia ahead of its planned launch.

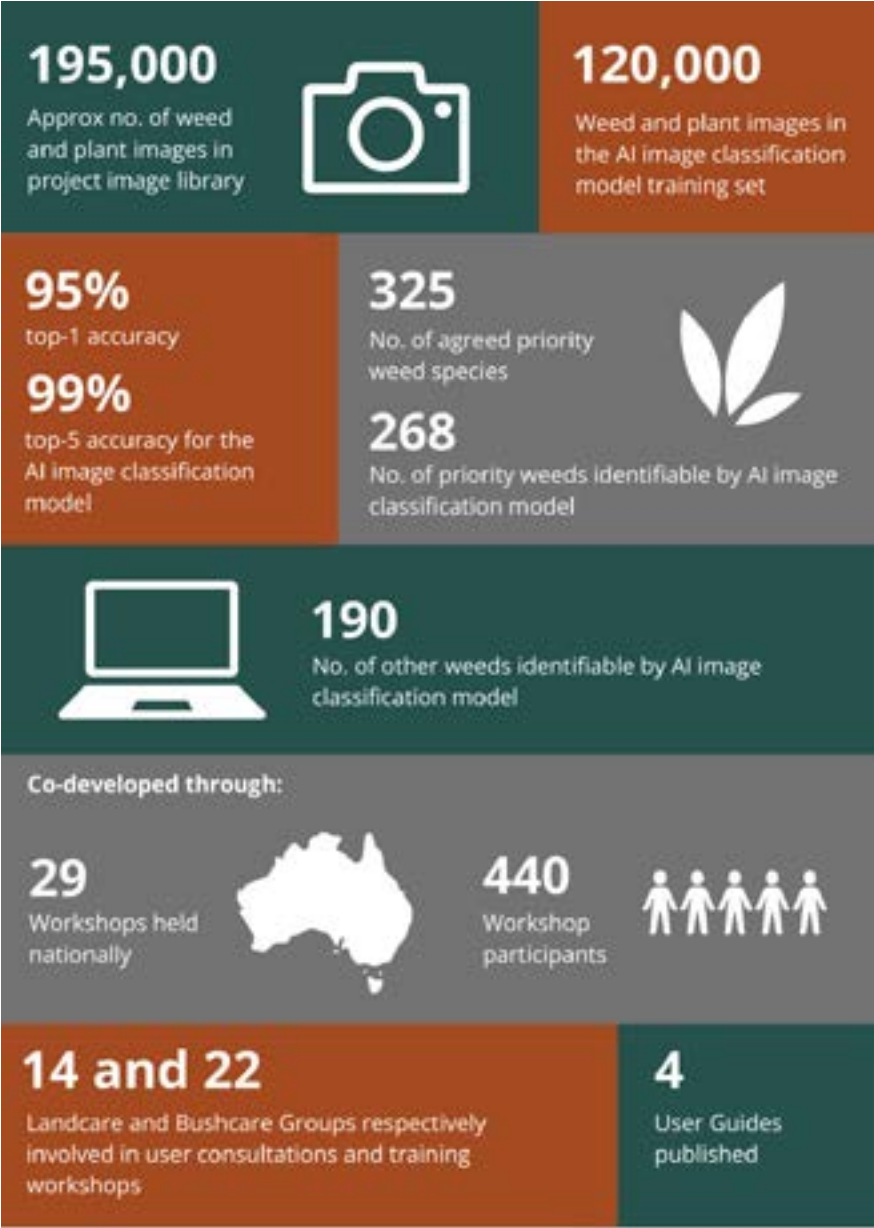
WeedScan is a free resource allowing registered users to report priority weeds for formal verification. Simply snap a photo of a suspected weed and upload it to WeedScan.

Powered by an AI model trained by the CSIRO and field tested across Australia, WeedScan assesses the image against verified records of priority weeds. Within seconds, it suggests possible plant identifications, with degrees of confidence for each suggestion. WeedScan is available as a web or mobile app (Android and iOS).



The WeedScan app in action.

KEY WEEDSCAN FACTS



2.2 OUR RESEARCH, DEVELOPMENT & ENGAGEMENT

TOWARDS A NATIONAL WEED BIOCONTROL PIPELINE STRATEGY

Looking to the successes of rabbit biocontrol, the Centre in partnership with CSIRO, NSW Department of Primary Industries, Queensland Department of Agriculture and Fisheries and Agriculture Victoria, is harnessing the unique opportunities and potential high returns of biocontrol research investment for weed management.

Biocontrol solutions do not come about quickly: the long-term pipeline of discovering, assessing risks and releasing biocontrol agents demands a clearly articulated strategy.

The strategy would be implemented in discrete stages, so that:

- progress can be readily assessed
- efforts redirected where necessary
- confidence provided to investors that desired outcomes will occur within an agreed-upon timeframe.

The Strategy will focus on weeds that are in the national interest for multiple sectors and will incorporate rolling five-year research and investment plans that will guide on-ground implementation of the strategic weed biocontrol research.



Successful biological control of *Cylindropuntia fulgida* var. *mamillata* (coral or boxing glove cactus) in Queensland. Image credit: Queensland Department of Agriculture and Fisheries.



ON THE FRONT FOOT: DIGITAL SURVEILLANCE FOR ILLEGAL PEST AND PLANT TRADE

Preventing and managing pest animal and weed incursions across Australia is now backed by digital smarts such as the Digital surveillance for Illegal Wildlife Trade (DIWT). The system has been adopted

and put into use across all Australian jurisdictions where it is uncovering a range of illegally traded ornamental plants and exotic animals.

DIWT in action

DIWT scrapes internet advertising for illegal trade in both invasive plants and animals.

- It prevents, controls, contains and eliminates invasive populations of alien plant species.
- A user-friendly website designed to support environmental biosecurity efforts
- An automated monitoring system recording online ads from about 90 ‘open web’ websites across four continents.
- Collected over seven million unique, online wildlife advertisements at a rate of about 2.5 million advertisements per year.
- Of 1,418 declared plants traded, 413 were prohibited.
- Prickly pear (*Opuntia*) cacti, aquatic weeds and invasive garden plants were the most traded.



The corn snake is an illegal alien reptile in Australia.

“The daily email allows me to check for online sales of weed species.”
Department of Natural Resources and Environment, Tasmania.



Access our Portfolio No. 1 reports and extensive range of publications at www.invasives.com.au/our-publications/ to learn more about our RD&E outputs, outcomes and impacts.

Our forward-looking strategy sparked a vision for weed biocontrol.

2.2 OUR RESEARCH, DEVELOPMENT & ENGAGEMENT



Celebrating 10+ years as Australia’s largest community platform for recording invasive animal information.

FeralScan is an interlinked community website and smartphone app that allows you to map pest animal sightings, their impacts and management actions in your local area.



FERALSCAN

- ✓ Connects communities
- ✓ Addresses community and landholder needs
- ✓ Facilitates community adoption
- ✓ Delivers customised pest control support and resources
- ✓ FeralScan is used by farmers, community groups, pest controllers, local government, catchment groups and individuals managing pest animals and their impacts. It supports their efforts in monitoring and recording information about pest species and promotes collaborations through local pest animal management.

Northern NSW Wild Dog Management Facilitator Dave Worsley demonstrates using the FeralScan App for recording wild dog control.

KEY FERALSCAN FEATURES

- ✓ Free resource
- ✓ Records pest animal activity
- ✓ Communicates the problem to others
- ✓ Identifies priority areas for pest control
- ✓ Creates and prints your own pest animal maps
- ✓ Real-time alert notifications
- ✓ Data sharing platform
- ✓ Enables you to view or upload photos
- ✓ Connection with community action groups in your area.

FERALSCAN IN ACTION

FeralScan was designed for simplicity, with platforms that have been configured with specialised software to communicate information - alert notifications - about pest data to nominated user groups. These notifications are sent via email notification or directly through the FeralScan app. Users can specify how they receive these notifications, through either channel or both.

The interactive dashboard contains a timeline of records (sightings, damage and control) entered by users in FeralScan.

Users can use FeralScan to record and photograph:

- sightings of animals e.g. animal sign, audible calls, tracks, scats and other traces
- damage caused by animals e.g. ‘six sheep mauled’
- control of animals e.g. ‘baiting with 1080’.



The striking but critically endangered Southern Corroboree Frog now lives in just 10% of its original range, within the Kosciuszko National Park in southern New South Wales. Trampling and habitat loss caused by feral pigs, horses and deer are among the threats pushing it towards extinction.

2.3 PEST ANIMALS AND WEEDS PROJECT SUMMARIES

DETECTION AND
INCURSION RESPONSE

A-032: NSW ENHANCED
PREPAREDNESS

Project status: Ongoing



Recent incursions impacting agriculture have identified deficiencies in the preparedness of NSW DPI laboratories to respond to biosecurity threats. Confounding factors contributing to this shortfall have included a lack of rapid and accurate tests, staff capacity and capability, non-availability of critical reagents, and the application of outdated resource-intensive methodologies, all of which have limited our ability to deliver accurate and timely results. Two critical areas highlighted for improvement are the timely implementation of appropriate diagnostics and their scalability.

The pest and disease list for this project now contains 444 biosecurity threats to animal and plant health. Diagnostics have now been developed for 69 pests and diseases and a further 76 are in development.

INTEGRATED LANDSCAPE MANAGEMENT:
WILD DOGS, FERAL CATS AND FOXES

A-041: NATIONAL WILD DOG
MANAGEMENT COORDINATOR

Project status: Ongoing



LEADER

Mr Greg Mifsud | National Wild Dog Management Coordinator | Centre for Invasive Species Solutions

PARTNERS

Australian Wool Innovation | Animal Health Australia
New South Wales Department of Primary Industries |
Queensland Department of Agriculture and Fisheries|
Western Australia Department of Primary Industries
and Regional Development | Primary Industries and
Regions South Australia | Sheep Producers Australia |
Wool Producers Australia.

AIM

Demonstration and transfer of landscape-scale collective community action across Australia. Connect and mentor a network of regional coordinators and local champions. Under the National Wild Dog Action Plan and Threatened Species Strategy Action Plan, enable a nationally coordinated approach to develop, trial, demonstrate, adapt and accelerate adoption of best practice management.

‘The National Coordinator project has been delivering integrated pest management programs for the past 15 years and has been the leader in the delivery of community led management programs for wild dogs that has translated into regional and state level management plans and control programs. The National Wild Dog Management Coordinator activities are intrinsically linked to the delivery of the National Wild Dog Action plan 2020-30 (NWDAP).

The National Coordinator has driven engagement in best practice wild dog management across a number of activities including but not limited to online presentations, research forums, workshops, field days and conference presence where many attendees left with glovebox and best practice management guides. The NWDAP Wild Dog Management Symposium in Armidale in March was extremely successful and appreciated by attendees. ~30 presenters across the two and half days covered all aspects of current research and provided an overview of wild dog management operations and policy from each state. It was an exceptional networking and information

sharing event that prompted discussions across all participants.

The National Coordinator met with staff from several States to discuss management challenges facing their jurisdictions. For example, bait allocation formula was discussed with the NT Government while in the ACT, the National Coordinator spoke to ACT National Parks Staff, Minister Vasarotti and her advisers about best practice wild dog management and the ACT’s current wild dog management program. This work effectively balances the need to reduce the impacts of wild dogs and dingos on livestock while conserving dingos in the ACT’s iconic Namadgi National Park. Discussions also took place about the use and benefits of 1080: staff confirmed the current program supports dingo conservation within the park while also aiding several native species when foxes take baits targeted at wild dogs, reducing their numbers. For example, Rosenberg’s Goanna (a threatened species in the ACT) is becoming more prevalent where predation by both wild dogs and foxes is reduced a result of this control program.

A-024: NORTH EAST NSW WILD DOG
COORDINATOR

Project status: Ongoing



LEADER

David Worsley | Centre for Invasive Species Solutions

PARTNERS

Australia Wool Innovation, Northern Tablelands Local Lands Service | Hunter Local Land Service

AIM

To mitigate the impacts by wild dogs and vertebrate pest species through the delivery of best practice wild dog and vertebrate pest management programs.

This project is aiming for best known and best practice change in the management of wild dogs in the Northern Tablelands and Hunter regions of NSW. The project aligns with the National Wild Dog Action Plan 2020-30 and the strategies of Australian Wool Innovation (AWI), and the Northern Tablelands Local Land Services (LLS) and Hunter LSS. The project will improve productivity, animal welfare and on-farm biosecurity.

As an industry-funded wild dog and vertebrate pest coordinator the NE NSW wild dog coordinator is driving on ground practice change. The coordinator is working with industry, statutory authorities, and public land managers. The goal is to reduce impacts from these pests on agricultural, biodiversity and social assets across the Northern Tablelands and Hunter regions of NSW. Initial funding supported the position until mid-2024 or until spent, whichever is sooner. The Northern Tablelands LLS and the Hunter LLS have provided extra funding to ensure the project can continue until June 2024. The Coordinator has been very active in teaching best practice on ground management to land holders as well as being actively involved in management activities such as aerial shooting and aerial baiting and has also run, in conjunction with NSW LLS, over a dozen feral pig FMD response workshops.

A-037: NATIONAL FERAL CAT AND FOX MANAGEMENT COORDINATOR

Project status: Ongoing



LEADER
Ms Gillian Basnett | National Feral Cat and Fox Management Coordinator | Centre for Invasive Species Solutions

PARTNERS
Department of Agriculture, Fisheries and Forestry

AIM
To build on the work of the Feral Cat and Fox Management Coordinator, first established through the Australian Government’s Bushfire Recovery Package. The coordinator aims to drive feral cat and fox management, increase participation and motivation to control feral cats and foxes using best practice methods to reduce their impacts on native fauna, industry and the environment and help raise awareness of the impacts of feral cats and foxes.

The project assisted with delivering actions identified in the 2015 Threat Abatement Plan for the Predation of Feral Cats and the Threat Abatement Plan for Predation by the European Red Fox as well as the Threatened Species Strategy 2022-2032 Action Plan.

The role of National Feral Cat and Fox Coordinator was expanded from the bushfire recovery project initiated in 2021 to encompass the whole of Australia and focus on reducing both biodiversity and agriculture impacts. Australia has the worst mammal extinction in the world with cats and foxes being implicated as key drivers in the extinction of at least 33 native species and continue to threaten an additional 200 nationally listed species. Despite their impact, effective coordinated management, particularly for feral cats, is limited, and effective options and tools are often unclear or unavailable.

The coordinator provided expert advice on best practice feral cat and fox management through facilitation, assistance with management plans and identifying gaps with stakeholders across the country leading to an uptake of improved evidence-based decisions in management programs based on the individual identified needs of stakeholder groups.

The coordinator promoted best practice management through media, training events, workshops, presentations, online forums, information stalls and online content including updating feral cat and fox management toolkits for PestSmart. The coordinator attended many community information events across Australia to raise awareness and build capacity and community with stakeholders and managers.

Two demonstration sites for effective feral cat and fox management are being established with a third under development. These sites will increase awareness of effective management techniques with fact sheets intended to be prepared based on the outcomes of the management undertaken.

The role of Feral Cat and Fox Management Coordinator has been renewed under a new project.

INTEGRATED LANDSCAPE MANAGEMENT: FERAL DEER
P01-L-002: THE ROLE OF WILD/FERAL DEER IN THE TRANSMISSION OF DISEASES OF LIVESTOCK

Project status: Completed



LEADER
Dr Carlo Paccioni | Arthur Rylah Institute for Environmental Research

PARTNERS
Arthur Rylah Institute for Environmental Research | La Trobe University | Vic Department of Economic Development, Jobs, Transport and Resources | NSW Department of Primary Industries | Funding support by the Australian Government Department of Agriculture, Fisheries and Forestry

AIM
To investigate the risk posed by deer to the livestock industry as hosts for exotic disease and to evaluate the effectiveness of possible mitigation strategies should an outbreak occur.

In Australia, feral deer can feed on agricultural landscapes and therefore pose a biosecurity risk to the agricultural sector as potential carriers of important livestock diseases such as foot-and-mouth disease (FMD).

FMD is highly contagious and is the exotic disease of greatest significance to Australian agriculture. A spatially explicit, multi-species model has been developed (Australian Animal Disease Spread Model; AADIS) to predict the movement of FMD virus through various Australian agricultural industries. However, this model currently does not include virus transmission between livestock and wildlife populations, including deer.

This project concluded in the 2022-23 year with the final milestone unable to be fully completed as it required the addition of a model on deer/livestock disease transmission incorporated into the AADIS system. Access to the AADIS system is through an inter-governmental agreement to which Victoria is not a signatory. The meant that the researchers had no access to the AADIS system. To overcome this barrier, a different disease transmission model was created from a previously published spatially explicit, individual based, SIR (Susceptible, Infectious, Recovered/Removed) epidemiological model. This model was re-parameterised, based on the results of this project. A hypothetical incursion of Foot and Mouth Disease (FMD) was used as a trial for the model where the disease had entered the deer population. Prevalence within the deer population and transmission to cattle was modelled over a 20-year period.

The modelling demonstrated that even with a low deer/cattle transmission rate, as the prevalence of the disease within the feral deer herd increases, there is an increase in transmission from deer to cattle. This modelling showed that feral deer may play a role in the epidemiology of the disease following an outbreak and this will have an impact on the livestock industry even with the limited transmission rate between deer and cattle using the FMD model. However, for Emergency Animal Diseases that have a higher transmission rate between deer and cattle, the impact to the livestock industry is likely to be much higher.

A-028: NSW WILD PIGS AND DEER

Project status: Ongoing



A novel technique to capture fallow deer was tested in June/July 2020 on a farm near Glen Innes, in northeast NSW. Over three days, four males and five females were captured using netguns fired from a helicopter. Each individual was equipped with a GPS tracking collar and was safely and quickly released on site. Following the satisfactory animal welfare outcomes of this method, an additional session was organised in the same location in September 2020.

Home ranges were calculated for all deer one month before and one month after the aerial shooting operations. Most deer maintained a high percentage of overlap between the two periods showing that aerial shooting did not push fallow deer away from their habitual home range. Fallow deer showed no change in movement behaviours during and after the shooting operation. In all sites, fallow deer showed a crepuscular activity with longer movements around sunrise and sunset. Preliminary analysis of tracking data of fallow deer in NSW shows that helicopter-based shooting is unlikely to displace deer away from their range and thus is a safe method to reduce deer densities and stop disease outbreaks.

A-029: NSW PREDATORS AND PREY

Project status: Ongoing



This project is intended to deliver management solutions (tools and practices) into the hands of land managers to minimise these impacts. It will maintain or expand current Centre and NSW DPI Prep4RESET wild fog, fox and feral pig projects. It may also supplement our current and new Commonwealth funding into rabbit biocontrol.

INTEGRATED LANDSCAPE MANAGEMENT: OTHER TOOLS

A-004: RODENTICIDES

Project status: Ongoing



LEADER

Dr Tony Buckmaster | Centre for Invasive Species Solutions

Dr Katherine Horak | USDA

PARTNERS

USDA | Grains Research & Development Corporation | Animal Control Technologies Australia

AIM

To progress the R&D and subsequential registration of a new rodenticide for use in Australia.

Rodent plagues cause significant damage to Australian crops. The most recent plague in 2021 which spanned most of Australia's cropping regions, caused a reported \$1 billion in losses to crops and farming enterprises in NSW alone. There is, on average, a mouse plague every seven years in each grain growing region and one every four years somewhere in Australia. At present there is only a single chemical that is approved for use in broadacre applications in Australia. Zinc phosphide (ZnP) is the only active ingredient available to Australian farmers to manage mouse outbreaks in broadacre situations.

This project is funded externally by GRDC with in-kind from the US Department of Agriculture. A Cooperative Research and Development Agreement (CRADA) was executed between the Centre and the USDA in December 2018. There has been an extended and comprehensive search to identify potentially suitable toxins to complement the current use of Zinc Phosphide for the control of rodents in broadacre cereal farming enterprises. After extensive literature and desk-top analysis, several potentially suitable toxins have been identified. Preliminary testing of one of these indicates that the toxin results in a quick and humane death for rodents.

In collaboration with researchers in the USDA, India and France, we have undertaken the first steps towards determining the suitability of this toxin for registration as a rodenticide in both Australia and the United States. Initial laboratory testing of the compound has shown that it is suitable as a rodenticide. Initial acute toxicity and mutagenicity testing have been completed and the results of those are positive.

A-008: LETHAL TRAP DEVICE/
PAPPUTTY™

Project status: Ongoing



LEADER
Dr Paul Meek | NSW DPI

PARTNERS
NSW Department of Primary Industries | Connovation Pty Ltd | Animal Control Technologies Australia Pty Ltd

AIM
To register and commercialise a wild dog and fox lethal trap device with the PAPPutty™ para-aminopropiophenone (PAPP) based product that could be applied on cloth put on trap jaws, which takes advantage of wild canids’ tendency to bite at the trap when captured.

To assist with wild dog management, some jurisdictions have allowed strychnine to be added to the jaws of traps for wild dogs. Once the wild dog is trapped, they instinctive bite at the trap, accessing the toxin, and self-euthanise. With the phasing out of strychnine, a suitable replacement needed to be developed. PAPPutty™, a para-aminopropiophenone based toxin, was successfully trialled as a potential replacement toxin.

PAPPutty™ was registered by the APVMA in September 2020. The licencing agreement for the manufacture and distribution of PAPPutty™ was executed in 2022. Application has recently been made to the APVMA for a minor change to the label to allow the product to be applied to either jaw of the trap (the initial label indicated the lazy jaw only). This application is progressing, and it is anticipated that the product will be available for release onto the market in late 2023/ early 2024.

U-014: REGISTRATION OF
GONACON™

Project status: Ongoing



LEADER
Dr Tony Buckmaster | Centre for Invasive Species Solutions

PARTNERS
ACT Government

AIM
To progress the registration of GonaCon™ in Australia as an injectable fertility control agent for macropods.

The Centre continues to collaborate with US Department of Agriculture and the licenced manufacturer, SpayFirst to progress the registration of GonaCon™ in Australia. Because stability and production data were not required to register GonaCon™ in the US but are a requirement for registration in Australia, preparing the APVMA registration package has been paused until these data issues can be resolved by the manufacturer.

INTEGRATED LANDSCAPE MANAGEMENT: BIOLOGICAL CONTROL
P01-B-003: TILAPIA BIOCONTROL:
PROSPECTING AND EVALUATION,
STAGE 1.

Project status: Completed



PROJECT LEADER
Dr Agus Sunarto | CSIRO

PARTNERS
CSIRO
James Cook University | University of the Sunshine Coast | NSW DPI Elizabeth Macarthur Institute Queensland Department of Agriculture and Fisheries Funding support by the Australian Government Department of Agriculture, Fisheries and Forestry

AIM
To evaluate tilapia diseases in the context of biocontrol more broadly and conduct a desktop review of Tilapia diseases and assess their potential as biocontrol agents. If one or more candidate agents are identified, then susceptibility of tilapia in Australian waterways will need to be determined followed by target specificity trials.

This project was funded to review tilapia pathogens and assess their potential as biocontrol agents. It included a business case presentation and potential cost-benefit analysis to advance the selection of new biocontrol agents for the future management of feral tilapia in Australia. Additionally, the project undertook proof of principle tank trials of Tilapia lake virus as this was the most promising of the biocontrol agents identified.

This project completed during the 2022-23 year following the conclusion of the TiLV tank trials. Two species of tilapia (Mozambique tilapia and Black mangrove cichlid aka spotted tilapia) were sourced from northern QLD. Susceptibility of both species to TiLV was undertaken through direct injection (virus directly injected into the fish), cohabitation testing (infected fish being added to a tank on non-infected fish) and immersion testing (virus added directly to the water).

Mozambique tilapia were the most susceptible to TiLV with 100% mortality for each of the trials undertaken. Time from introduction of the virus to complete mortality ranged from 8 days for the immersion trial to 13 days for the cohabitation trial. It is noted that Mozambique Tilapia are the most prevalent and widespread tilapia species in Australia at this time.

Black mangrove cichlids are also susceptible to TiLV but less so than Mozambique tilapia. The greatest mortality occurred in the injection trial at 63% after 14 days. Only 42% of fish perished during the cohabitation testing and no mortality attributed to TiLV was found during the immersion trial.

This study is a ‘proof of principle’ demonstration of the susceptibility to TiLV of two of the most prevalent tilapia species present in Australia as an initial step in determining the suitability of TiLV as a biocontrol.

P01-B-005: PROOF OF CONCEPT FOR GENETIC BIOCONTROL IN VERTEBRATES

Project status: Completed



LEADER
Dr Mark Tizard | CSIRO

PARTNERS
CSIRO

Macquarie University

Funding support by the Australian Government
Department of Agriculture, Fisheries and Forestry

AIM
To deliver assessment (proof-of-concept) for a genetic biocontrol strategy for vertebrate invasive species with a particular focus on fish. The outcome will either prove or disprove the genetic biocontrol strategy and thereby help to understand the opportunity or limitations to this approach to pest animal biocontrol.

The project seeks to create gene expressions in zebrafish models to control populations of invasive fish species. Two different types of zebrafish have been generated, each with a different expression system. Four systems were tested. Two did not prove viable. This is an important outcome since the level and distribution of expression of the gene variant, dCas9VPR, is harmful, even to itself. Generating two lines out of four constructs tested is valuable and a critical first step to generating the final ‘synthetic’ species.

The project concluded in the 2022-23 year following its extension due to circumstances beyond the control of the researcher team. Researchers were unable to find in the current literature reference to promoters for genes whose over-expression will drive lethality in females only and this investigation pathway was suspended. This is, in part, due to the unusual nature of sexual differentiation in zebra fish. As a result, the manuscript on female lethality was unable to be produced. However, a gene was discovered that, when removed, induced 100% sex reversal in fish. This process would result in a boost to the Self Stocking Incompatible Male System (SSIMS) as there would be an increase in the number of males in the system.

The project has delivered the first zebra fish lines, expressing dCas9-VPR to direct induced lethality and the modified zebra fish line required to cross with it to establish a self-protected synthetic species, self-sustaining but lethal in outcrossing to wild-type fish – the first effector step in a non-gene-drive genetic biocontrol system for vertebrate pests. The project has also produced a line of zebra fish that have complete sex reversal to ensure only male offspring are produced.

A-030: GENETIC TECHNOLOGY FOR MOUSE MANAGEMENT

Project status: Ongoing



LEADER
Professor Paul Thomas | University of Adelaide
Associate Prof Phill Cassey | University of Adelaide
Dr Owain Edwards | CSIRO

PARTNERS
University of Adelaide | CSIRO | New South Wales
Department of Primary Industries

AIM
Identify at least one genetic biocontrol strategy for population suppression of invasive mice and develop an online analytical tool that validates vertebrate pests as viable targets for genetic biocontrol, with mouse plagues in Australian agricultural settings as the first target to be evaluated.

Gene drive is a technology that aims to manipulate reproductive processes to disseminate a gene across a population. In terms of biocontrol, the gene selected would suppress the rate of reproduction and thus the overall spread and impact of the pest population. Several potential strategies have been selected as candidates for this gene drive.

The X-Shredder approach cuts specific X-Chromosome using CRISPR in developing sperm with fertilization by the remaining Y-Chromosome bearing sperm resulting in a bias towards only male offspring. It has been discovered that instead of biasing sperm production X-shredding in mice blocks development of all spermatocyte resulting in infertile males, these results are being prepared for publication.

Further strategy candidates use a ‘cleave and rescue’, approach where one expressed Cas9 disrupts genes with essential function and a recoded ‘cleave resistant’ gene provides essential function, meaning the population with the targeted disrupted gene perish and the recoded gene persists through the overall population. These strategies are partially working but are still under development.

Work undertaken by CSIRO also seeks develop analytical tools to assess the feasibility and risk of gene drive designs against various species Whole genomes have been generated for mouse populations across the grain-growing regions of SE Australia. There was significant genetic structuring of mouse populations, with a strong effect of isolation by distance. Mouse genomes were analysed for all prospective guide RNAs (gRNAs) that had consistent variation in the target sequence between target (QLD) and non-target (SA, NSW) populations, restricted to the transcribed regions of the genes and their 5 untranscribed regions (UTR). The effect of each sequence variant on conversion efficiency was estimated (it varies depending on the location in the gRNA). None of the variants identified were located within the PAM binding region of the gRNA, which would have the greatest effect on conversion efficiency. To date, the model has shown that none of the gRNA variation observed would be sufficient to prevent spread to, and elimination of the non-target populations.

WEEDS PORTFOLIO

P01-W-004: REVIEW/UPDATE
CONTROL SECTION OF WEED OF
NATIONAL SIGNIFICANCE MANUALS

Project status: Completed



LEADER
Shauna Potter | Wild Matters Pty Ltd
Matt Sheehan | Wild Matters Pty Ltd

PARTNERS
Wild Matters Pty Ltd | Funding support by the
Australian Government Department of Agriculture,
Fisheries and Forestry

AIM
To review and update where necessary the control
section for the Weeds of National Significance (WoNS)
manuals to ensure the manuals reflect best practice
control, to undertake a review on the current status of
biological control for the WoNS and report on current
biological control options, barriers to agents and on
what new agents might be available.

The Weeds of National Significant (WoNS) manuals
are pivotal to the management of these priority
weeds but are outdated in sections for some species.
The update addressed the chemical, mechanical and
biological control sections within these manuals and
includes additional new information as addenda. The
project identified gaps in control methods for different
weed species, and this knowledge will be used to help
identify new research areas. The research was focused
on practical, appropriate solutions.

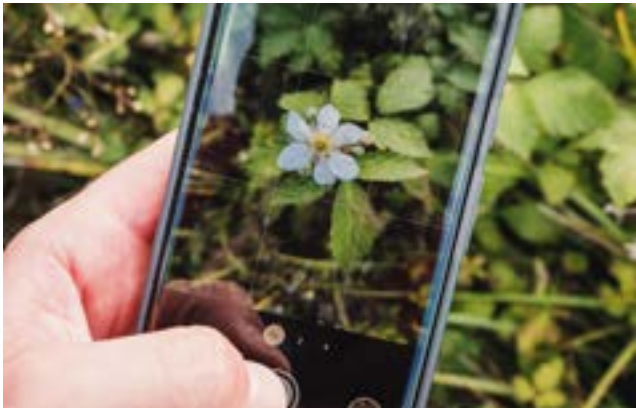
A substantial review of the control sections of the
WoNS manuals and supplementary information in
relation to control was undertaken. Revisions to the
control sections of 21 manuals were required. Addenda
were published for these 21 manuals to ensure
that best practice management practices are now
available. Publication of these addenda were delayed
as between the time of writing and the time of intended
publication, the APVMA has approved changes to the
label for a number of species. Additional revisions were
undertaken to ensure that the most accurate and up to
date information was included in the addenda.

In addition to reviewing current best practice WoNS
management, the researchers reviewed the extent
that biological control is available for WoNS and have
provided a report indicating what agents are available,
what barriers there are to the use / development of
agents, and what potential new agents are on the
horizon.

The outputs from this project have been submitted
to the Weeds Working Group for endorsement and
referral to the Environment and Invasive Committee.

A-021: WEEDSCAN: COMPUTER
VISION WEEDS ID APP AND
COMMUNITY MANAGEMENT AND
COMMUNICATION SYSTEM

Project status: Ongoing



LEADER
Dr Hanwen Wu | NSW Department of Primary
Industries

PARTNERS
NSW Department of Primary Industries | CSIRO |
Atlas of Living Australia | SA Department of Primary
Industries and Regions | Vic Department of Jobs,
Precincts and Region | Vic Department of Environment,
Land, Water and Planning | Department of Agriculture,
Fisheries and Forestry | Queensland Department of
Agriculture and Fisheries.

Funding support from the Australian Government's
National Landcare Program

AIM
To develop, trial and implement the WeedScan app and
web application that includes Australia's first real-time,
artificial intelligence-based weed identification tool,
links to best practice management information, and
a WeedScan Groups function to enable cooperative
community based action.

Early identification of weeds means that weed
management actions can be taken much earlier in the
invasion curve. Finding weeds when only a few plants
are present saves money and resources and prevents
significant damage to agricultural systems and natural
habitats.

WeedScan is Australia's first real-time, easy to
use automated identification for 459 national and
state priority and other weeds (new, emerging and
established) as well as an online system to better
enable cooperative community-led weed management.

WeedScan comprises a web application and Apple
and Android compatible apps linked to the national
WeedsAustralia weed profiles and relevant state weed
profiles where those exist.

This new tool will provide graziers, farmers, bush
regenerators, communities, natural resources
management (NRM) bodies and local, state and
Australian government biosecurity and weed officers
with an easy-to-use tool enabling:

- priority weeds to be identified, digitally recorded and
mapped quickly without expert knowledge
- easy access to best practice management information
by state or through WeedsAustralia
- action at the individual business level or as part of a
community led regional WeedScan Group.

The AI model used in the smart phone was trained on
more than 120,000 weed images. Most of these were
generated by CSIRO staff, who travelled to regions
around Australia and systematically photographed
key weeds encountered. Each photo showed only one
weed species and the entire training dataset was much
cleaner than datasets harvested from the internet. Due
to the clean training data, the AI model is 95% accurate
in identifying a weed in the top 1 place rising to 99%
accuracy for a top 5 place.

WeedScan is different from other plant ID Apps, such
as iNaturalist, in that it not only identifies weeds but
also links users to weed management information,
enables people to set up WeedScan Groups to foster
cooperative, regional weed management, and notifies
local or State weed officers if a high priority weed is
identified.

Over the reporting period, a final field trip to obtain
additional weed photos and 12 training workshops
attended by 213 participants across 11 NRM regions
were completed, the beta app and web application
were released, a data management plan and four user
guides were prepared.

Trialling of the WeedScan app and web application beta
version started in July 2023, and once improvements
are incorporated WeedScan is expected to be launched
late 2023-early 2024.

<https://weedscan.org.au>

A-026: NSW WEED MANAGEMENT

Project status: Ongoing



This project covers an integrated weed management approach in NSW consistent with national plans. The first component covering invasives grasses has concluded herbicide demonstration trials for serrated tussock, Chilean needle grass and African lovegrass testing a range of treatments across a range of treatments. A compiled report on the data from these sites will be completed December 2023. Component 2 focusing on Blue Heliotrope is currently testing the efficacy of range of herbicides on naturally growing field populations and seeking biocontrol options from Blue Heliotrope's natural range. A third component has been added in 2023 that will assess herbicide resistance.

A-027: NSW WEED BIOCONTROL

Project status: Ongoing



This project seeks to invest in weed biocontrol solutions, with the goal of streamlining the research through to implementation pipeline of new weed biocontrol agents, and assessing the efficacy of previously released agents. This will translate into faster implementation of new biocontrol solutions and the reinforcement existing ones. It is investigating and rearing biocontrol options including mealybug, long horn beetle and cactus weevil.

COMMUNITY ENGAGEMENT AND EDUCATION PROJECTS

COMMUNITY ENGAGEMENT AND EDUCATION PROJECTS

A-031: STRATEGIC COORDINATION FOR PEST PRACTICE MANAGEMENT OF THREE PEST ANIMALS

Project status: Ongoing



PROJECT LEADER

Feral Cats: Gillian Basnett | Centre for Invasive Species Solutions

Feral Deer: Dr Annelise Wiebkin | PIRSA

Feral Horses: Dr Trudy Sharpe | NSW DPI

PARTNERS

Department of Primary Industries and Regions, South Australia | NSW Department of Primary Industries | Department of Climate Change, Energy, the Environment and Water

AIM

To increase the impact and effectiveness of management of three pest animal species (feral cats, feral deer, and feral horses) through engaging a National Feral Cat and Fox Management Coordinator, providing assistance for the National Feral Deer Coordinator, and increasing collaboration and knowledge of feral horse best practice management methods amongst jurisdictions.

Provided under the Commonwealth Regional Bushfire Recovery for Multiregional Species and Strategic Projects Program, this project enabled appointment of the National Feral Cat and Fox Management Coordinator, reviews and updates of the national Feral Horse Control SOPs and supported the existing Feral Deer Coordinator. Due to COVID impacts affecting delivery of parts of the project the project was extended. The deer and feral cat/fox components were extended to 15 July 2022 while the horse component was extended to 15 December 2022 to ensure the delivery of the required outcomes.

The portions of this project relating to feral cats and feral deer were completed prior to this reporting period and, as such, are not report on. The feral horse portion of the project had been significantly impacted by COVID restrictions and has been extended by the Department to 15 December 2022 to allow for its completion. This project has updated the current Standard Operating Practices (SOPs) for feral horses, and these have been submitted to the TVWG for referral to EIC for endorsement. A guideline for the rehoming of feral horses has also been developed and is available on the Centres website. The feral horse portion of the project concluded 31 December 2022.

A-038: IMPROVED ADOPTION OF NATIONAL FERALS SCAN DIGITAL PLATFORM

Project status: Ongoing



LEADER
Peter West | NSW Department of Primary Industries

PARTNERS
NSW Department of Primary Industries |
Australian Wool Innovation

AIM
This project will maintain delivery of the national FeralScan digital platform for landholders, community groups, pest controllers and biosecurity organisations Australia-wide. This will provide continuity with surveillance, monitoring, reporting, planning and management of invasive species, especially wild dogs. This will also enable improved collaboration between private landholders, Government organisations and industry, with adoption of best-practice pest management practices.

FeralScan is a national digital community monitoring, reporting and management platform to enable community led, cooperative, regional scale pest animal management. It is aligned with the PestSmart best-practice management website that provides easy access to national wild dog management standard operating procedures and promoted by the National Wild Dog Coordinator project as a tool to facilitate cross-tenure regional management of wild dogs and other pest animals.

The FeralScan platform currently hosts >350,000 pest reports from communities and pest controllers across Australia and provides a user-friendly App and web-based resource for over 30,000 Australians. Participation is projected to reach 100,000+ Australians by 2027, enabling users to record, report and control pests collaboratively, using best-practice control techniques. FeralScan Groups is used by over 650 community and regional groups across the country to implement adaptive regional scale management and reporting.

This project will bring the experts together as a project team and establish a project advisory group consisting of State/Territory representatives, industry partners, IT expertise, behavioural science experts and pest control practitioners to maximise adoption of the FeralScan platform for improved pest management Australia-wide.

This project will engage with the National Coordinators (wild dog, pigs, foxes/cats, and deer), involve regional coordinators and regional biosecurity organisations, and connect with the national Landcare networks to enable adoption of FeralScan by groups involved in pest monitoring or pest control.



In 2021, feral deer cost the community \$91.3 million. This example of a deer exclusion fence is on the Bogong High Plains, Victoria. Image credit: Elaine Thomas, Parks Victoria.

SECTION 3

**PRODUCTS &
ENGAGEMENT**

3.1 NEW PRODUCTS & COMMERCIALISATION

Over the past year, several new commercial products have entered the market, been registered or otherwise progressed. These include legacy products from the Centre’s predecessor — the Invasive Animals Cooperative Research Centre (IA CRC) — as well as new products started by the Centre.

IA CRC legacy products include:

- HOGGONE® sodium nitrite feral pig bait. The culmination of more than 10 years’ work through a strategic partnership between Animal Control Technologies (ACTA), Meat and Livestock Australia, US Department of Agriculture and Invasive Animals Ltd. ACTA obtained Australian Pesticides and Veterinary Medicines Authority (APVMA) registration in September 2019, and the product is now commercially available. (<https://animalcontrol.com.au/>)



- PAPPutty™ Lethal Paste for Wild Canids for use on leg-hold traps. This extensive collaboration between Invasive Animals Ltd, NSW Department of Primary Industries and Connovation Ltd resulted in PAPPutty™ being registered by the APVMA in September 2020. It is in the final stages of commercialisation and will be available for sale soon through Animal Control Technologies (ACTA) which will manufacture and distribute the product.

- GonaCon Immunocontraceptive Vaccine for the nonsurgical sterilisation of kangaroos and wallabies is an international collaboration between Invasive Animal Ltd, the US Department of Agriculture (USDA), Spayfirst, CSIRO and the ACT Government. Initial difficulties with manufacturing processes have been overcome. Differences in registration processes and information requirements between the US and Australia have resulted in added impediments to the Australian registration process. The Centre remains in long-standing discussions with USDA and Spayfirst to ascertain whether these impediments will make Australian registration unviable or can be resolved.
- Wild Dog Alert and E-Tech Hub are collaborative artificial intelligence/machine learning based technology projects between Invasive Animals Ltd, Australia Wool Innovation, Meat and Livestock Australia, NSW Department of Primary Industries and the University of New England. They are now cooperating through a Commercialisation Governance Committee to oversee the commercialisation process. Commercialisation of outputs was initially being managed through the NSW Department of Primary Industries Global Ag-Tech Ecosystem (GATE) program however following an Expression of Interest process the nominated commercialisation partner withdrew due to the amount of development needed to get the proof of concept to a minimum viable product.

New product development or registration started under the Centre that will follow a commercialisation pathway to market include:

- a Feral Deer Aggregator. It currently has several prototype devices currently under trial and a suitable device will be carried through to commercialisation.
- extending the 1080 based feral cat bait, Eradicat® registration to three additional jurisdictions. Eradicat® is already registered and available in Western Australia. The Department of Primary Industries and Regions South Australia and Western

- Australia’s Department of Biodiversity, Conservation and Attractions are collaborating with Invasive Animals Ltd to undertake efficacy studies and APVMA application lodgement to expand registration to South Australia, Queensland and the Northern Territory.
- an RHDV2 vaccine. Development is well progressed: mono-valent and multi-valent vaccines were investigated to determine their respective efficacy, and the commercial viability of both products is being considered by NSW Department of Primary Industries.

Intellectual property management

Licensed IAL IP that generates royalties from the sale of products developed through the IA CRC (2005-17) is reinvested into the new Centre. Licensed intellectual property (IP) that generates royalties from the sale of products from the Pest Animal Control CRC (pre-2012) is disbursed to IP owners from that CRC.

IP NOVATED AND/OR MANAGED BY IAL FOLLOWING COMMERCIALISATION		
PRODUCT	ROYALTY IN 2022-23	DISTRIBUTION
PIGOUT®	\$866.53	Distributed to Pest Animal Control CRC Participants
HOGHOPPER	\$744.78	Retained by IAL
RODEMISE®	\$0	Retained by IAL
Wild dog and fox PAPP	\$95.62	Retained by IAL
HOGGONE®	\$18,264.74	Retained by IAL

3.1 NEW PRODUCTS & COMMERCIALISATION

Intellectual property (IP) strategy

IP as defined in the Portfolio No. 1 agreement encompasses all assets resulting from intellectual endeavour excluding Moral Rights. Public Good IP will continue to be managed in the same way as previous years and by the IA CRC - that is, all IP is 100% vested in IAL (called Centre and/or Portfolio IP) and available to all Portfolio Agreement parties for their own use in research, training and adoption.

- IP with commercial potential is managed distinctly from public good IP.
- Co-investors (Investor Partners) in a commercially orientated project (Specified Project) may legally and beneficially co-own project IP.
- Specified Project IP is distinguished from Centre IP.
- Specified Project IP ownership is determined by a process that is agreed to by Specified Project participants directly involved in the project.
- All investors in a Specified Project have a say in developing the terms under which project IP will be commercialised.

This approach is consistent with national principles for the management of IP generated using publicly funded research and ensures that R&D that is commercialised benefits Australia and Australian investors in innovation in pest animal management.

Digital assets

The Centre for Invasive Species Solutions is maintaining and upgrading several of our leading pest and weed management digital tools, including:

- PestSmart (knowledge hub) | pestsmart.org.au
- Weeds Australia (knowledge hub) | weeds.org.au
- Community engagement tool (knowledge hub) | community.invasives.com.au
- FeralScan (community surveillance digital platform) | feralscan.org.au
- Rabbit management planning decision support tools | <https://landcare.shinyapps.io/SimRab>
- Field Guide to Pest Animals of Australia (app) | iTunes Apple store

In addition, the WeedScan web and mobile app moved into beta testing this year. The Centre recognises the role of digital technology as a core enabler of present and future best-practice in pest animal management. All our digital tools have been enhanced and integrated to provide end users with improved community features and better ways to connect.

Intellectual property protected (non-patent)

Table 1: Intellectual Property currently held for commercial purposes

IP DESCRIPTION AND PRODUCT NAME	IP CREATION DATE BY YEAR	LICENCE NATURE
Blue Healer trademark	2005	Not applicable
HOGHOPPER design and manufacturing specifications	2010	Exclusive (worldwide)
Rodenticide pen/field efficacy studies	2005-2008	Exclusive (in Australia)
Nitrite-based pesticide products: Commercialisation of granted patents, Aus, NZ, USA and Canada	2007 2003-2005	Exclusive (worldwide)
PIGOUT pen/field efficacy studies	2005-2014	Exclusive (worldwide)
PAPP wild dog and fox bait and toxin	2012	Not applicable
PestSmart trademark	2015	Not applicable
LandSmart trademark	2016	Not applicable
FarmSmart trademark	2016	Not applicable
AntSmart trademark	2015	Not applicable
AVPC trademark	2015	Not applicable
Centre for Invasive Species Solutions trademark	2017	Not applicable
PlantSmart	2018	Not applicable
FeralScan trademark	2018	Not applicable
BiteMe trademark	2018	Not applicable
PAPPutty trademark	2019	Not applicable
Wild Dog Alert trademark	2019	Not applicable
WeedScan trademark	2019	Not applicable
BiosecuritySmart trademark	2020	Not applicable
WeedScan (with new logo) trademark	2022	Not applicable
Weeds Australia (with logo) trademark	2022	Not applicable
ThermEye trademark	2023	Not applicable

3.1 NEW PRODUCTS & COMMERCIALISATION

Patents

IAL has maintained and managed patents and patent applications for the use of nitrite salts as poisons in baits for omnivores. The development work in nitrite salts is focused on feral pig control. Patented IP managed during the reporting period includes:

PATENT NAME
Australian granted patent AU 2008221237 — Nitrite Salts as Poisons in Baits for Omnivores
New Zealand granted patent 579357 — Nitrite Salts as Poisons in Baits for Omnivores
United States of America granted patent US 9750242 — Nitrite Salts as Poisons in Baits for Omnivores
Canadian patent application 2677935 — Nitrite Salts as Poisons in Baits for Omnivores. Exclusive (worldwide)

Option agreements to commercialise intellectual property

Table 2: Option agreements to commercialise intellectual property

IP DESCRIPTION AND PRODUCT NAME	CONTRACT	IP CREATION DATE	LICENCE NATURE
Rodenticide (CRADA) with USDA	USDA	2013–2017	Exclusive (worldwide)
HOGGONE® USA (CRADA) with USDA	USDA	2013–2017	Exclusive (worldwide)
Microencapsulated sodium nitrite formulations (CRLA) with Texas Parks and Wildlife	Texas Parks and Wildlife Department USDA	May 2015	Exclusive (worldwide)
Rodenticide (CRADA)	USDA	2017–2022	Exclusive (worldwide)



Australia may now have the largest wild population of feral camels, including *Camelus dromedarius*, in the world. Learn more at pestsmart.org.au/pest-animals

3.2 RESEARCH EXCELLENCE

The Centre again delivered a substantial body of research as the direct result of its collaborative research projects. During the financial year, a total of 22 peer-reviewed, scientific publications and 56 technical reports were published following the conclusion of Portfolio No. 1 projects.

These focused on both prevention and early response to new and emerging invasive species, and strategic landscape scale management of established vertebrate and weed pests.

The Centre’s research informs best practice management, and the development and subsequent adoption of new tools, technologies and systems that support land managers to effectively deal with invasive species.

In addition, in September and October 2022 the Centre presented two events showcasing the research completed through Portfolio No. 1. The first, Celebrating and showcasing impact, brought the Centre’s extensive research, development and engagement efforts to life with researchers presenting their findings to peers, colleagues and industry leaders. The occasion recognised the 31 projects funded under Portfolio No. 1 addressing national biosecurity and invasive species RD&E priorities. The second, the Balanced Scientist & Researcher Program Celebration, provided participants with the opportunity to share the research undertaken during their participation in the program.

A full list of this year’s publications is presented below by research domain.

Invasive Animals Portfolio

DETECTION AND INCURSION RESPONSE DOMAIN

P01-I-002: UNDERSTANDING OF AND INTERVENTION IN ILLEGAL TRADE IN NON-NATIVE SPECIES

Deliveyne N, Cassey P, Linacre A, Delean S, Austin JJ and Young JM (2022) Recovering trace reptile DNA from the illegal wildlife trade. Forensic Science International: Animals and Environments, 2.

Lassaline C, Stringham O, Moncayo S, Toomes A and Cassey P (2023). Untangling the web: Dynamics of Australia’s online terrestrial invertebrate trade. Austral Entomology.

Toomes A, Moncayo S, Stringham O, Lassaline C, Wood L, Millington M, Drake C, Jense C, Allen A, Hill KGW, García-Díaz P, Mitchell L and Cassey P (2023) A snapshot of online wildlife trade: Australian e-commerce trade of native and non-native pets. Biological Conservation 282 (110040).

P01-I-003: DEVELOPMENT OF INTEGRATED PASSIVE AND ACTIVE SURVEILLANCE TOOLS AND NETWORKS

Caley P and Cassey P (2023) Do we need to mine social media data to detect exotic vertebrate pest introductions? Wildlife Research.

Caley P and Barry S (2023) Effectiveness of citizen surveillance for detecting exotic vertebrates. Frontiers in Ecology and Evolution.

Kelly CL, Schwarzkopf L, Christy TM, & Kennedy MS. (2023) The toad less travelled: comparing life histories, ecological niches, and potential habitat of Asian black-spined toads and cane toads. Wildlife Research.

P01-I-005: TOOLS FOR COST-EFFECTIVE DECISIONS FOR VERTEBRATE PEST ERADICATIONS

Anderson D, Pepper M, Travers S, Michaels T, Sullivan K, Ramsey D (2022) Confirming the broadscale eradication success of nutria (Myocastor coypus) from the Delmarva Peninsula, USA. Biological Invasions 24, 3509-3521.

Dean P, Anderson I, Rouco C, Latham MC and Warburton B (2022) Understanding spatially explicit capture-recapture parameters for informing invasive animal management. Ecosphere 13(11).

FINAL DOMAIN REPORTS:

Caley P, Campbell S, Csurhes S and Cassey P (2022) Development of integrated passive and active surveillance tools and networks (Final Report for P01-I-003). Report for the Centre for Invasive Species Solutions, Canberra.

Campbell S, Armstrong K, Barnard D, Lucas D and Yuki Konishi (2020). Automated Detection: Triggering Smarter, Faster, Better Response to Incursions: Final Reports for Project P01-T-002. Report for the Centre for Invasive Species Solutions, Canberra.

Dawson S, Adams P, Low T, Ulhaq A, Khan A, Paul M and Cox T (2022). Automated Thermal Imagery Analysis Platform for Multiple Pest Species: Final Report for Project P01-T-003. Report for the Centre for Invasive Species Solutions, Canberra.

Gleeson DM, Trujillo-González A, Rojahn J, Duncan R and Furlan E (2023) Real time eDNA tools to improve early detection and response approaches for high-risk pest animals (Final Report for P01-I-004). Report for the Centre for Invasive Species Solutions, Canberra.

Ramsey D, Anderson D, Gormley, Scroggie M and Howard S (2023) Tools For Developing Cost-Effective Decisions For Managing Invasive Pest Eradications (Final report of Project P01-I-005). Report for the Centre for Invasive Species Solutions, Canberra.

Stringham O, Maher J, Lassaline C, Wood L, Toomes A, Moncayo S, Hill K, Mitchell L, Ross J and Cassey P (2023) ‘Understanding and Intervening in Illegal Trade in Non-Native Species and Biosecurity Surveillance of E-Commerce for Illegal Trade in Declared Plants’ (combined final report for P01-I-002 and P01-W-003). Report for the Centre for Invasive Species Solutions, Canberra.

3.2 RESEARCH EXCELLENCE

INTEGRATED LANDSCAPE MANAGEMENT: WILD DOGS, FERAL CATS AND FOXES

P01-L-003: MANAGEMENT OF WILD DOG AND DEER IN PERI-URBAN LANDSCAPES: STRATEGIES FOR SAFE COMMUNITIES

Amos M, Pople A, Brennan M, Sheil D, Kimber M, and Cathcart A (2022). Home ranges of rusa deer (*Cervus timorensis*) in a subtropical peri-urban environment in South East Queensland. *Australian Mammalogy*, 45(1), 116-120.

Harriott L, Amos M, Brennan M, Elsworth P, Gentle M, Kennedy M, Pople T, Scanlan J, Speed J and Osunkoya OO, 2022. Statewide prioritisation of vertebrate pest animals in Queensland, Australia. *Ecological Management & Restoration*, 23(3), 209-218.

Harriott L, Speed J, Gentle M. (2023) Best-practice management of wild dogs in peri-urban environments (glovebox guide). Centre For Invasive Species Solutions, Canberra.

Li-Williams S, Stuart KC., Comte S, Forsyth DM., Dawson M, Sherwin WB., Rollins LA. (2023) Genetic analysis reveals spatial structure in an expanding introduced rusa deer population. *Wildlife Research* 50, 757-769.

P01-L-006: ASSESSMENT OF THE BIODIVERSITY, ECONOMIC AND PRODUCTIVITY GAINS FROM CLUSTER FENCING (WA)

Dawson SJ, Kreplins TL, Kennedy MS, Renwick J, Cowan MA, and Fleming PA (2023). Land use and dingo baiting are correlated with the density of kangaroos in rangeland systems. *Integrative Zoology*, 18(2), 299-315.

A-037 NATIONAL FERAL CAT AND FOX COORDINATOR

Centre for Invasive Species Solutions (2023) Planning Guide for Fox Management in Australia. A PestSmart publication. The Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Planning Guide for Feral Cat Management in Australia. A PestSmart publication. The Centre for Invasive Species Solutions, Canberra.

FINAL DOMAIN REPORTS:

Gentle M, Amos M, Brennan M, Comte S, Forsyth D, Harriott L, Hampton J, Low-Choy D, Kelly C, Michaelien T, Speed J and Taygfeld P (2022). Management Of Wild Dogs and Deer in Peri-Urban Landscapes: Strategies for Safe Communities: Final Report for Project P01-L-003. Report for the Centre for Invasive Species Solutions, Canberra.

Kennedy M, Allen B, Allen L, Carter J, Castle G, Elsworth P, Pahl L, People T, Scanlan J and Star M (2022). Assessment of the Biodiversity, Economic and Productivity Gains from Exclusion Fencing, Queensland: Final Report for Project P01-L-005. Report for the Centre for Invasive Species Solutions, Canberra.

Kreplins T, Kennedy M, Fleming T, Dawson S, Miller J, Barwick J, Macleay C, Omogbeme M, O’Leary R, Renwick J, and Cowan M (2022). Assessment of the Biodiversity, Economic and Productivity Gains from Exclusion Fencing, Western Australia: Final Report for Project P01-L-006. Report for the Centre for Invasive Species Solutions, Canberra.

Meek P, Ballard G, Abell J, Milne H, Van der Eyk J, Smith D, Collingridge L, Hine A and Fleming P (2022). Preparing For Reset Landscape Predator Management [Prep4Reset]: Final Report for Project P01-L-004. Report for the Centre for Invasive Species Solutions, Canberra.

Mifsud G (2022). National Wild Dog Management Coordinator: Final Report for Project P01-E-005. Report for the Centre for Invasive Species Solutions, Canberra.

Tarran M (2022). National Registration with The APVMA of A Poison Feral Cat Bait Containing 1080 in the Liquid Form – Stage 1: Final Report for Project P01-T-004. Report for the Centre for Invasive Species Solutions, Canberra.

INTEGRATED LANDSCAPE MANAGEMENT: FERAL DEER

P01-L-001: BEST PRACTICES FOR COST-EFFECTIVE MANAGEMENT OF WILD DEER

Bengsen AJ, Forsyth DM, Pople AR, Brennan M, Amos M, Leeson M, Cox TE, Gray B, Orgill O, Hampton JO, Crittle T and Haebich K (2022) ‘Effectiveness and costs of helicopter-based shooting of deer’, *Wildlife Research*, 50(9) 617-631.

Comte S, Thomas E, Bengsen AJ, Bennett A, Davis NE, Brown D and Forsyth DM (2023) ‘Cost-effectiveness of volunteer and contract ground-based shooting of sambar deer in Australia’, *Wildlife Research*, 50(9) 617-631.

Forsyth DM (2022) Using exclusion fencing to manage wild deer impacts in Australia, NSW DPI.

Forsyth DM, Comte S, Bengsen AJ, Hampton JO, and Pople AR. Glovebox Guide for Managing Wild Deer. Centre for Invasive Species Solutions, Canberra.

McLeod R (2022) Annual Costs of Wild Deer in Australia. A report to the Centre for Invasive Species Solutions, eSYS Development Pty Limited.

FINAL DOMAIN REPORTS:

Comte S, Forsyth D, Bengsen A, Hampton J and Pople A (2023). Cost-Effective Management of Wild Deer: Final Report for Project P01-L-001. Report for the Centre for Invasive Species Solutions, Canberra.

McKenzie J, Korcz M, Page B, Wiebkin A and Marcus J (2022). Feral Deer Aggregator: Final Report for Project P01-T-001. Report for the Centre for Invasive Species Solutions, Canberra.

Wiebkin A, Evenden S and Page B (2022). National Feral Deer Coordinator: Final Report for Project P01-E-003. Report for the Centre for Invasive Species Solutions, Canberra.

INTEGRATED LANDSCAPE MANAGEMENT: BIOLOGICAL CONTROL

P01-B-001: UNDERSTANDING RHDV2 INTERACTION WITH OTHER RHDVS AND ITS POTENTIAL AS AN ADDITIONAL RABBIT BIOCONTROL AGENT

Updated Rabbit Management Glovebox Guide

Hardaker T (2022) ‘An Analysis of the Potential Net Benefits of the Registration of RHDV2 as a Tactical Biocontrol Agent (Biocide) for the Control of Pest Rabbits in Australia’, report prepared by ACRE Economics.

Ramsey DS, Patel KK, Campbell S, Hall RN, Taggart PL, Strive, T (2023) Sustained Impact of RHDV2 on Wild Rabbit Populations across Australia Eight Years after Its Initial Detection. *Viruses*, 15(5), 1159.

P01-B-002: INCREASED AND EXTENDED IMPACTS OF EXISTING BIOCONTROL AGENTS BY IMPLEMENTING NEW APPLICATION STRATEGIES (NATIONAL RABBIT BIOCONTROL OPTIMISATION)

Pacioni C, Hall RN, Strive T, Ramsey DSL, Gilland M and Vaughan TG (2022) ‘Comparative epidemiology of rabbit haemorrhagic disease virus strains from viral sequence data’. *Viruses*, 15(1) 21.

P01-B-003: TILAPIA BIOCONTROL: PROSPECTING AND EVALUATION, STAGE 1

Sunarto A, Grimm J, McColl K, Ariel E, Nair KK, Corbeil S, Hardaker T, Tizard M, Strive T, and Homes B. (2022) Bioprospecting for biocontrol agents for invasive tilapia in Australia. *Biological Control* 174.

3.2 RESEARCH EXCELLENCE

A-030 GENETIC TECHNOLOGY FOR MOUSE MANAGEMENT

Birand A, Cassey P, Ross JV, Russell JC, Thomas P and Prowse TAA (2022). Gene drives for vertebrate pest control: Realistic spatial modelling of eradication probabilities and times for island mouse populations. *Molecular Ecology*, 31, 1907–1923.

Birand A, Cassey P, Ross JV, Thomas PQ, Prowse TAA (2022) Scalability of genetic biocontrols for eradicating invasive alien mammals. *NeoBiota*, 74, 93–103.

Gierus L, Birand A, Bunting MD, Godahewa GI, Piltz SG, Oh KP, Antoinette J, Piaggio AJ, Threadgill DW, Godwin J, Edwards O, Cassey P, Ross J, Prowse T and Thomas P. (2022) Leveraging a natural murine meiotic drive to suppress invasive populations. *PNAS*, 46.

FINAL DOMAIN REPORTS:

Sunarto A, Hardaker T, Hick P, Grimm J, Spiers Z, Nair K K, Holmes B, Ariel E, Kirkland P, Tizard M and Strive T (2023). Tilapia Biocontrol Prospecting and Evaluation, Stage 1: Final Report for Project P01-B-003. Report for the Centre for Invasive Species Solutions, Canberra.

Taggart P L and Strive T (2022). Understanding RHDV2 Interaction with Other RHDVS and its Potential as an Additional Rabbit Biocontrol and National Rabbit Biocontrol Optimisations: Final Report for Projects P01-B-001 and P01-B-002. Report for the Centre for Invasive Species Solutions, Canberra.

Tizard M, Maselko M, and Pfitzner C (2023) Proof of concept for genetic biocontrol in vertebrates: Final report for Project P01-B-005. Report for the Centre for Invasive Species Solutions, Canberra.

UNALIGNED REPORT:

Centre for Invasive Species Solutions (2022) 20-year National Weed Biocontrol Pipeline Strategy: Consultation, Centre for Invasive Species Solutions, Canberra.

COMMUNITY ENGAGEMENT AND EDUCATION PROJECTS

P01-E-001: BEHAVIOURALLY EFFECTIVE COMMUNICATION AND ENGAGEMENT IN THE MANAGEMENT OF WILD DOGS

McLeod LJ, Howard TM, Driver AB and Hine DW (2023). Evaluating Behaviour Change Interventions: A Practical Guide. Centre for Invasive Species Solutions, Canberra.

McLeod LJ and Hine DW (2023) Wild dog management: understanding rural landholders' willingness to participate in coordinated control programs. *Australasian Journal of Environmental Management*, 30(1), 88-106.

P01-E-004: DELIVERY OF THE BALANCED RESEARCHER DOCTORAL LEADERSHIP PROGRAM

Buckmaster T (2023) Guide to the Balanced Researcher Program: enhanced PhD training. Centre for Invasive Species Solutions, Canberra.

FINAL DOMAIN REPORTS:

Buckmaster T (2022). Balanced Researcher Program: Final Report for Project P01-E-004. Report for the Centre for Invasive Species Solutions, Canberra.

Exon F (2022). Development of a National 'Invasive Species Management' Digital Information Portal: Final Report for Project P01-E-008. Report for the Centre for Invasive Species Solutions, Canberra.

Dickson K (2023). Behaviourally Effective Communication and Education in Management of Wild Dogs: Final Report for Project P01-E-001 Part 2. Report for the Centre for Invasive Species Solutions, Canberra.

McLeod L, Dickson K and Hine D (2023). Behaviourally Effective Communication and Education in Management of Wild Dogs: Final Report for Project P01-E-001 Part 1. Report for the Centre for Invasive Species Solutions, Canberra.

West P (2023). Facilitating Community Adoption of Digital Resources (FeralScan): Final Report for Project P01-E-002. Report for the Centre for Invasive Species Solutions, Canberra.

TOWARD A WEEDS PORTFOLIO

P01-W-003: BIOSECURITY SURVEILLANCE OF E-COMMERCE AND OTHER ONLINE PLATFORMS FOR ILLEGAL TRADE IN PLANTS

Maher J, Stringham OC, Moncayo S, Wood L, Lassaline CR, Virtue J, Cassey P (2023) Weed wide web: characterising illegal online trade of invasive plants in Australia. *NeoBiota* 87, 45-72.

P01-W-004 WONS ADDENDUMS

Updated WoNS Manual control sections.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of rubber vine (*Cryptostegia grandiflora*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of boneseed (*Chrysanthemoides monilifera* ssp. *monilifera*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of parthenium weed (*Parthenium hysterophorus*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of bridal creeper (*Asparagus asparagoides*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of Chilean needle grass (*Nassella neesiana*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of pond apple (*Annona glabra*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of mesquite (*Prosopis* spp.). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of prickly acacia (*Vachellia nilotica*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of parkinsonia (*Parkinsonia aculeata*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of willows (*Salix* spp.). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of athel pine (*Tamarix aphylla*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of bitou bush (*Chrysanthemoides monilifera* ssp. *rotundata*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of bellyache bush (*Jatropha gossypifolia*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of lantana (*Lantana camara*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of gorse (*Ulex europaeus*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of serrated tussock (*Nassella trichotoma*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

3.2 RESEARCH EXCELLENCE

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of blackberry (*Rubus* spp.). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of opuntoid cacti (*Austrocylindropuntia*, *Cylindropuntia* and *Opuntia* spp.). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of asparagus weeds (*Asparagus* spp.). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

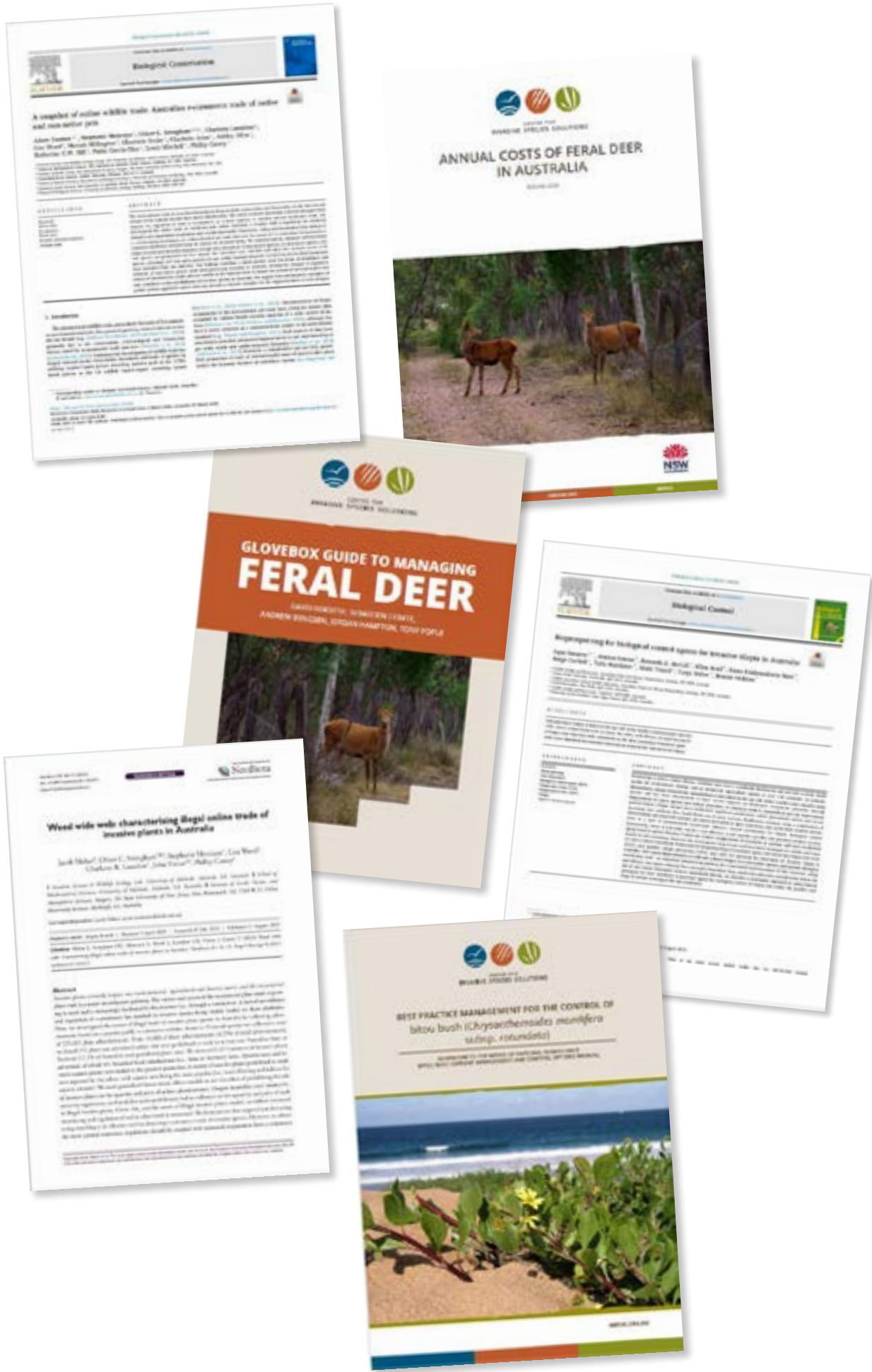
Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of Scotch broom (*Cytisus scoparius*), Montpellier broom (*Genista monspessulana*) and flax-leaf broom (*G. linifolia*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

Centre for Invasive Species Solutions (2023) Best practice management addendum for the control of silverleaf nightshade (*Solanum elaeagnifolium*). A Weeds Australia publication. Centre for Invasive Species Solutions, Canberra.

FINAL DOMAIN REPORT:

Stringham O, Maher J, Lassaline C, Wood L, Toomes A, Moncayo S, Hill K, Mitchell L, Ross J and Cassey P (2023) ‘Understanding and Intervening in Illegal Trade in Non-Native Species and Biosecurity Surveillance of E-Commerce for Illegal Trade in Declared Plants’ (combined final report for P01-I-002 and P01-W-003). Report for the Centre for Invasive Species Solutions, Canberra.

This sample of academic research papers, reports and planning guides reflects the Centre’s leadership in best practice management, development and adoption of new tools, technologies and systems in invasive species solutions.



3.3 COMMUNICATION & MEDIA

MEDIA

A key media focus for the year was to highlight the release of the Centre’s Portfolio No. 1 outputs to ensure the guidelines, tools and practices that can better support biosecurity and invasive species management responses were promoted widely. Combined with focus from media on the issue of wild dog management versus dingo protection and the use of 1080 baiting

meant that the Centre received approximately 500 media mentions for the year.

Media coverage continued to be broad, with radio and newspapers outputs featuring strongly. TV reach continued to be a challenge with increased focus on this medium planned for the next reporting period.

WEBSITE

The Centre’s website attracted 22,342 users (slight increase from the previous year) with 53,919 page views. The most visited pages were:

- Homepage
- Our publications
- Research page.

An important project which commenced this reporting period was the re-design of the Centre’s research project pages, to ensure all publicly available assets from Portfolio No. 1 can be accessed from these pages. This project is due for completion late 2023.

SOCIAL MEDIA

This financial year, the Centre continued to increase its visibility and reach across its social media platforms - Facebook, X (formerly known as Twitter) and LinkedIn - to enhance the Centre’s brand awareness.

This strategy was to ensure the Centre’s purpose as a leading authority and coordinator of Australian invasive species solutions gained a broader following beyond its traditional stakeholders. This focus saw significant audience increases across all three platforms with a total audience of over 5,000 for the year (compared to approximately 2,000 the previous year).

Now this increased presence has been achieved, the Centre will transition into a consolidation phase of its social media activity, assessing its purpose and moving to a more subtle approach to maintaining brand awareness.

Media releases distributed this reporting period include:

[Putting a dent in feral cat and fox numbers, one plan at a time](#)

[New guide sheds light on challenges facing peri-urban communities from wild dogs](#)

[New Biocontrol Pipeline Offers Opportunities to Reduce National Weed Bill](#)

[Next generation of researchers ready to take on Australia’s biosecurity and invasive species challenges](#)

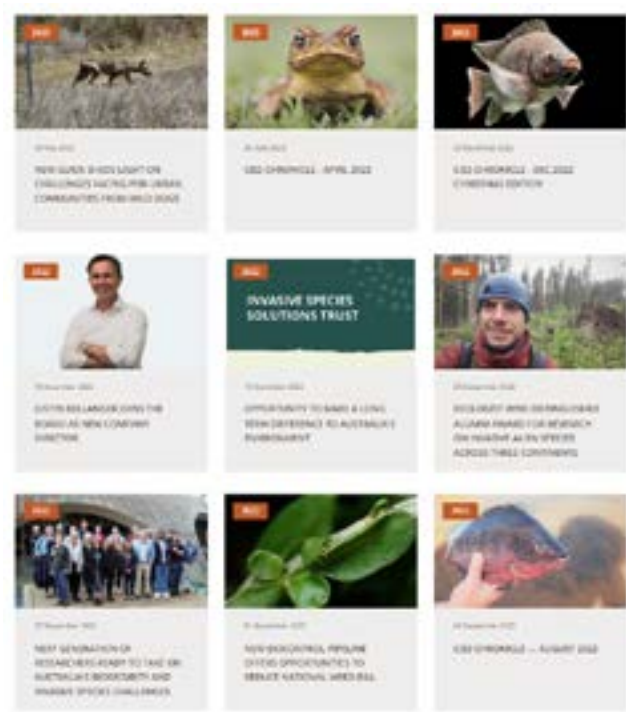
[State of the environment report indicates it’s time to double down on pests and weeds](#)

[New monitoring tool to put the brakes on illegal plant trade in Australia](#)



Channel 7’s Sydney news bulletin reported on urban fox activity with input from the Centre.

An important project which commenced this reporting period was the re-design of the Centre’s research project pages.



Snapshot of the Centre’s 2022-23 media and communications activity.



A sample of some of the Centre’s social media activity during the year.

3.3 COMMUNICATION & MEDIA

EVENTS

The Centre played a role as host, exhibitor, speaker, attendee and sponsor at various events throughout the year. Some of these included:

- National Feral Cat and Fox Management Coordinator Forum Series
- National Wild Dog Action Plan Symposium
- Centre Portfolio No. 1 celebration
- Centre Balanced Researcher Program celebration
- National Landcare Conference
- 22nd Australasian Weeds Conference
- 2nd WA Feral Cat Symposium
- Rabbit R&D Forum.



Tony Buckmaster and Gillian Basnett at the 2nd Feral Cat Symposium in WA.



The Centre's exhibition stand at the 2022 National Landcare Conference.

COLLATERAL

Newsletter



The Centre's monthly newsletter (*The CISS Chronicle*) continued providing timely updates to subscribers with key stories over the past 12 months including:

- [New guide sheds light on challenges facing peri-urban communities from wild dogs](#)
- [Invasive species achievements documented in new booklet](#)
- [2021 State of the Environment Report](#)
- [Final design of the Deer Aggregator](#)
- [Tilapia lake virus considered most promising biocontrol agent for Mozambique tilapia](#)

Factsheets

Invasive Grasses: Highlights the environmental and agricultural impacts of invasive grasses.

Using our Smarts to get Rid of Weeds: Showcases the work the Centre is doing to address the impact of invasive plants and animals across Australia.



MEMBER ENGAGEMENT

Quarterly Member Communiques continued to be an important conduit for communication between the Centre and its members, providing updates on key issues.

The Centre also hosted several Member and Communique meetings.



Highlights from the March 2023 Member Communique.

3.3 COMMUNICATION & MEDIA

DIGITAL SUPPORT SYSTEMS AND TOOLS

The Centre manages several online platforms to support invasive species best practice management and adoption. Many new resources and tools were added to these sites during the year.

Key achievement this reporting period was the refinement of the navigation, functionality and home page layouts for the PestSmart and Weeds Australia websites.



feralscan.org.au

FeralScan provides a pest animal recording and management tool for Australian land managers.

The FeralScan website attracted 143,000 users with 383,570 page views, both increases on activity from the previous year (108,428 and 371,264 respectively).

The most popular pages were:

- FeralScan homepage
- FoxScan map page.



An interface in the FeralScan app.

KEY FERALSCAN FACTS



350,000 + records of pest animal sightings, photos and damage reports



Over 30,000 registered users



App downloaded more than 13,000 times



Over 650 landholder and community groups

Can record and monitor up to 27 different pest animals



Real time alerts deployed over 36,000 times



pestsmart.org.au

The PestSmart website provides land managers with information toolkits to manage pest animals and the knowledge to plan, implement and improve their control programs.

PestSmart attracted 277,719 users and 442,982 page views during the financial year, both increases on activity from the previous year (223,963 and 366,849 respectively).

The most popular pages were:

- Facts of 1080 baiting
- PestSmart homepage
- Toolkit resources – how did the cane toad arrive in Australia.



weeds.org.au

Weeds Australia provides land managers with the latest information to effectively manage invasive weeds.

The Weeds Australia website attracted over 87,555 (small increase from the previous year which had 83,403 users) and 277,404 page views (a minor decrease from the previous year which had 278,429).

The most popular pages were:

- Weeds Australia homepage
- Weeds profiles
- identify a weed.

Community Invasive Action

community.invasives.com.au

Community Invasives Action provides tailored resources for coordinators supporting communities to take action on invasive species. This includes printable training guides on designing, evaluating and communicating behaviour change interventions based on the Centre's previous five-year community engagement program.

The microsite attracted 1,091 users, with 1,589 page views (both increases from the previous year).

SECTION 4

**GOVERNANCE
& FINANCE**

4.1 GOVERNANCE & MANAGEMENT

Invasive Animals Ltd (IAL) is a public company limited by guarantee incorporated and domiciled in Australia. The Centre’s governance and management for 2023 was again a year of achieving high standards across this function to ensure compliance and member needs are met.

IAL has been endorsed by the Australian Taxation Office, as a tax concession charity and exempt from income tax and is registered as a Charity with the Australian Charities and Not-for-Profit Commission.

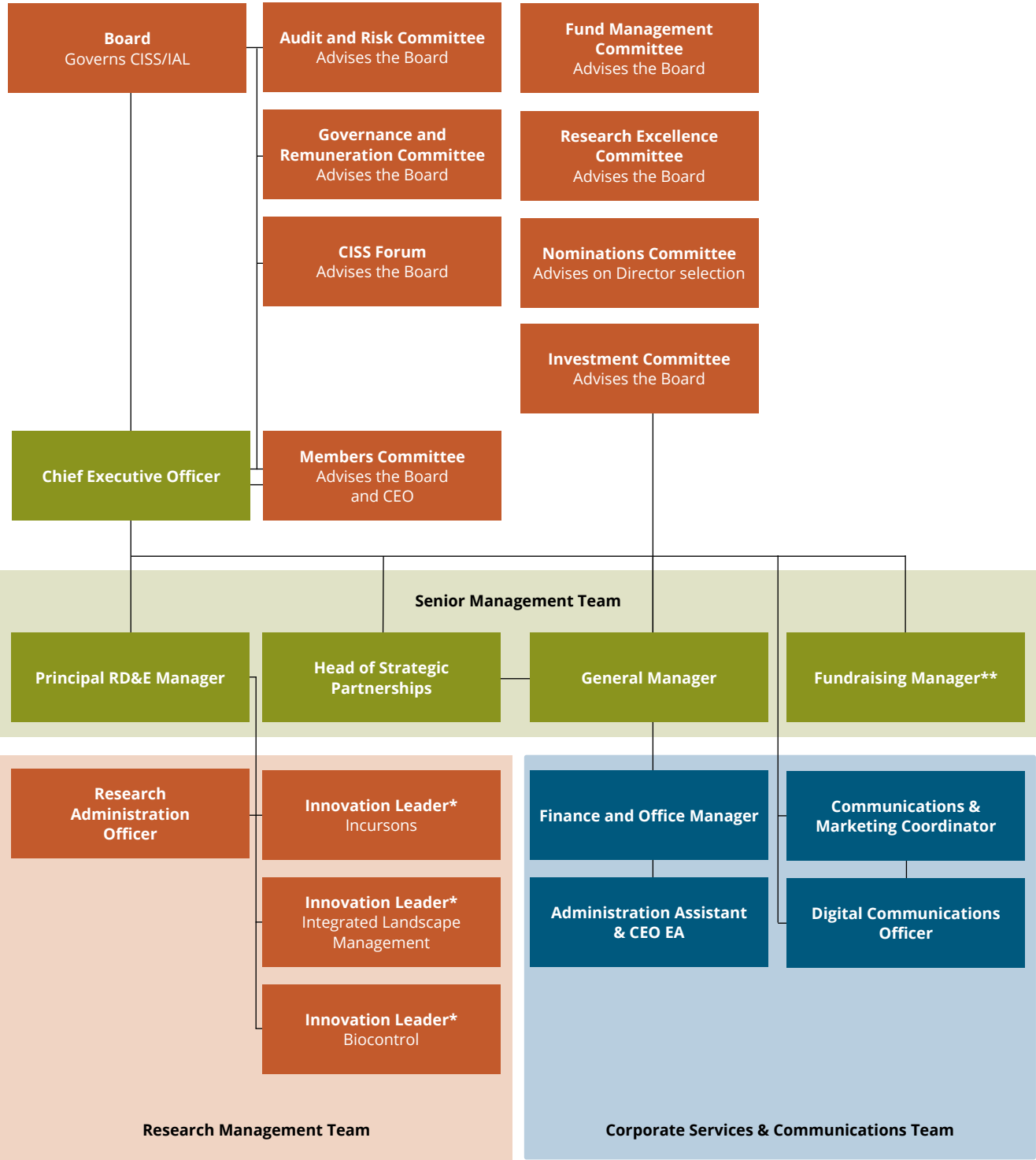
From 15 September 2020, IAL was appointed as the Trustee for the Invasive Species Solutions Trust (ISST).

The ISST and the related Public Fund, known as the Invasive Species Solutions Fund, were formally established by deed on 15 September 2020 (Trust Deed) and the Public Fund was entered in the Register of Environmental Organisations and Deductible Gift Recipient (DGR) status, granted 7 December 2020.

The organisation chart opposite excludes IAL project staff.

The structure and governance of the Centre provides strong support to its operations. The Centre is led by a Board of skills-based Directors, who are independent from its members and partners. The Governing Board meets at least four times a year and is committed to compliance with the Australian Charities and Not-for-Profit Commission, the Australian Security & Investments Commission Corporate Governance Principles and Recommendations and the Register of Environmental Organisations.

In carrying out its governance role, the main task of the Board is to develop and monitor the Centre’s strategy, ensure compliance to IAL constitution, to develop policies and ensure the company complies with its contractual, statutory and other obligations.



* Portfolio No. 1 innovation leaders are external to the Centre and provide leadership on an in-kind basis. Their roles ceased 31 October 2022.

** Role ceased 29 September 2023.

4.2 BOARD OF DIRECTORS



Bruce Christie
Chair

Director since 2020.

Corporate Biosecurity expert,
Research and Development,
Adoption Governance

Independent



Peter Noble
Director

Director since 2015.

Legal speciality, Governance
and Risk Management

Independent



Justin Bellanger
Director

Director since 2022.

Governance, Management
& Policy Development

Independent



Murray Rankin
Director

Director since 2013.

Governance, Communication,
Business & Commercial

Independent



Robbie Davis
Director

Director since 2020.

Governance, Primary Industries
and Regions

Independent



Jan Ferguson OAM
Director

Director since 2018.

Governance, Research &
Development, Communication

Independent

PUBLIC OFFICER

Lucie Hassall
Company Secretary

Appointed 14 August 2020.
Centre for Invasive Species Solutions

BOARD MEETINGS														AUDIT AND RISK		GOVERNANCE AND REMUNERATION COMMITTEE		RESEARCH EXCELLENCE COMMITTEE		ISST FUND MANAGEMENT COMMITTEE		TRANSITIONAL NOMINATIONS COMMITTEE	
Number of meetings held for the year		4		5		3		2		4		3											
NUMBER OF MEETINGS ATTENDED		No. eligible to attend		2022-23		No. eligible to attend		2022-23		No. eligible to attend		2022-23		No. eligible to attend		2022-23		No. eligible to attend					
Directors																							
Bruce Christie (Chair)		4		4						2		2		3		3							
Jan Ferguson OAM (Chair Research Excellence Committee)		4		4						2		2		2		3		3					
Peter Noble (Chair Fund Management Committee)		4		3				3		3				4									
David Palmer (to 9 Nov 2022)		2		2		3		3															
Murray Rankin (Chair Audit and Risk Management Committee)		4		4		5		5															
Robbie Davis (Chair Governance and Remuneration Committee)		4		4				3		3				4		4							
Justin Bellanger (from 9 Nov 2022)		2		2		2		2						3		3							
Transitional Nominations Committee Members																							
Mark Simpson (Chair)																3		3					
Malcolm Lettis																3		3					
Lisien Loan																3		3					
Robyn Bryant/Fiona Simson																3		3					

4.3 COMMITTEES & STAFF

COMMITTEES

Audit and Risk Committee

The Audit and Risk Committee operates under Terms of Reference as approved by the Board. The Audit and Risk Committee has responsibility for the oversight of fiscal and legal matters and ensuring appropriate procedures and internal controls are in place. The Committee is responsible for the independence of the external auditors. The members of the Audit and Risk Committee at any time during the year were:

- Mr Murray Rankin — Chair
- Mr Justin Bellanger (from November 2022)
- Mr David Palmer (to November 2022).

The Chief Executive Officer, and General Manager and external auditors are invited to Audit and Risk Committee meetings at the discretion of the committee.

Governance and Remuneration Committee

The Governance and Remuneration Committee operates under Terms of Reference as approved by the Board. The members of the Governance and Remuneration Committee at any time during the year were:

- Ms Robbie Davis — Chair
- Mr Peter Noble.

The Chief Executive Officer and General Manager are invited to Governance and Remuneration Committee meetings at the discretion of the committee.

Research Excellence Committee

The Research Excellence Committee operates under Terms of Reference approved by the Board. The members of the Research Excellence Committee at any time during the year were:

- Ms Jan Ferguson OAM — Chair
- Mr Bruce Christie.

The Chief Executive Officer and Principal RD&E Manager are invited to the Research Excellence Committee meetings at the discretion of the committee.

ISST Fund Management Committee

The ISST Fund Management Committee was established in September 2020 in accordance with the ISST Trust Deed and Register for Environmental Organisations.

The members of the ISST Fund Management Committee at any time during the year were:

- Mr Peter Noble — Chair
- Ms Robbie Davis
- Mr Justin Bellanger from November 2022
- Ms Jan Ferguson OAM to October 2022.

The Chief Executive Officer and Fundraising Manager are invited to the ISST Fund Management Committee meetings at the discretion of the committee.

Investment Committee

The Investment Committee operates under Terms of Reference approved by the Board. It consists of a representative from each full Member of IAL and non-Member Research and Development Corporation partners investing in the ISS2030 Initiative. The Chair of the REC, the Chair of the ARC, Chief Executive Officer and the Portfolio Director are also members of the Investment Committee. The Committee met twice during the year.

- Ms Jan Ferguson OAM — Chair
- Mr Murray Rankin.

Nominations Committee

The Nominations Committee operates under Terms of Reference approved by the Board. The members of the Nominations Committee at any time during the year were:

Name	Position
Mr Mark Simpson	Chair
Mr Bruce Christie	IAL Director representative
Ms Jan Ferguson OAM	IAL Director representative
Mr Malcolm Letts	State member (Queensland)
Ms Lisien Loan	State member (South Australia)
Ms Robyn Byrant	National Farmers Federation representative

STAFF

The Centre’s staff coordinate and maintain its administration, communication and research management functions. Staff members as at 30 June 2023 were as follows:

NAME	POSITION/ROLE	TIME COMMITTED
Andreas Glanznig	Chief Executive	100%
Lucie Hassall	General Manager	100%
Dr Tony Buckmaster	Principal RD&E Manager	100%
Dawn Jean-Luc	Research Administration Officer	100%
David Picker	Head of Strategic Partnerships	100%
Trevor Capps	Fundraising Manager	100%
Sreshti Nair	Communications and Marketing Coordinator	100%
Karen Gregory	Digital Communications Officer	100%
Shan Southwell	Finance and Office Manager	100%
Jane Leslie	Administration Assistant and EA to the Chief Executive	100%
Greg Mifsud	National Wild Dog Management Coordinator	100% *
Andrew Mitchell	Research Scientist	100% *
Gillian Basnett	National Feral Cat and Fox Management Coordinator	100% *
Dave Worsley	NE NSW Wild Dog Control Coordinator	100% *

* Funded under project agreements.

STAFF CHANGES

Catherine Walsh’s contract as Invasive Weeds RD&E Manager ended in November 2022.

Associate Professor Richard Price (Portfolio Director) retired in November 2022.

Frank Exon resigned as Communications and Marketing Manager in June 2023.

The Centre also utilised a number of casual staff throughout the year for specific tasks.

4.4 FINANCIAL PERFORMANCE

Invasive Animals Ltd (IAL) was established to be a non-profit institution to promote a managed and co-operative approach to RD&E in the field of invasive species management and maximise the benefits from that RD&E. IAL was appointed as the Trustee for the Invasive Species Solutions Trust (ISST) from 15 September 2020. The 2022-23 consolidated financial statements and notes represents those of IAL and the entity it controls, ISST, collectively referred to as the Group.

The Group's short-term objective is to continue its work promoting and managing strategic RD&E through the Centre for Invasive Species Solutions (CISS), and finalise the delivery of its first RD&E project portfolio – Portfolio No. 1. Portfolio No.1 was funded through a five-year agreement between the Commonwealth Department of Agriculture, Fisheries and Forestry (DAFF), all States and the ACT, two industry Research and Development Corporations, five universities and the NZ Department of Conservation. Portfolio No. 1 commenced in 2017 and finishes in October 2023. In addition, the Group is attracting further funding from state governments and industry bodies to further pursue its objectives.

The Group's long-term objective is to secure the Centre for Invasive Species Solutions as a permanent national collaborative invasive species institution that enables and drives a more coordinated and efficient approach to invasive species management across Australia's national biosecurity system. This will include pursuing a broader RD&E scope that covers vertebrate pests, weeds and environmental invertebrates and diseases, and diversifies revenue by attracting new investment, aligning with the Centre's strategy, and/or the Invasive Species Solutions Public Fund which has Deductible Gift Recipient status.

PERFORMANCE OF THE CENTRE

The total contributions of resources refers to the Portfolio No. 1 plus aligned and other projects. Total contributions available in 2023 were \$9,941,175, significantly down from \$22,782,200 available in 2022. 2023 cash revenue (including IAL reserve funded projects) being \$6,053,971 and total In-kind contributions being \$3,887,204.

2023 Total resources available

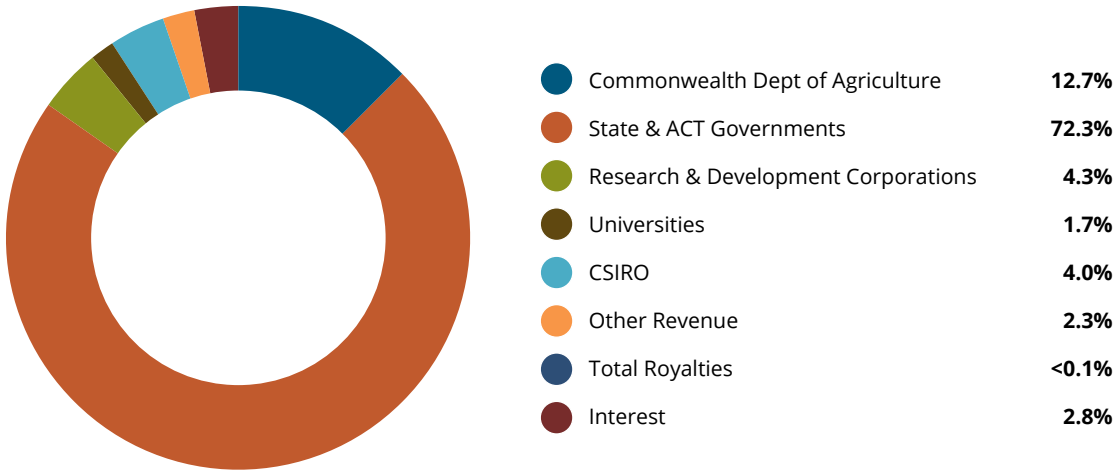


Chart 1: Financial year 2022-23 Total Contributions, both Cash and In-kind by revenue source.

The current whole of the Centre's leveraging ratio at 30 June 2023 was 2.93 (as defined by AgTrans Research). That is, the Centre has secured \$2.93 in co-contributions (cash and in-kind, excluding any additional investment by the Department of Agriculture, Fisheries and Forestry) for every \$1.00 (cash) of the initial Portfolio No. 1 Grant funding.

Resources applied for 2023

The following chart reflects on a percentage basis, the expenditure allocation of the cash revenue and in kind contributions received for the year. The allocation to research activity of 85% is 6% less than for 2022 (91.5%) due to reduced project funding received during the period. This year a cash revenue amount of \$7,195,612 was carried forward to future years to be spent on contracted and committed projects.

Total Resources Applied for 2023

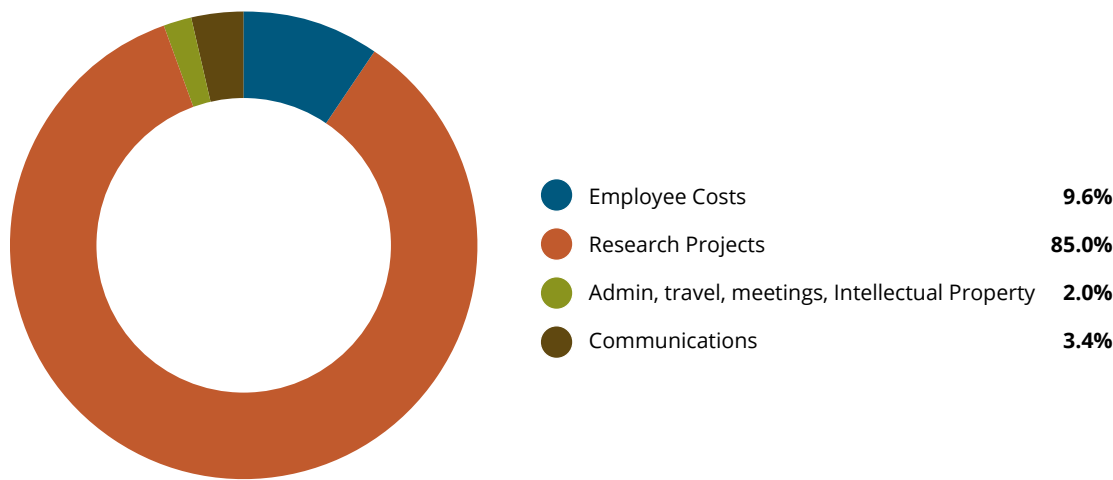


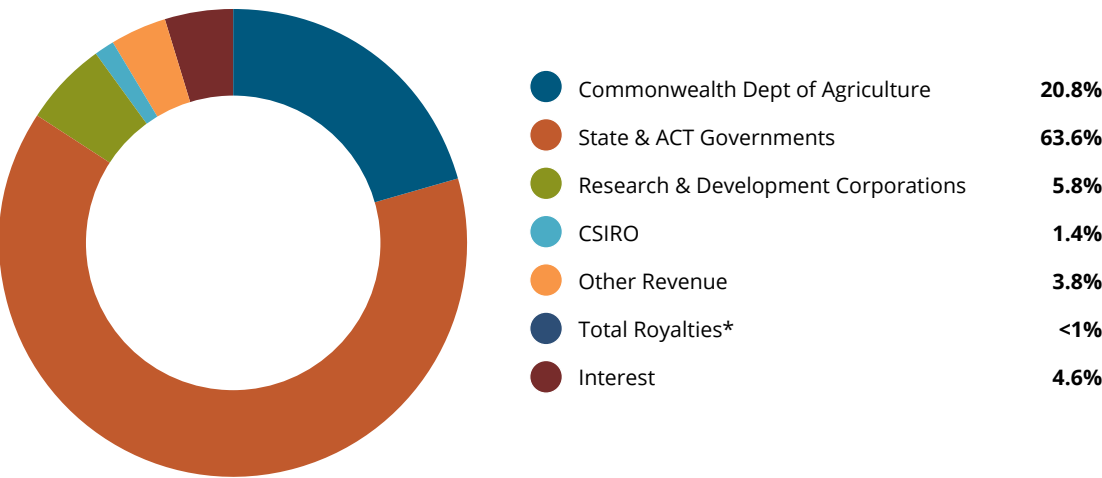
Chart 2: Financial year 22-23— Allocation of cash and in kind resources to expenditure by percentage ratio.

Net surplus 2023

The Group achieved a net surplus of \$162,817 in 2023 (2022: \$87,817). The surplus was achieved during the year 2022-23 primarily due to increased income from term deposit interest and contract management administration fees and savings in relation to employee, legal and software costs.

2023 Revenue (cash and other)

The total net revenue of \$9,057,289 (total cash \$6,053,971 including IAL reserve projects plus carried forward movement of \$3,003,318) included \$1,260,924 invested by the Commonwealth Department of Agriculture, Fisheries and Forestry, with other members and partners also providing significant revenue: \$348,806 by Research and Development Corporations (including universities), \$3,851,159 by the States and Territories and \$82,776 from CSIRO.



*Total Royalties includes Pigout Royalties which are paid out annually to PAC CRC Participants.
Chart 3: Financial year 2022-23— Cash and other revenue received by revenue source.

2023 In-kind Contributions

The total In-kind contributions of \$3,887,204 for aligned projects was invested by state and territory governments, the universities, and CSIRO.

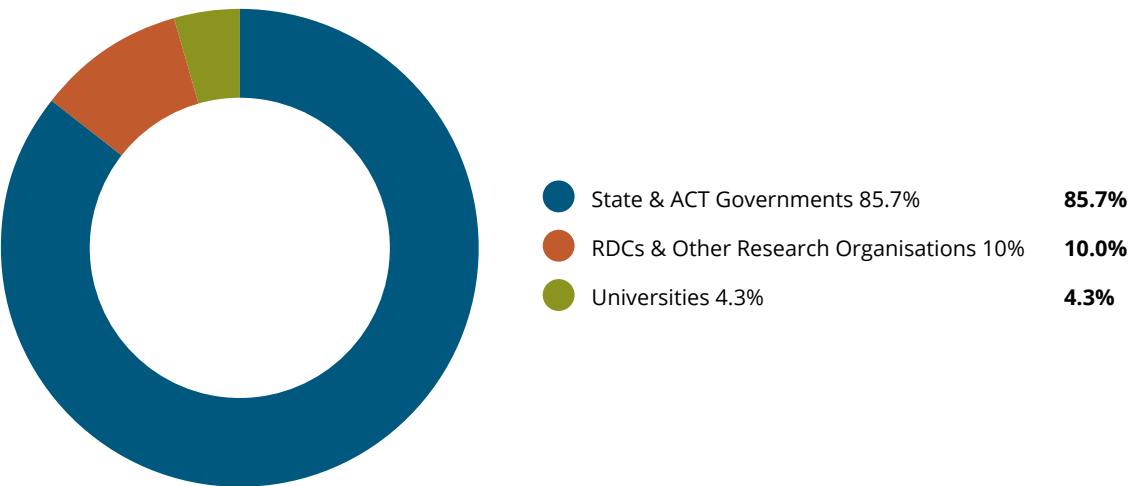


Chart 4: Financial year 2022-23— Total In-kind Contributions received by organisation group.

The positive total asset position at June 2023 of \$10,576,502 represents sufficient cash flow to meet the liabilities of \$8,693,519. The Group's equity position at 30 June 2023 was \$1,882,983 an increase from \$1,720,166 at 30 June 2022.

Balance Sheet

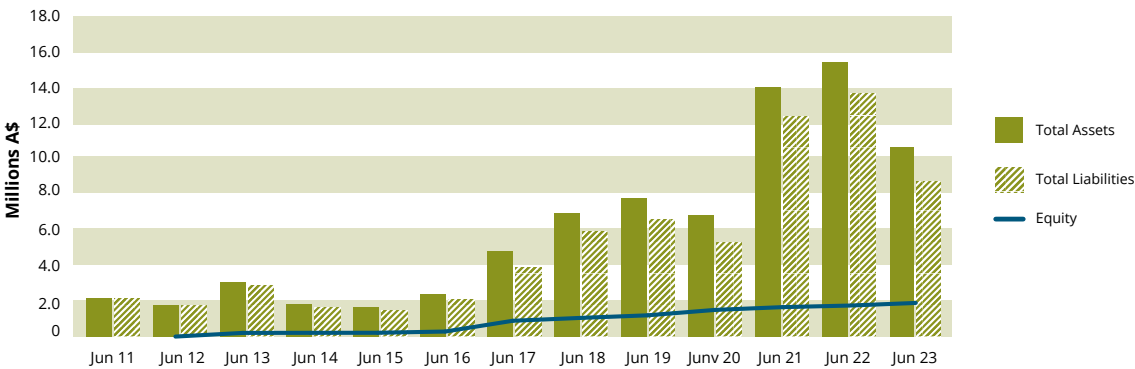


Chart 5: Financial year 2022-23— IAL Company Balance Sheet reflecting Total Assets to Total Liabilities and resulting Equity (or Earnings).

Total Cash Reserve

The cash reserves at 30 June 2023 are \$10,099,445 which includes \$7,526,558 of project funds.

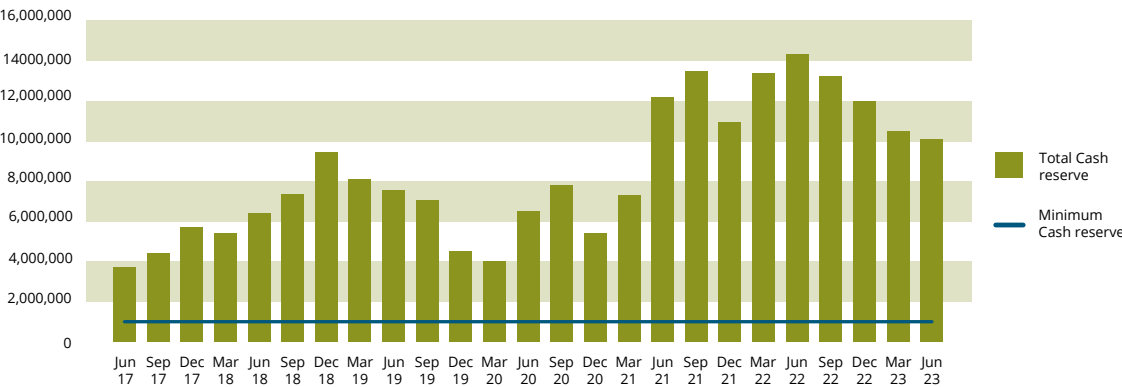


Chart 6: Financial year 2022-23— Total Cash Reserves for the Group as a quarterly trend over time.

Liquidity Ratio

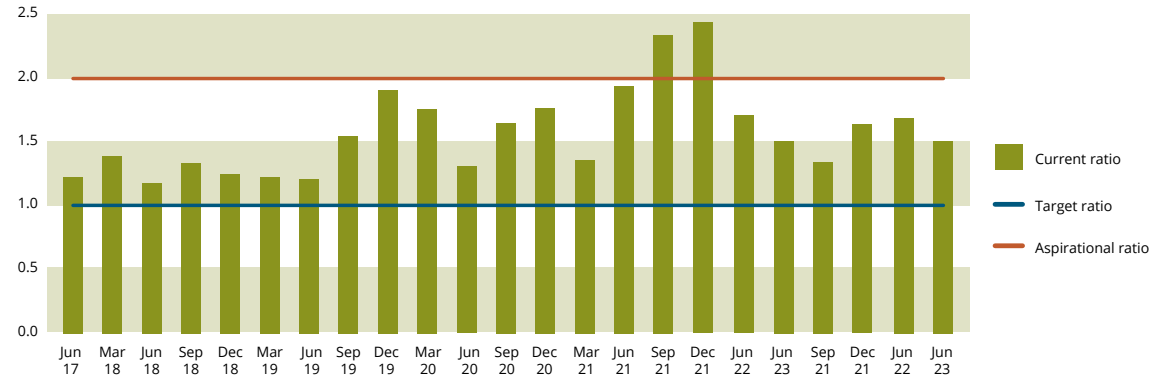


Chart 7: Financial year 2022-23 — IAL's Liquidity Ratio compared to the Commercial best practice benchmark.

The current asset ratio — a measure of liquidity — as at 30 June 2023 was 1.84.

This is significantly above the target ratio of 1:1 but below the aspirational target of 2:1.

Information used in compiling these graphs has been derived from the complete Audited Financial Statements which are available for download from www.invasives.com.au



In the wake of Kangaroo Island's Black Summer bushfire devastation, local volunteers, landholders, KI Land for Wildlife, the KI Landscape Board and National Parks staff are coming together to manage feral cat predation on the island's threatened species including Dunnarts (similar to this *Sminthopsis* sp.).



**CENTRE FOR
INVASIVE SPECIES
SOLUTIONS**

CENTRE FOR INVASIVE SPECIES SOLUTIONS

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