

ANNUAL REPORT 16 2017



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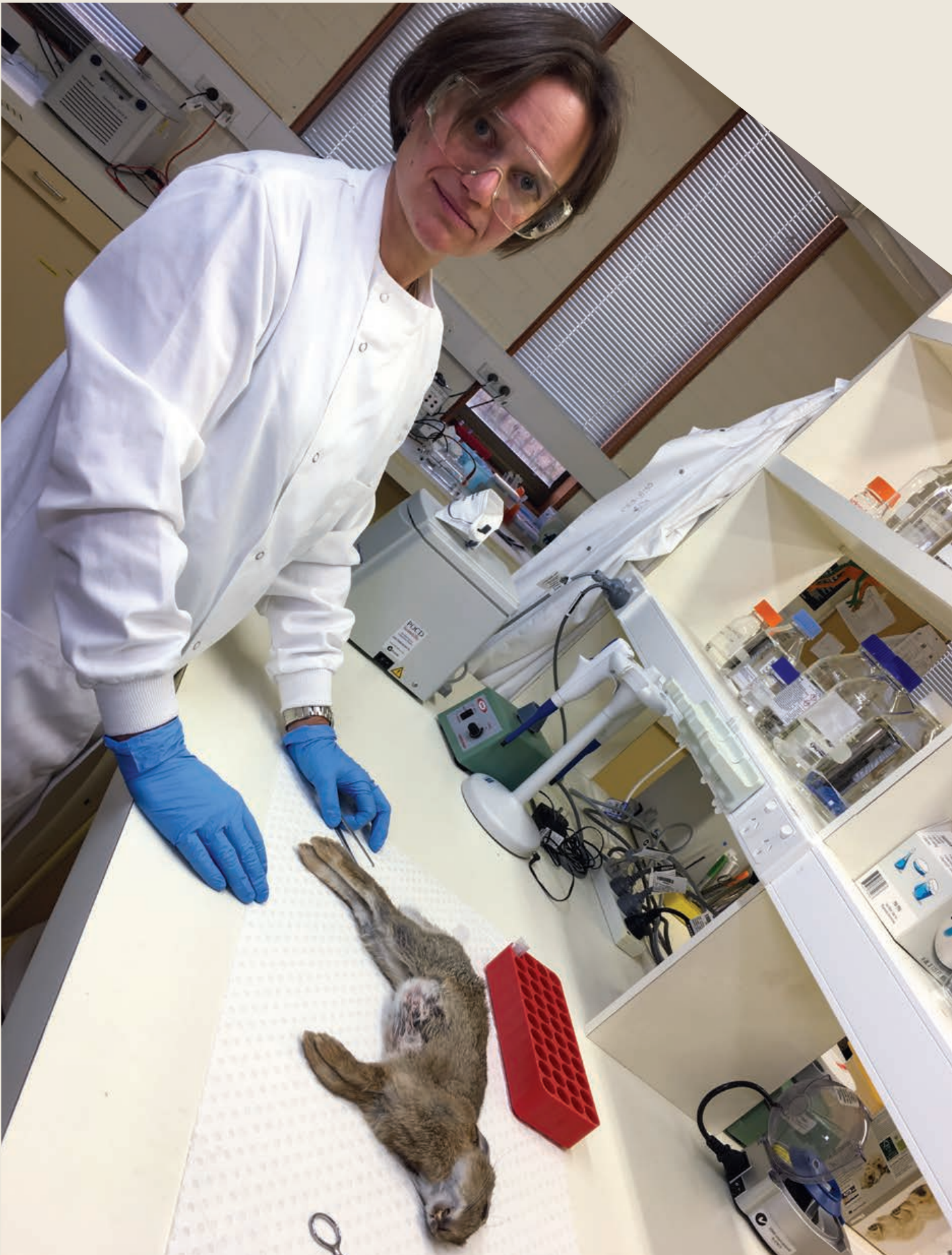
OUR PARTICIPANTS



SUPPORTED UNDER THE AUSTRALIAN GOVERNMENT'S COOPERATIVE RESEARCH PROGRAMME



Business
Cooperative Research
Centres Programme



Dr Tanja Strive from the CSIRO, and the Invasive Animals CRC rabbit research theme co-leader, testing a dead rabbit for RHDV. The rabbit was found dead near Mulligans Flat Woodland Sanctuary, just near the northern border of the ACT, and was sent in for analysis. This rabbit was the lab's first confirmed RHDV1 K5 sample, one of many samples, which later tested positive for the disease, confirming that the disease was spreading.

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More than 250 stakeholders, including representatives from our international partners, attended the 17th Australasian Vertebrate Pest Conference in May 2017

INTRODUCTION

‘TOGETHER, CREATE AND APPLY SOLUTIONS’

The Invasive Animals Cooperative Research Centre (IA CRC) is Australia’s largest integrated invasive animal research and management collaboration with 27 participating organisations.

We combat the threat of invasive animals by developing new technologies and integrated strategies that are humane, target specific and effective to reduce the impact of invasive animals on Australia’s economy, environment, and people.

We concentrate on developing smarter tools to prevent and detect new invasions, advanced and tactical tools to strengthen integrated management strategies of carp and other pest fish, and new tools and integrated management strategies for major pests including foxes, wild dogs, feral pigs, rats and mice, cane toads, feral cats and rabbits.

The IA CRC extension program received funding from July 2012 through to June 2017, however the IA CRC began in July 2005. Its legacy will continue through the Centre for Invasive Species Solution, the successor organisation to the IA CRC.

OUR PURPOSE

To counteract the impact of invasive animals through the application of new technologies and by integrating approaches across agencies and jurisdictions.

OUR OUTCOMES

1. No new vertebrate pests established in Australia
2. Improved prediction and control of emerging outbreaks
3. Recovery of key land and water regions from rabbit, wild dog and carp impacts
4. Strengthened social networks and institutions around pest animal control
5. An enduring organisation dedicated to innovative pest animal control research and training
2. Land Pests (Commercial Products) - Developing a new rodenticide, a new pest bird toxin and fertility control agents for kangaroos and feral horses.
3. Inland Water Pests - Products and strategies to detect new pest fish incursions using new environmental DNA techniques and complete the science to enable release of Australia’s first carp biological control agent.
4. Community Engagement Ensuring availability and adoption of new products and capacity to manage pests: by understanding and influencing policies and social drivers in pest animal control; encouraging cooperation and overcoming economic and social barriers.

OUR PROGRAMS

1. Land Pests - Products and strategies to manage land pests impacting on agriculture, urban areas and biodiversity. The focus is on developing a national incursions response system and strategic landscape scale approaches to rabbit (new strains of RHD virus) and wild dog control.

NATIONAL SCIENCE AND RESEARCH PRIORITIES

The Australian Government has developed a new set of nine Science and Research Priorities and associated Practical Research Challenges mapping out research areas of critical importance to the nation.

The IA CRC’s research is of national significance and fits within the two of the new priority areas.

SCIENCE AND RESEARCH	PRACTICAL RESEARCH CHALLENGE
Food	<ul style="list-style-type: none"> • Knowledge of the social, economic and other barriers to achieving access to healthy Australian foods.
Environmental change	<ul style="list-style-type: none"> • Improved accuracy and precision in predicting and measuring the impact of environmental changes caused by climate and local factors. • Options for responding and adapting to the impacts of environmental change on biological systems, urban and rural communities and industry.



Greg Mifsud, our National Wild Dog Facilitator talking with a group of landholders in Western NSW about wild dog management in the region.



CHAIR'S FOREWORD

Twelve years ago Australia's chronic and cross-sectoral invasive animal problem had impacts estimated at more than \$600M per year with mouse plagues, swelling rabbit numbers, expanding carp populations and a rising concern about livestock losses to wild dogs and pigs. Innovation in this sector had been hampered by market failure and declining investment by international companies. Rural communities, government agencies and industries were all seeking better control options to minimise the impacts of invasive species on the prosperity, health and sustainability of communities and environments across Australia. It was well recognised that left to the ad hoc approach of the past the impacts from invasive species would dramatically escalate in the short term.

It was also becoming more apparent that Australia needed a permanent research institute to continue the discovery and delivery of world-leading, humane, cost-efficient and ecologically sound controls for invasive animals. Failure to achieve this would expose Australia's agricultural and natural resource managers to the risk of having inadequate technologies to protect our national biodiversity assets and long-term food security.

Twelve years on through the collaboration, the commitment and support of SMEs, industry RDCs, ABARES, MDBA, CSIRO, the Australian government, 7 State governments, 6 universities, the CRCA, international agencies in the US, UK and NZ, and Australian end-user groups and communities we have opened a new and promising era using advanced technologies in invasive species management.

In reviewing the past and final year of the IA CRC it is worth noting the role our IA CRC has played in improving our biosecurity capability and our extensive community engagement capacity across the Australian landscape. The independently assessed IA CRC return on investment shows that the IA CRCs audacious goals have achieved an excellent quantifiable legacy. This is a proud moment in time when we can all reflect on our contribution to Ralph Slatyer's fabulous CRC vision.

The IA CRC Board and Management team have spent a tightly focused year ensuring that the transition from the IA CRC to the Centre for Invasive Species Solutions (CISS) is sound and seamless. We have now delivered an exemplary closure to the IA CRC and are well underway in the CISS start-up.

CISS will be an enabler within the National Biosecurity System dedicated to innovative national research and training. A prime motivator for the establishment of CISS has been to strategically tackle the complex national invasives problem

"It was also becoming more apparent that Australia needed a permanent research institute to continue the discovery and delivery of world-leading, humane, cost-efficient and ecologically sound controls for invasive animals. Failure to achieve this would expose Australia's agricultural and natural resource managers to the risk of having inadequate technologies to protect our national biodiversity assets and long-term food security."

CISS does aspire to be a global leader in collaborative pest animal and weed research, development and extension and will continue to bring together Australian jurisdictions, industry, businesses, universities and research agencies to work together on shared invasive's problems.

at a landscape scale for the long term and to ramp up the collaboration and cooperation many notches. CISS does aspire to be a global leader in collaborative pest animal and weed research, development and extension and will continue to bring together Australian jurisdictions, industry, businesses, universities and research agencies to work together on shared invasive's problems. CISS will further develop our international partnerships ensuring our research is world class, increasing our capacity with the ability to create and learn from global programs.

Over time CISS will develop its business potential to ease the financial burden traditionally borne by governments, sharing the burden of managing the impact of invasives across the entire spectrum of beneficiaries.

I sincerely thank our Participants and all members of the IA CRC family for your tireless commitment and support over the life of the IA CRC; your dedication, cooperation and collaboration has been a major factor in the creation of CISS.

To those who are continuing their IAL Membership, to new Members and Strategic Partners, welcome to the Centre for Invasive Species Solutions, together we shall embark on this new and very exciting era.

I welcome Dr Glen Saunders to the IAL Board. Glen's extensive experience, deep knowledge and passion for improving management strategies for vertebrate pests, in line with best practice principles, as well as population ecology and demographics, are well recognised.

My sincere thanks and congratulations to Andreas Glanznig, Carolyn Campbell-Wood and their team for their exceptional work and tenacity throughout a very demanding year and to the dedicated IAL Board for their continued commitment and support. Together we have ensured the IA CRC legacy is secure for the future benefit of the nation and that the seamless establishment of CISS is underpinned by sound governance.



Helen Cathles

Chair

Invasive Animals Limited





ACHIEVING OUR OUTCOMES

IMPACT THROUGH COLLABORATION

OUTCOME 1

NO NEW VERTEBRATE PESTS ESTABLISHED IN AUSTRALIA

Through world class research and extension, new national incursion prevention and response strategies and plans have been developed in collaboration with the cross-jurisdictional Invasive Animals and Plants Committee, biosecurity government agencies and key research and industry partners.



OUTCOME 2

IMPROVED PREDICTION AND CONTROL OF EMERGING OUTBREAKS

Development of environmental DNA (eDNA) technology for pest fish and predator detection in Australia has been supporting management decisions.

Our FeralScan digital technology has engaged thousands of users to record over 100,000 evidences of pest animals in Australia.

FeralScan has supported many community groups around Australia to share data and make management decisions.



OUTCOME 3

RECOVERY OF KEY LAND AND WATER REGIONS AFTER HUMANE CONTROL OF RABBITS, WILD DOGS AND CARP

Coordinated rabbit biocontrol research results in the national release of RHDV1 K5, and national monitoring of all RHD viruses in Australia.

Development of a 20-year rabbit biocontrol pipeline strategy, including research into new types of rabbit biocontrol agents.

Eight years of carp herpes virus research and testing has resulted in the \$15 million Australian Government funded National Carp Control Plan, which is aimed at deciding if the virus should be released in 2019.

Better understanding of wild dog ecology, movement and management options to provide more tailored and coordinated control programs for land managers in both regional and peri-urban areas.

Creating new feral predator control tools on farm, with the availability of a new wild dog and fox (PAPP) baits.

Research and development of a new feral pig bait (HogGone) and delivery system (HogHopper).



OUTCOME 4

STRENGTHENED SOCIAL NETWORKS AND INSTITUTIONAL 'ARCHITECTURE' AROUND PEST ANIMAL CONTROL

Creation of key digital decision support platforms such as PestSmart Connect, FeralScan and the Invasive Actions Tool have seen thousands of Australians connected and engaged with pest animal management.

Creation of a wide network of national and regional facilitators who are enhancing knowledge of best practice pest animal management and creating stronger community engagement and collaboration in regional and rural Australia.

Our Balanced Researcher Program has seen a 93% PhD graduation rate (thus far) and 45% remaining employed in the invasive species sector (based on IA CRC stage 1 statistics).



OUTCOME 5

AN ENDURING ORGANISATION DEDICATED TO INNOVATIVE PEST ANIMAL CONTROL RESEARCH AND TRAINING

The Centre for Invasive Species Solution will continue the legacy and maintain the momentum built through the Invasive Animals CRC and its participants.





CEO'S EXECUTIVE SUMMARY

In 1992, the first CRC in our research sector was established - the CRC for Biological Control Vertebrate Pest Populations. The research program was pioneering but high risk, and pushed the frontier on developing viral vectored immunocontraceptive agents for mice, rabbits and foxes.

While the research focus of this first CRC was very focused, at the same time a series of additional projects were also undertaken to understand more about the ecology and movements of pest animals and the public understanding of their impacts.

This is what CRCs are all about, bringing together key stakeholders to implement a strategic research portfolio to overcome a national problem.

“This is what CRCs are all about, bringing together key stakeholders to implement a strategic research portfolio to overcome a national problem.”

From 2005 onwards, the Invasive Animals CRC moved to a diversified research and innovation portfolio which focused on developing new strategic and tactical tools for managing pest animals, while also understanding the best practice, systems-based approaches to management.

Over the past 25 years, our CRCs have put invasive animal innovation, research and extension on the Australian agenda and brought together a powerful mix of industry and government investors to ensure a strong and practical end-user focus.

Thanks to our many participants from government, industry, research and commercial enterprises, we have now set the wheels in motion to a successful transition. This is a too rare result, I recently read a stat which stated that just 15 out of the total 180 CRCs funded have successfully transitioned into their own established research and innovation centres.

Additionally, I am proud to say that our stakeholders have seen a need for continued innovation in this area and to broaden our scope from animals to weeds, and over time possibly other invasive species groups.

The Centre for Invasive Species Solutions is our next endeavour which is forming a new collaboration of government, industry and research stakeholders to build on the work of the IA CRC. What is also impressive, is that we are now all a part of this elite group who have transitioned into an independent and established national research institute.

I look forward to leading the Centre for Invasive Species Solutions into our next stage of invasive species RD&E and working with our members and partners to provide solutions to these big problems.

Finally I would like especially thank the IA CRC's management and research teams for your insights, efforts and comradery over the years.

I commend this final IA CRC Annual Report to you.

Andreas Glanznig

Chief Executive Officer

Invasive Animals CRC

(now Centre for Invasive Species Solutions)



Images supplied with thank to our partners.

RESEARCH AND COLLABORATION HIGHLIGHTS

NEW RABBIT BIOCONTROL AGENT RELEASED AROUND AUSTRALIA

After eight years of searching, evaluating, planning and preparing – we were extremely proud to see that in March of 2017, RHDV1 K5 was officially released around Australia. RHDV1 K5 was the first new rabbit biocontrol agent released in 20 years.

The RHD Boost project, led by Dr Tarnya Cox from NSW DPI, was undertaken as a massive collaboration and partnership between all relevant state and territory governments, the Australian Government and industry and research partners such as the CSIRO, AWI and MLA.

More than 600 sites were registered to take part in the release and were mailed a series of information guides including video tutorials. All packs included instructions on how to collect tissue samples from dead rabbits, and vials and reply-paid envelopes to send samples back.

Due to this, we could officially confirm rabbit deaths from RHDV1 K5 at many release sites through laboratory analysis of these samples.

Since release of the virus, an average 42 per cent reduction in wild rabbit numbers has been observed at sites where the virus was released based on coinciding spotlight counts undertaken pre-and post-release.

Well done to all involved on this momentous occasion in Australia's environmental history, and a big thanks to the many hundreds of community groups, producers and land managers who volunteered their time and effort to be involved in releasing and monitoring impact virus.

“Australian, state and territory governments, hand-in-hand with research and industry bodies worked together since 2014, screening 38 strains of RHDV, to identify an effective strain which could manage the wild rabbit populations which devastate our nation”.

Deputy Prime Minister and Minister for Agriculture and Water Resources, Barnaby Joyce



2009

2014

2016

2017

IA CRC RHD Boost project begins search for new strain of RHDV (which overcomes RCV-A1)

A Korean strain of Rabbit Haemorrhagic Disease Virus (RHDV1 K5) selected as agent for proposed national release

All national, state and territory approvals granted to release RHDV1 K5

Rabbit Biocontrol Tracker launched and expansion of National RHDV monitoring program

RHDV1 K5 released nationally

QUICK STATS!

- › RHDV1 K5 released at 382 locations nationwide
 - » 373 community-run release sites
 - » 9 intensively monitored releases sites
- › 42% observed national reduction in rabbit numbers post release (based on data from 191 sites)
 - » RHDV1 K5 confirmed in every state and territory, except NT



TRACKING RABBIT VIRUSES ONLINE

In preparation for the release of RHDV1 K5, a new function to boost the power of the popular RabbitScan app gave the community the ability to track the spread of rabbit biocontrol agents from their smart phone or computer, via an interactive digital map. Known as the *Rabbit Biocontrol Tracker* – the new tool delivers an innovative approach to understanding how rabbit biocontrol agents and viruses are tracking in the Australian landscape.

Users who report 'evidence of disease' into the *Tracker* also have an ability to request a rabbit tissue sample kit so that they can get the potential disease sample analysed and confirmed if it was an RHD virus infected sample.

Once the tissue sample is analysed, an update on the *Tracker* will record the results and the person who submitted the sample will be notified with accurate information of what virus is affecting rabbits in their area or control site. This type of information is valuable for local rabbit management plans and for land managers to understand rabbit disease impacts on their land.



Since its launch in August 2016, the Tracker has had more than 800 reports of disease, encompassing all states and territories across Australia. The Tracker is still in use today.



Dr Michelle Christy gave an inspiring and thought-provoking keynote speech to an audience of 250+ delegates at the Australasian Vertebrate Pest Conference in May 2017

PREVENTING NEW INVASIVE SPECIES FROM ENTERING OUR COUNTRY

A draft *National Incursion Prevention and Response Strategy for Potentially Invasive Animals (2017-2022)* was developed through the Invasive Animals Cooperative Research Centre in consultation with the Invasive Animals and Plants Committee (IPAC) Vertebrate Pest Incursions Expert Group and the Australian and State and Territory Governments.

Considering the potential for enormous financial and environmental repercussions as the number of exotic species establishing in Australia continues to grow, it is important that a national strategy is in place to prevent new incursions.

Bruce M Christie, Chair of IPAC and NSW Dept. Primary Industries Deputy Director-General said that it is important to have a national approach to prevent and/or respond to exotic incursion threats.

“The development of this draft strategy is a big step forward in our ability to minimise the risk of additional pests establishing in Australia and we encourage members of the public to have their say on the current draft,”

Bruce M Christie, Chair of the Invasive Plants and Animal Committee, NSW Dept. Primary Industries Deputy Director-General



Based on the results of this project, a report and series of recommendations for peri-urban wild dog managers have been developed and available at www.pestsmart.org.au/peri-urban-wild-dog.

BEING AWARE OF DISEASES IN PERI-URBAN WILD DOGS

The Invasive Animals CRC funded a long-term project assessing the impacts of wild dogs in peri-urban areas of Australia, specifically in south east Queensland. A series of recommendations have been made based on this research. Like in regional areas, peri urban wild dogs commonly attack livestock, pets and wildlife, but rarely people. The research also noted that dingoes/hybrid wild dogs (not domestic dogs) were responsible for attacking koalas in peri-urban north Brisbane. Koala attacks were at sufficient levels to threaten localised populations, calling for a need to enhance koala conservation strategies in these areas, which include wild dog control.

One important finding was that peri-urban wild dogs were found to carry diseases, which pose a significant risk to public, domestic animal and livestock health. For example, Helminth parasites were found in ~80% of wild dogs analysed, specifically *Echinococcus granulosus* and *Spirometra erinacei* – which if ingested can cause liver, lung and brain infections, that can lead to disease.

This finding is of concern and the research team has recommended the development of a best-practice guide to highlight the strategies, practices and personal protective equipment required to minimise the risks of pathogen transmission to people, livestock and pets.

COMMERCIALISATION AND UTILISATION HIGHLIGHTS

HOGGONE PACKAGE SENT TO APVMA



A feral pig caught on a remote camera trap taking a HogGone bait during one of the Australian field trials of the package (image supplied)

The registration package to seek APVMA approval for the HOGGONE® Feral Pig Bait was submitted by Animal Control Technologies Australia (ACTA – commercial partner of the IA CRC) on 4 August 2017. This was a major achievement for the project partners consisting of ACTA, United States Department of Agriculture and Texas Parks and Wildlife Department, and is a culmination of more than eight years of research and development through the Invasive Animals CRC

The APVMA submission and the shortly-to-be-received US EPA Experimental Use Permit are big steps towards developing a complementary tool for managing feral pigs and we now look forward to getting adoption and use in the field – especially in Australia.

“The project started as a ‘simple’ idea to look at additional toxins to 1080 in the PIGOUT baits. After a great many failed attempts to achieve a palatable and stable finished product, we can say that this has been one of the most challenging technical projects that we have ever attempted but to get a final result has truly been a global collaborative effort”.

Professor Linton Staples, Managing Director ACTA

RHDV1 K5 AVAILABLE FOR USE AS FREEZE-DRIED POWDER

The release of the new Korean strain of RHDV1, also saw it delivered as a freeze-dried powder within vials. This technology, developed by researchers at NSW DPI through IA CRC funding meant that transport costs of the vials of virus were significantly reduced as it didn't need to be kept below freezing during movement. Moreover, as there is no need for a cooling chain, it increases product stability and reliability.

The new formulation even made the news itself, with The Weekly Times intrigued by the fact that a virus could be sent safely via the Australia Post mail system.

National

Rabbit calicivirus: RHDV1 K5 vials to be sent through the mail

HANNAH DRISCOLL, The Weekly Times
February 16, 2017 12:00am

RHDV1 K5 is now available for purchase as an additional rabbit control tool. However, legislation surrounding the use of RHDV varies across the Australian states and territories, so it is best to contact local authorities before use and to ensure the rabbit virus is the best method to use in your region.



The freeze dried RHDV1 K5 virus is now available to purchase as an additional tool for rabbit management in Australia

CARP HERPESVIRUS APPLICATION SENT TO APVMA

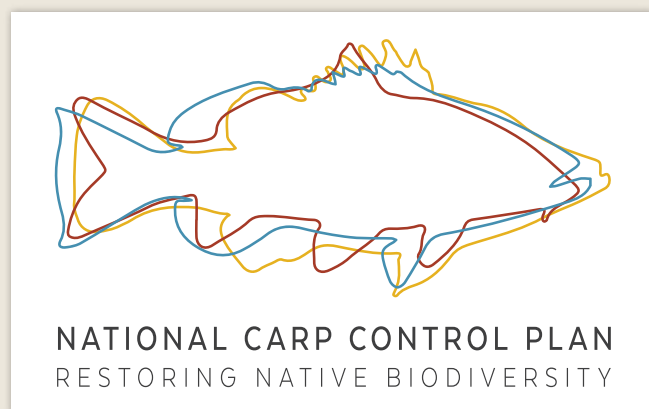
The registration submission to seek APVMA approval for the cyprinid herpes-virus 3 (CyHV-3) as a class 3 Agricultural Biological Product for European carp was submitted in June 2017.

This sees the eight years of carp herpesvirus research led by Dr Ken McColl and his research team at the CSIRO AAHL, all packaged up for review and consideration by APVMA staff.

The registration of the carp herpesvirus is one step, in many steps, required to be undertaken as part of the consideration to release CyHV-3 as a biocontrol agent for carp.

An extensive consultation and community engagement campaign is now underway and further research projects on this topic are being led through the Australian Government's \$15 million National Carp Control Plan (NCCP).

The NCCP is being led by Mr Matt Barwick, who was the project leader for the IA CRC carp herpesvirus registration and release project, which of course has now been superseded by the NCCP.



The National Carp Control plan will lead a \$15-million planning process, on behalf of the Australian Government. At the end of 2018, they will make recommendations based on the evidence gained during this process, in a document entitled 'The National Carp Control Plan' – www.carp.gov.au

AG WHITE PAPER FUNDING FOR INNOVATION IN PEST ANIMAL MANAGEMENT



The Ag white paper funding announcement was made during Barnaby Joyce's opening address at the 17th Australasian Vertebrate Pest Conference in Canberra

23 projects shared in \$10.5 million as part of \$50 million being invested in the established pest animals and weeds efforts under the Agricultural Competitiveness White Paper.

Two project applications put in through Invasive Animals Limited, received funding.

One of these projects is in collaboration with Primary Industries and Region SA, looking at parasites (specifically Eimeria) as additional biocontrol agents for European rabbits. While a second project is looking at developing an e-technology hub that utilises digital technologies and interventions to improve pest management effectiveness and enhance welfare outcomes.

These projects are ongoing and we look forward to highlighting their outcomes in future news items.

“The funding will be used to develop technologies such as herbicide spraying devices, automated traps and thermal aerial imaging for pest monitoring and optimise the use of chemicals, biological control agents.

Deputy Prime Minister and Minister for Agriculture and Water Resources, Barnaby Joyce

EDUCATION AND TRAINING HIGHLIGHTS

WILD DOG MANAGEMENT ON THE GOLD COAST — PROMOTING COMMUNITY PARTICIPATION



Residents of the gold coast received a fridge magnet (pictured) as a way of promoting how to report wandering dogs in their area (image supplied)

The Invasive Animals CRC, in partnership with the City of Gold Coast Council and Queensland Department of Agriculture and Fisheries, funded a behaviour change project undertaken in the Gold Coast area to promote community participation in peri-urban wild dog management.

The researchers consulted with experts to identify 15 behaviours that could be adopted by the community to reduce impacts of wild dogs in peri-urban areas. Two on-line surveys with wild dog experts and peri-urban residents were used to create a *Behaviour Prioritisation Matrix*, which ranked the behaviours in terms of their projected impact, based on expert estimates of effectiveness, current community adoption levels (penetration), and likelihood of future adoption in the community.

The analysis led to 'reporting wild dog sightings and impacts to local council' to be the target behaviour selected for the project. A second community survey found the main perceived benefits driving reporting were beliefs that reporting would benefit native wildlife and community safety and the main perceived barriers to reporting were beliefs that reporting takes too much effort and wild dogs should be left alone.

Based on these results a Communications Strategy was developed to focus on shifting social norms about reporting wild dogs, framing messages around protecting native wildlife and making reporting easier to do.

MAINTAINING THE CAPABILITY PIPELINE THROUGH OUR BALANCED RESEARCHER PROGRAM

The Balanced Researcher Program was developed with the specific aim of producing exceptional multi-skilled industry-ready PhD graduates that have gained professional, strategic and vocational skills in research leadership and management, stakeholder and community engagement and have developed contacts, collaborations and networks beyond those gained during a traditional researched based doctoral program.

A longitudinal study and survey was undertaken through the program to follow those students who took part and have since submitted their theses.

The results from the survey are extremely positive with respondents indicating that the Program enriched their PhD experience, and many noting it gave them a competitive edge when seeking future employment. Respondents' found most benefit from the annual training camps which focused on team development, leadership and media and communication skills, to name a few. All respondents developed networks because of their industry placement which assisted in gaining employment post PhD.

The survey from students indicates that the Balanced Researcher Program has been an extremely worthwhile investment and should be continued.



Four PhD camps were held over the course of the CRC, here students are undertaking a journal writing workshop in Kioloa, NSW

THE INVASIVES ACTION ONLINE LEARNING TOOL

The Invasive Action Tool, developed through IA CRC funding, now has five courses to support team based learning. Three courses focus on community engagement planning, with the remaining courses focusing on behaviourally effective communications.

The online tool is free to use and appropriate for a range of challenging issues that have community impact. It has received positive reviews from those who have completed the coursework.

The tool currently has 279 registered users and is being housed at www.invasives.contentlogic.com.au, however the plan is to integrate the tool within the PestSmart website over the coming year.



Professor Ted Alter standing, leading a group of Masterclass attendees in best practice community engagement skills

EVENTS



Dr Hugh Tyndale-Biscoe (left) with Helen Cathles (IAL Chair), Dean Chamberlain (NSW LLS) and Julie McGuinness (IA CRC Office Manager) at the Invasive Animals CRC farewell celebration drinks

INVASIVE ANIMALS CRC ACHIEVEMENTS CELEBRATED

To celebrate over a decade of research achievements, the Invasive Animals CRC hosted an event on May 2nd to coincide with the 17th Australasian Vertebrate Conference in Canberra.

Helen Cathles, Chair of *Invasive Animals Limited*, said she was in awe of the breadth and depth of knowledge of those who were in the room.

Ms Cathles was also pleased to see in attendance Dr Hugh Tyndale-Biscoe who was the very first CEO for the Biological Control of Vertebrate Pest Populations which began back in 1992 and Mr Peter Allen who was the first Chair of the Invasive Animals CRC, when it began in 2005.

“....we are celebrating the IA CRC - your work, your collaborations, and your cooperation that has produced a most remarkable and effective network in minimising the impact of invasive species. Think about the fact that every Australian benefits directly or indirectly from your work... every Australian. That is how impressive your reach is,”

Helen Cathles, Chair, Invasive Animals Limited.

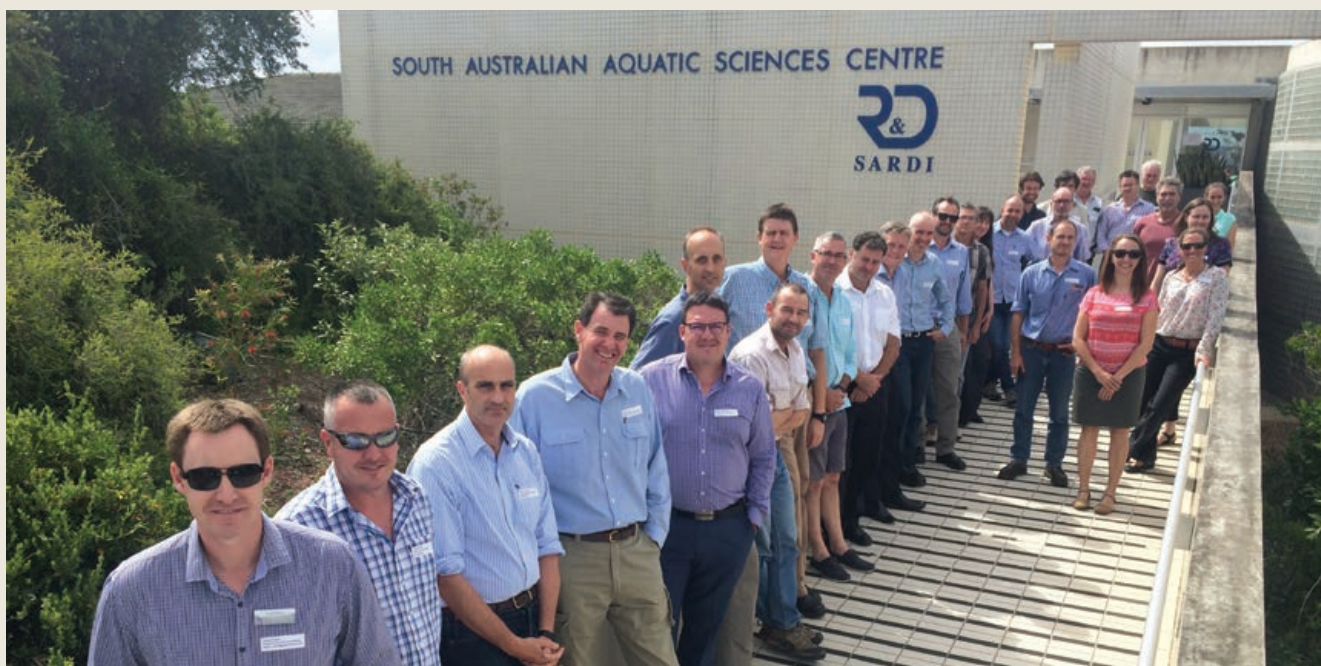
17TH AUSTRALASIAN VERTEBRATE PEST CONFERENCE

On behalf of the Invasive Animals and Plants Committee, the Invasive Animals CRC hosted the 17th Australasian Vertebrate Pest conference in Canberra (May 2017).

The conference, officially opened by Deputy Prime Minister and Minister for Agriculture and Water Resource Barnaby Joyce, was attended by 277 attendees, including 20 international delegates.

The conference highlighted the latest research and developments in the sector encompassing more than 50 presentations and 30 posters. Keynote speakers included Dr Kurt VerCauteren from the US Department of Agriculture, Dr Dan Tompkins from Landcare Research, New Zealand and our own Andreas Glanznig. The conference received very positive feedback from delegates who attended and is always a key conference for our field. Delegates are already excited for the 18th AVPC.

Andreas Glanznig gave the first keynote address at the Australasian Vertebrate Pest Conference in May 2017 – providing an overview and state of play in the invasive species research sector.



National deer workshop participants (image by Chris Lane)

NATIONAL DEER MANAGEMENT WORKSHOP

A two-day workshop was held in Adelaide on 17-18 November 2016 to discuss the way forward for deer management in Australia. An emerging national issue that all state and territory governments are interested in developing strategies for.

The workshop identified a need for cost-effective and socially acceptable wild deer management practices. The full workshop proceedings and recommendations for future research and management strategies were made available online via PestSmart.

“Managing the impacts of wild deer is a national problem and it is hoped that these proceedings will assist agencies with prioritising funding and resources to better understand and minimise the impacts of wild deer in Australia”.

Dr David Forsyth, lead organiser of the National Deer Workshop.

INVASIVE ANIMALS CRC AWARDS



Pictured left to right: Dr John Virtue (Acting IA CRC Participants Committee Chair), Geoff McFarlane (winner of our Participants award), Dr Ken McColl (winner of our Prof Dave Choquenot Science Prize), Helen Cathles (IAL Chair), Jonas Bylemans (winner of our CEOs Student Prize), Andreas Glanznig (IA CRC CEO).

The Invasive Animals CRC Professor Dave Choquenot Science Prize for Excellence in Invasive Animal Science and Research

DR KEN MCCOLL FROM THE CSIRO

Dr Ken McColl was the powerhouse scientist behind the Invasive Animals CRC carp biocontrol research program. Ken and his team's rigorous scientific trials were instrumental in discovering that Cyprinid herpesvirus-3 could be effective as a management option for European carp in our waterways. In conjunction with his research team of Drs Agus Sunarto and Matt Neave, Ken's research has addressed a wide range of questions, with the main aim of assessing whether Cyprinid herpesvirus -3 could be used as a successful carp biocontrol agent in Australia. After eight years of extensive research trials (spanning both iterations of our CRC) and publishing eight highly ranked scientific papers, this research program has culminated in Dr McColl and his team being confident that the carp herpesvirus is specific to carp and won't cause disease in any other fish, animals or humans. With the cherry on top, Dr McColl's research outcomes were fundamental in the Australian Government announcement this year of allocating \$15 million towards a National Carp Control Plan. Dr McColl is now recognised as a global leader on this research topic and he is extremely deserving of receiving the IA CRCs top honour.

The Chief Executive's Award for Student Achievement

JONAS BYLEMANS FROM THE INSTITUTE FOR APPLIED ECOLOGY, UNIVERSITY OF CANBERRA

Jonas began his PhD studies with the Institute for Applied Ecology in December of 2013 working with Associate Professor

Di Gleeson and her team on eDNA surveillance for multiple high risk invasive aquatic species. Jonas' PhD is funded through the Invasive Animals CRC and he is a participant in our Balanced Research Program. Even though Jonas is still finalising his PhD research, he has already had two scientific manuscripts accepted for publication in highly ranked journals and another manuscript is under review. Jonas is in his final year of his PhD studies and he is also undertaking a 4 week internship with the CSIRO as part of the Balanced Researcher Program and we wish him the best of luck for his future endeavours.

The Participants Award for Outstanding Contribution to Invasive Animal Management

GEOFF MCFARLANE, CHAIR, BELLARINE LANDCARE GROUP RABBIT AWARENESS PROGRAM

Geoff is the current chair of the Bellarine Landcare Group Rabbit Awareness Program based in Victoria. He was nominated by his fellow members as being one of the main drivers of the rabbit awareness community program that has recognised the extent of rabbit infestation on the Bellarine peninsula in Victoria. Through his leadership and using the IA CRCs RabbitScan resource, Geoff and the community have mapped over 1200 warrens along the roadside in the region. Geoff has used this information (collated within the RabbitScan system) and the rabbit awareness program to engage local council and various land agencies to work together to drive the next stage of the areas rabbit eradication program. He is really getting across the message of integrated rabbit management promoting multiple methods of rabbit control and not just one silver bullet.

OTHER AWARDS

Feral Scan wins the Banksia Sustainability Award for 2016



Peter West was extremely proud to receive the Banksia award at the ceremony in Sydney in March 2017, on behalf of the many users of the FeralScan program.

The FeralScan community pest animal mapping and monitoring program was recognised with one of Australia's top environmental honours, receiving the Minister's award for a cleaner environment in the field of research and science excellence.

The award, sponsored by the Australian Government Department of Environment and Energy, was part of the 2016 Banksia Foundation Awards.

NSW Department of Primary Industries (DPI) research officer and IA CRC FeralScan program manager Peter West, was humbled to receive the award on behalf of all the program partners, stakeholders and users.

FeralScan was also named by rural paper *The Land* as one of the top 10 farming apps you should download.

"Thanks to the strong support from our stakeholders, communities and individuals all around Australia the FeralScan program has collated more than 100,000 new community records about pest animals, and has been used by many thousands of Australians".

Peter West, FeralScan Program Manager based at NSW DPI.

Dr Simon Humphrys awarded prestigious Fulbright Scholarship



Dr Humphrys (left), receiving his award from US Chargé D'Affaires to Australia James Caruso (right) (image supplied)

The Fulbright program is the flagship foreign exchange scholarship program of the United States of America, aimed at increasing binational collaboration, cultural understanding, and the exchange of ideas.

Dr Humphrys project will involve working with world-leading US wildlife toxicology researchers and registration specialists so that the outcomes from toxicology tests and modelling can be incorporated into registration data packages in Australia.

The ultimate aim of the project is expedite approval of effective and safer-to-use products for grain producers to protect crops from mouse plagues.

Dr Paul Meek awarded UNE medal

In recognition of exceptional research achievements, NSW DPI invasive animals officer, Dr Paul Meek, has been awarded a prestigious Chancellor's Doctoral Research Medal from the University of New England (UNE).

DPI deputy director general for biosecurity and food safety, Dr Bruce Christie, said the international standing and impact of Dr Meek's research work in the use of camera trapping technology earned the exceptional merit medal.

Dr Meek is project leader of our Wild Dog Alert project and is involved in many of our projects which involve camera trapping work.

Katrina Dickson awarded AVPC student presentation prize



Katrina was presented with her student prize on the final day of AVPC

Katrina Dickson, an IA CRC PhD candidate based at the University of England, was awarded the national prize for the best student paper at the 17th Australian Vertebrate Pests Conference (AVPC) in Canberra. Katrina's PhD is run through the Law School's AgLaw Centre and her topic is 'Natural Resource Management Agencies as Learning Organisations'.

As part of her PhD, Katrina has developed a T.O.O.L. to 'Test Our Organisational Learning' designed to assess learning status in work units and to identify areas of improvement. Katrina's research included case studies in a major conservation agency in South Africa, and an invasive species work unit in the NSW Department of Primary Industries in Australia.

Ex IA CRC PhD-students kicking goals



Kate giving an interview as part of receiving her honour (image supplied)

Congratulations to previous PhD candidates of the Invasive Animals CRC who have since moved on to bigger things.

Dr Kate Grarock was one of 30 female scientists and technologists who were named the first Superstars of STEM – ready to smash stereotypes and forge a new generation of role models for young women and girls. Dr Grarock was chosen out of more than 300 applicants for her work in effective management of introduced species. Kate is now a sanctuary ecologist at Mulligans Flat Woodland Sanctuary.

Dr Tom Newsome was awarded a NSW Young Tall Poppy Science Award. Awarded annually by the Australian Institute of Policy and Science, the Young Tall Poppy awards are prestigious early career researcher awards that recognise scientists aged 35 and under for excellence in scientific research and passion in science communication and community engagement. It doesn't stop there; Dr Newsome was also awarded the 2017 President's Early Career Award from the Australian Mammal Society. Dr Newsome researches how top predators like dingoes and wolves change the abundance and behaviour of their prey and competitors, and how that in turn affects other species and ecological processes.

Dr Eve McDonald-Madden was one of three Eureka Prize Finalists, nominated for the 2016 Macquarie University Eureka Prize for Outstanding Early Career Researcher. Unfortunately, she didn't take out the top award but it is an amazing achievement just to be nominated. The work of Dr Eve McDonald-Madden applies quantitative methods, from fields such as economics and artificial intelligence, to solving complex conservation problems. Her research is frequently published in leading interdisciplinary journals and has influenced the way major conservation organisations make decisions.

OUR 2012–2017 COMMUNICATION SUMMARY

PUBLICATIONS

- 207** PestSmart Toolkit publications
- 159** Accepted conference abstracts
- 155** Peer-reviewed scientific publications

PESTSMART

- 844,886** Pageviews
- 289,930** Users
- 38,610** Document downloads

FERALSCAN

- 100,000+** Records / Sightings
- 15,000+** Registered users
- 11,000+** Non-registered users

APPS

- 22,000+** Field Guide to Pest Animals of Australia
- 13,000+** FeralScan

SOCIAL

- 1,055,278** YouTube channel minutes watched
- 382,868** YouTube video plays
- 4,084** e-news subscribers
- 2,525** Facebook fans
- 2,474** Twitter followers
- 678** YouTube subscribers

MEDIA

- 4,199** online mentions of the IA CRC
- 68** IA CRC media releases distributed
- 7** ABC Landline segments highlighting our rabbit, wild dogs and carp research

RISK AND IMPEDIMENTS

Many of the control products funded through the IA CRC and its participants, require regulatory and policy approval before they can be made available, which creates inherent risk in our path to adoption.

Several product applications have been submitted for APVMA approval in the financial year or subsequent period. This includes submission of registration packages seeking APVMA approval for carp herpes virus as a carp biocontrol agent (June 2017), HOGGONE Feral Pig Bait (4 August 2017), and the GonaCon fertility control agent for macropods (in progress). Staffing issues associated with the recent announcement that the APVMA will move to Armidale creates risk in relation to the timely assessment of these registration applications.

END-USER ENVIRONMENT

The IA CRC five year Strategic Plan scope and direction remains unchanged. Established pests — wild dogs, rabbits, carp, feral pigs, feral cats and mice — remain a policy and investment priority for the IA CRC's industry and government end users, while new and emerging pests remain a priority for government end users.

Timely availability of IA CRC products remains an end-user risk, and the regulatory challenges are discussed above.



IMPACTS

The IA CRC Impact Tool was updated in Nov 2015 and independently reviewed by AgTrans Research. The revised 2016 Tool estimates the economic impact of the IA CRC to be \$627.8 million over 15 years from a 2012 baseline year, with a Benefit Cost Ratio of 8.43. The CRC impact will be significantly greater over 30 years. Unfortunately, the benefits of most of the IA CRC's outputs cannot be readily be quantified in monetary terms as they have mostly non-market value. Major exclusions from the economic impact analysis include a monetary valuation of Australia's first potential carp biocontrol agent, and the benefits from adoption of resilient community-led best practice management approaches, which artificially reduces the IA CRCs overall Benefit Cost Ratio. In relation to the former, the National Carp Control Plan has commissioned a study to calculate both the market and non-market benefits from the release of the carp biocontrol agent.

The expected benefit from the release of strengthened rabbit biocontrol agents (RHDV1 K5 strain in 2016/17 and first RHDV Accelerator strain in 2022) is based on conservative assumptions. Based on the first six months of performance since the release of RHDV1 K5, the assumptions used to

calculate the impact of RHDV1 K5 have proven to be overly-conservative. For example, the analysis assumed that the national average expected reduction in industry rabbit control costs to be 13%, with a stable impact of 8 years before impacts start to diminish in the face of genetic resistance of rabbits to the RHDV1 K5 strain. In comparison, since the release of RHDV1 K5 in March 2017, there has been an average 42% reduction in rabbit numbers observed at 191 release sites. Assuming a direct correlation between rabbit number reduction and industry rabbit control cost reduction, then the medium term economic impact of RHDV1 K5 is set to be significantly higher, possibly discounted by the competition from RHDV2 which is now widespread since its detection in 2015. Given the continued uncertainty about the effects of RHDV2 competition on RHDV1 K5 impact, and the availability of only a short-term dataset on rabbit reductions caused by RHDV1 K5, a further economic impact assessment of RHDV1 K5 may be made at the conclusion of the RHD Boost Plus project in 2018 when more definitive data is available.

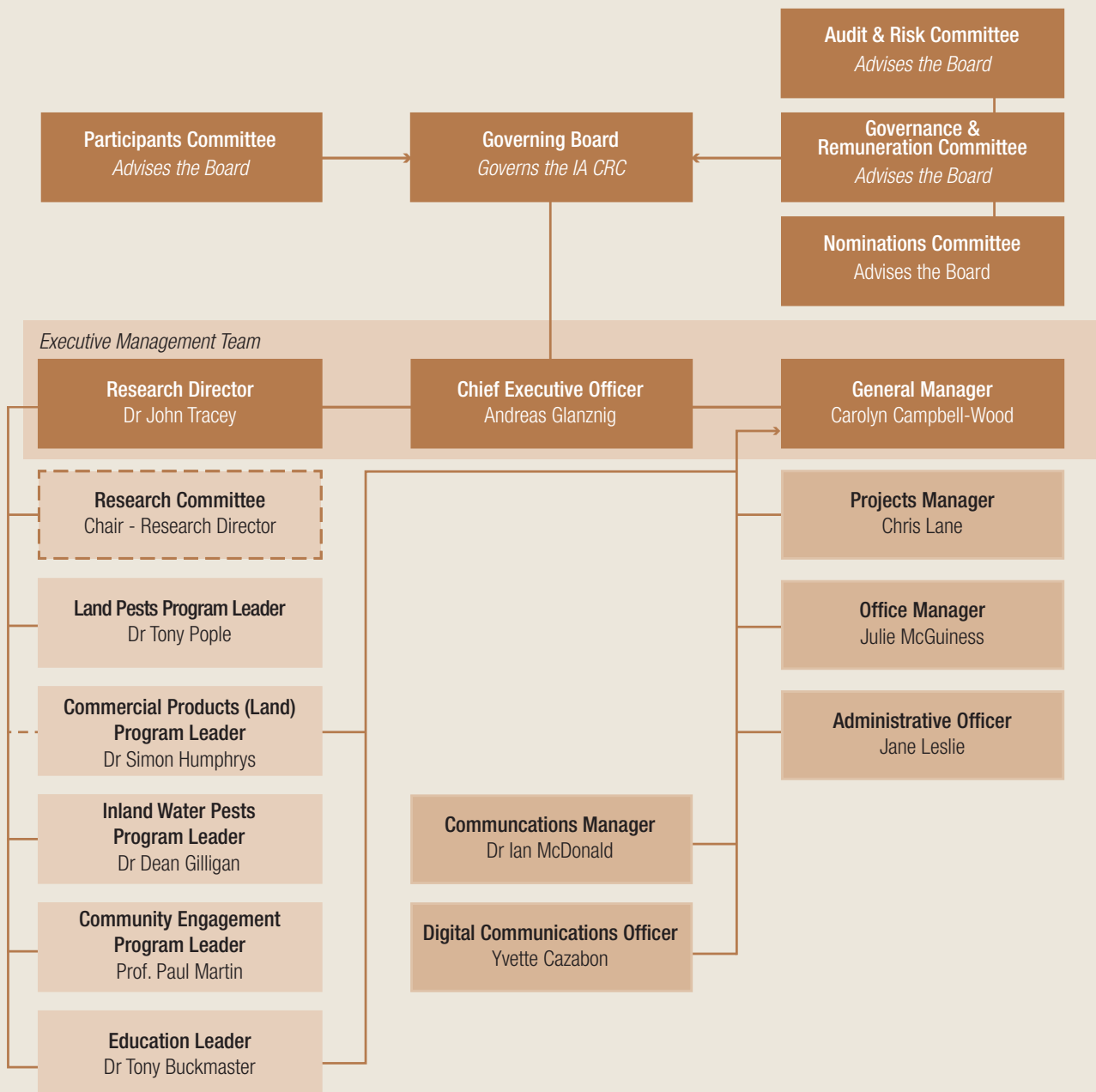


A group of NSW producers learning from Emma Sawyers (NSW DPI technical officer) about how to take a rabbit tissue sample, for RHDV analysis by our labs (image supplied by Peter West)

STRUCTURE & GOVERNANCE

The Invasive Animals CRC (IA CRC) was a joint venture arrangement between the Participants, which includes the Management Company, Invasive Animals Ltd.

Invasive Animals Ltd is a public company limited by guarantee incorporated and domiciled in Australia. It 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-profits Commission.





Invasive Animals Limited Board of Directors – L-R: Peter Noble, Dr Andrew Sanger, Murray Rankin, Helen Cathles, Dr Glen Saunders and David Palmer

The structure and governance of the IA CRC provides strong support to its operations. The IA CRC is led by a Board of skills-based Directors, the majority of whom are independent from the participants of the IA CRC. The Governing Board meets at least four times a year and is committed to compliance with both Australian Charities and Not-for-Profit Commission and the Australian Security & Investments Commission Corporate Governance Principles and Recommendations.

In carrying out its governance role, the main task of the Board was to drive the IA CRC strategy, to develop policies and monitor and review performance to ensure that the IA CRC achieved its research and adoption/utilisation goals until the expiration of its term on 30th June 2017 and to ensure a smooth windup process.

The Board ensured the company complied with its contractual, statutory and other obligations.

During 2016-17 the Board also pursued a transition to the establishment of the Centre for Invasive Species Solution (CISS). CISS will continue to build on the work of the IA CRC and the previous CRC iterations. It will continue to capitalise on the company's unique role in facilitating research collaboration and deploying innovative solutions across jurisdictions that are strategic, efficient and humane in reducing the impact of invasive species.

The names and details of the Directors in office during the financial year and up to the date of this report are as follows:

DIRECTORS	ROLE	KEY SKILLS	INDEPENDENT/ORGANISATION
Helen Cathles	Chair	Director since 2005. Corporate Governance, Primary Production, Pest Animal Control	Independent
Peter Noble	Director	Director since 2015, Legal speciality, Governance & Risk Management	Independent
David Palmer	Director	Director since 2013. Governance, Management & Policy Development	Independent
Murray Rankin	Director	Director since 2013. Governance, Communication, Business & Commercial	Independent
Dr Andrew Sanger	Director	Director since April 2015. Applied scientific research, Management and Regulatory Governance	NSW Dept of Primary Industries
Dr Glen Saunders	Director	Director appointed November 2016. Pest Animal Management and Research.	Independent
Public Officers			
Carolyn Campbell-Wood	Company Secretary	Appointed March 2014.	
Julie McGuinness	Acting Company Secretary	Appointed for the period 24 th Aug 2016 to 4 th October 2016.	

COMMITTEES

The Audit & Risk Committee operates under Terms of Reference as approved by the Board. The Audit & 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 and also manages the internal audit program.

Audit & Risk Committee Members in office during the financial year

NAME	ROLE	KEY SKILLS	INDEPENDENT/ORGANISATION
Murray Rankin	Chair ARC	Director since 2013. Governance, Communication, Business & Commercial	Independent
Dr Andrew Sanger	Director	Director since April 2015. Applied scientific research, Management and Regulatory Governance	NSW Dept of Primary Industries
David Palmer	Director	Director since 2013. Governance, Management & Policy Development	Independent

The Governance & Remuneration Committee operates under Terms of Reference as approved by the Board and has responsibility for Invasive Animals Ltd governance policy and procedures and remuneration policy.

Governance & Remuneration Committee Members in office during the financial year:

NAME	ROLE	KEY SKILLS	INDEPENDENT/ORGANISATION
Peter Noble	Chair GRC	Director since 2015, Legal speciality, Governance & Risk Management	Independent
Helen Cathles	Board Chair	Director since 2005. Corporate Governance, Primary Production, Pest Animal Control	Independent
Dr Glen Saunders	Director	Appointed November 2016. Pest Animal Management and Research	Independent

The Nomination Committee, operating under a Committee Charter as approved by the Board, has responsibility for the Board Directors nomination process and facilitating the Director Election process.

Nominations Committee Members

NAME	ROLE	KEY SKILLS	INDEPENDENT/ORGANISATION
Dr Jim Thompson	Chair	Chair of the IA CRC Participants Committee	Chief Biosecurity Officer Dept of Agriculture & Fisheries Qld
Dr Elaine Murphy	Member	Participants Representative	Principal Scientist NZ Dept of Conservation
Mr Murray Rankin	Chair ARC	Director since 2013. Governance, Communication, Business & Commercial	Independent
Mr Peter Noble	Chair GRC	Director since 2015, Legal speciality, Governance & Risk Management	Independent

DIRECTOR'S MEETINGS

The following Directors were in office during the financial year.

The Committee Chairs held their stated Chair position as at 30 June 2017.

	BOARD MEETINGS		AUDIT AND RISK COMMITTEE		GOVERNANCE & REMUNERATION COMMITTEE		NOMINATIONS COMMITTEE	
	No. eligible	2016–17	No. eligible	2016–17	No. eligible	2016–17	No. eligible	2016–17
No. of meetings held		4		6		4		2
Meetings attended Directors								
Helen Cathles (<i>Chair</i>)	4	4	1	1	4	3	-	-
Peter Noble	4	4	-	-	4	4	2	2
David Palmer	4	3*	6	5*	-	2	-	-
Murray Rankin (<i>Chair Audit & Risk Management Comm</i>)	4	4	6	6	-	-	2	-2
Dr Andrew Sanger	4	4	6	6	-	-	-	-
Glen Saunders	2#	2	-	-	2	2	-	-
Meetings attended Participants								
Dr Jim Thompson (<i>Chair Nominations Comm</i>)	-	-	-	-	-	-	2	2
Dr Elaine Murphy	-	-	-	-	-	-	2	2

* Directors were on leave at this time.

Dr Glen Saunders, elected in November 2016, was eligible for meetings in the 2nd half of the year.

STAFF

Key staff* sit on the Executive Management Team. This committee continually assesses the activities and performance of the CRC and provides management information to support the decision making of the Governing Board.

Invasive Animals CRC Management and Invasive Animals Ltd Staff

NAME	ORGANISATION	CRC POSITION/ROLE	TIME COMMITTED
Mr Andreas Glanznig*	Invasive Animals Ltd	CEO	100%
Mrs Carolyn Campbell-Wood*	Invasive Animals Ltd	General Manager	100%
Dr John Tracey*	NSW Primary Industries	Research Director	60%
Dr Tony Pople	Qld Agriculture, Forestry and Fisheries	Program Leader, Land Pests	75%
Dr Simon Humphrys	Invasive Animals Ltd	Program Leader Land Pests (Commercial Products)	100%
Dr Dean Gilligan	NSW Primary Industries	Program Leader, Inland Water Pests	50%
Prof Paul Martin	University of New England	Program Leader, Community Engagement	51%
Dr Tony Buckmaster	Invasive Animals Ltd	Education Leader	40%
Mr Chris Lane	NSW Primary Industries	Project Manager	100%
Dr Ian McDonald	Invasive Animals Ltd	Communications Manager	100%
Ms Yvette Cazabon	Invasive Animals Ltd	Digital Communications Officer	80%
Ms Julie McGuinness	Invasive Animals Ltd	Office Manager	100%
Ms Jane Leslie	Invasive Animals Ltd	Administration Assistant	100%

STAFF CHANGES

During the period Mr Guy Leedon (Digital Content Officer) and Ms Minky Faber (Communications Officer) resigned from Invasive Animals Ltd. Ms Yvette Cazabon was appointed in January 2017.

In May 2017 Mr Chris Lane accepted another position within NSW Department of Primary Industries.

ESSENTIAL PARTICIPANTS

NAME	TYPE	ABN OR ACN
Commonwealth of Australia through the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES)	Australian Government	ABN 24 113 085 695
Commonwealth of Australia represented by the Murray-Darling Basin Authority (MDBA)	Australian Government	ABN 13 679 821 382
Commonwealth Scientific and Industrial Research Organisation (CSIRO)	Australian Government	ABN 41 687 119 230
ACT Environment and Planning Directorate	State Government	ABN 31 432 729 493
ACT Territory and Municipal Services Directorate	State Government	ABN 37 307 569 373
Local Land Services (formerly Livestock Health and Pest Authority State Management Council (NSW))	State Government	ABN 57 876 455 969
State of Queensland acting through its Department of Agriculture, Fisheries; and Biosecurity Queensland	State Government	ABN 66 934 348 189
State of South Australia through the Department of Primary Industries and Regions (SARDI and Biosecurity SA)	State Government	ABN 53 763 159 658
State of Tasmania acting through its Department of Primary Industries, Parks, Water and Environment	State Government	ABN 58 259 330 901
State of Victoria through its Department of Environment and Primary Industries; and Biosecurity Victoria	State Government	ABN 90 719 052 204
State of Western Australia as represented by the Director-General of the Department of Agriculture and Food	State Government	ABN 18 951 343 745
The Crown in Right of the State of New South Wales acting through the Department of Primary Industries, an office of the Department of Trade and Investment	State Government	ABN 72 189 919 072
Animal Control Technologies (Australia) Pty Ltd	Industry/ private sector/SME	ABN 25 137 868 449
Australian Wool Innovation Ltd	Industry/ private sector/SME	ABN 12 095 165 558
Grains Research and Development Corporation (GRDC)	Industry/Private Sector/SME	ABN 55 611 223 291
Meat and Livestock Australia Limited	Industry/Private Sector/SME	ABN 39 081 678 364
The University of Adelaide	University	ABN 61 249 878 937
The University of Newcastle	University	ABN 15 736 576 735
University of Canberra	University	ABN 81 633 873 422
The University of Queensland	University	ABN 63 942 912 684
University of New England	University	ABN 75 792 454 315
Connovation Ltd	International	NZCN 831417
Department of Conservation, New Zealand	International	Not Applicable
Landcare Research New Zealand Limited	International	NZCN 546064

OTHER PARTICIPANTS

NAME	TYPE	ABN OR ACN
Penn State University, USA	International	Not Applicable
United States Department of Agriculture	International	Not Applicable
The Food and Environment Research Agency (Fera), UK	International	Not Applicable

THIRD PARTY PROJECT PARTICIPANTS

NAME	TYPE	ABN OR ACN
Brisbane City Council	Other	ABN 72 002 765 795
Far North Queensland Regional Organisation of Councils	Other	ABN 52 034 736 962
Gold Coast City Council	Other	ABN 84 858 548 460
Griffith University	University	ABN 78 106 094 461
Istituto Zooprofilattico Sperimentale della Lombardia d dell'Emilia Romagna	Other	Not Applicable
James Cook University	University	ABN 46 253 211 955
Logan City Council	Other	ABN 21 627 796 435
Moreton Bay Regional Council	Other	ABN 92 967 232 136
Somerset Regional Council	Other	ABN 77 195 375 530
Sunshine Coast Regional Council	Other	ABN 37 876 973 913
The University of Sydney	University	ABN 15 211 513 464
Terrain Natural Resource Management	Industry/private sector/SME	ABN 53 106 385 899



A NSW LLS employee releases rabbit virus-laced carrots as part of their management program (image supplied by NSW LLS)

RESEARCH ACHIEVEMENTS



Australian and international research, commercial and industry collaborators that are part of the end-user driven partnerships of the IA CRC

**155** (58 THIS FY)

Articles published in scholarly refereed journals

**38**

IA CRC projects

**55**

Research articles in draft, with plans to publish

RESEARCH LEADERS



DR JOHN TRACEY

Research Director

Our Phase 2 (2012-2017) research program includes the largest strategic rabbit R&D program in nearly 20 years, a major new wild dog research effort, a new strategic community engagement program to focus on the social and institutional aspects of pest animal control, and continuing efforts to develop new pest animal toxins.



DR TONY POPLER,

Land Pests

Products and strategies to manage land pests which impact on agriculture, urban areas and biodiversity.



DR SIMON HUMPHRYS,

Land Pests (Commercial Products)

Research and development into new pest animal toxins and fertility control agents.



DR DEAN GILLIGAN

Inland Water Pests

Products and strategies to detect, control and manage pest fish species.



PROFESSOR PAUL MARTIN

Community Engagement

Ensuring availability and adoption of new products, and understanding the human dimensions of invasive species management.

OUTCOME 1: NO NEW VERTEBRATE PESTS ESTABLISHED IN AUSTRALIA

THEME LEADERS:

Dr Andrea Byrom, Landcare Research NZ

Dr Andrew Woolnough, Victorian Department of Economic Development, Jobs, Transport and Resources

The theme leaders oversee four themes. Highlights of each theme are mentioned below, and outputs from outcome 1 and the collaborations are listed in Table #. Full progress against project milestones is provided in Appendix A and within Research Portfolio Summary.

NATIONAL INCURSIONS RESPONSE SYSTEM:

Developing an incursion response decision support system, capability and tools, including pathway analysis and risk modelling, to better enable a nationally coordinated, efficient and effective response to new invasive animal incursions.

RESEARCH HIGHLIGHTS AND IMPACTS

- › The consultation process for the draft *National Incursions Response Strategy* has been completed and the strategy is now being reviewed by the Invasive Plants and Animals Incursion Expert Group Committee before publication. This strategy is a key publication that will facilitate the expansion and guide future direction of animal plant incursion management.
- › Completed the *National Incursion and Prevention Response Program – A National Incursions Management Toolkit*. This toolkit provides summaries of work completed by other incursion researchers to support and deliver stakeholders a practical means adopting and utilising the information.
- › Completed analysis which reveals that using missing pet websites is a novel resource to obtain information on the numbers and localisation of newly escaped companion animals and constitutes a useful source of information to better understand bird incursions generally.
- › Developed two surveillance data modelling approaches that have the potential to make very important contributions in avoiding or eliminating the deleterious effects of invasive species.



In 2015, a large boa constrictor was found on the streets of Melbourne city (image supplied by Victorian Government)

The *National Incursion Response Plan for Terrestrial Snakes* was developed to provide important information and procedures that can be used by biosecurity specialists and professional snake handlers to respond to terrestrial snake incursions in Australia.

“Snakes on a plane are a real phenomenon... A range of exotic snakes are illegally kept in Australia and now and then they are found in the wild, often by a member of the public,”

Dr Michelle Christy, National Incursions Response Facilitator

STRATEGIC FORECASTING AND PLANNING TO ENABLE PRE-EMPTIVE INVASIVE ANIMAL MANAGEMENT:

Enabling priority regions to use macro-ecological modelling to assess potential patterns of biological invasion under extreme weather events and climate change, and to determine the most cost-effective pest management strategies.

RESEARCH HIGHLIGHT AND IMPACT:

- › Developed a priority list of invasive animal management options for the Lake Eyre Basin that maximised the biodiversity and agricultural benefit per unit cost under current and future climatic conditions

CITIZEN SCIENCE MAPPING AND SURVEILLANCE:

Creating new mobile and web-mapping technology for pest management that will build stronger community involvement in citizen science mapping and surveillance.

RESEARCH HIGHLIGHTS AND IMPACTS

- › FeralScan now hosts more than 100,000 pest animal records and photographs since beginning in 2011, ensuring land managers have access to the latest information about pest animal sightings and control measures, to inform their upcoming management decisions.
- › The Rabbit Biocontrol Tracker function of RabbitScan was launched as part of the National RHDV Monitoring Program. The Tracker has received just over 700 reports of disease to date, helping land managers and researchers understand the movement and interaction of RHDV in Australia.
- › The FeralScan suite is now being utilised as part of management programs for many land management and land care agencies within Australia – in some cases it has even been translated into other languages for use by non-english speaking users.
- › The FeralScan suite was awarded an prestigious 2016 Banksia Award Sustainability Award for its environmental impact and use in 'engaging citizens in an important topic'.

NEXT-GENERATION INVASIVE CARNIVORE DETECTION TOOLS, TECHNIQUES AND STRATEGIES:

Developing an optimal strategy to eradicate foxes from Tasmania through the development of next-generation DNA invasive carnivore detection tools, techniques and strategies. This long-term and risk-based strategic planning approach aims to minimise impact to native species and the sheep industry.

RESEARCH HIGHLIGHTS AND IMPACTS:

- › Developed and implemented robotic extraction for trace DNA of predator scats. Demonstrated that this method was faster and less expensive than the previous manual approach.
- › The robot extraction approach was also adopted for the 2014 scat survey conducted by the Tasmanian Government and the University of Canberra.
- › Research outcomes from these projects, around the monitoring, eDNA detection, modelling and risk assessments have all assisted with developing a long-term strategy for the Tasmanian fox program, which is now being implemented by the Tasmanian Government.



PhD Candidate Jonas Bylemans collecting a water sample from Blakney Creek, NSW, for future eDNA analysis

Traditional detection techniques are unable to identify species at all life stages and are often unable to detect incursions until the species has reached a relatively high density, often after they have become established. This seriously limits the ability to successfully eradicate or contain the species. Through the Invasive Animals CRC, researchers have developed a combination of advanced DNA detection methods utilising genomic technologies, with a robust analytical framework that will enable rapid field application for a wide range of taxa.



Peter West presenting to a group of residents at Carwoola, NSW (image taken by Megan Dixon)

Peter West, FeralScan Program Manager based at NSW DPI, has built this important program from the ground up and is always making upgrades and improvements based on user needs and requests. During the reporting period he was involved in delivering more than 140 extension, training and adoption workshops (online and face to face) engaging stakeholders with our digital tools. The FeralScan Program is now an integral part of many coordinated pest animal programs within Australia.



A number of scats were collected and analysed via eDNA detection techniques as part of the Tasmanian fox detection project

Based on a synthesis of relevant information from numerous contributing pieces of work and research undertaken through the Invasive Animals CRC, Tasmania has now created a long-term strategy for managing fox incursion into the state. Including how to minimise the risk, recommended surveillance options for early detection, and tools required for incursion response.

DEVELOPING PEST FISH DETECTION TOOLS:

Supporting a national incursions response system through an efficient and accurate field surveillance technique to detect national and state priority pest fish at low densities. eDNA technology for tilapia and other high risk invasive aquatic species

OUTPUTS AND COLLABORATION

Outcome 1: No new vertebrate pests established in Australia

OUTPUT	COLLABORATIONS
1L1. National Incursions Response Facilitator	Australian Government Department of Agriculture and Water Resources
	Australian Government Department of the Environment and Energy
	Western Australian Department of Primary Industries and Regional Development
	Primary Industries and Regions South Australia
	Victorian Department of Economic Development, Jobs, Transport and Resources
	Queensland Department of Agriculture and Fisheries
	Tasmanian Department of Primary Industries, Parks, Water and Environment
	NSW Department of Primary Industries
	Invasive Plant and Animal Committee (IPAC) Incursions Working Group
	University of Adelaide
	Wildlife Health Australia

RESEARCH HIGHLIGHTS AND IMPACTS:

- › Developed laboratory manual and field use protocols for eDNA detection of freshwater fish species.
- › Developed a multispecies detection method for whole fish community analysis within a water system.
- › Developed eDNA technology to detect pest fish species such as European carp, tilapia, redfin perch and weatherloach,.

OUTPUT	COLLABORATIONS
	Nursery and Gardens Industry Australia
	Landcare Research New Zealand
	US Geological Survey
	US Fish and Wildlife Service
	SeaGrant USA
1L2. Pest-Information Hub (Pest iHub)	Western Australia Department of Primary Industries and Regional Development
	Victorian Department of Economic Development, Jobs, Transport and Resources
	NSW Department of Primary Industries
	New Zealand Department of Conservation
	University of Adelaide
	University of Queensland
	Arthur Rylah Institute
	New Zealand Landcare Research
	USA National Wildlife Research Centre
1L4. Exotic vertebrate risk analysis and complex invasion pathway framework	Victorian Department of Economic Development, Jobs, Transport and Resources
	Primary Industries and Regions South Australia
	Western Australia Department of Primary Industries and Regional Development
	NSW Department of Primary Industries
	Invasive Animals and Plants Committee
	Zoological and Aquarium Association
	University of Adelaide
	New Zealand Landcare Research
1L5. Mobile devices and web-mapping tools for pest species	NSW Department of Primary Industries
	NewtonGreen Technologies (web-service provider)
	University of Adelaide
	University of Western Sydney
	University of New England
	Atlas of Living Australia
	IPAC National Indicators Working Group
	Upper Murrumbidgee Demonstration Reach
	Murrumbidgee Landcare Group
	Wollongong City Council (NSW)
	Canberra Indian Myna Action Group (ACT)
	Granite Borders Landcare Committee
	Tenterfield Wild Dog Control Group
	Australian Government Dept. of Environment
	CSIRO Agriculture Flagship
	Grains Research and Development Corporation
	Department of Agriculture Western Australia (WA)
	Goulburn Broken CMA
	ACT Government TAMS
	NSW National Parks and Wildlife Service

OUTPUT	COLLABORATIONS
	Bush Heritage Australia
	Agriculture Kangaroo Island
	Dept of Environment, Water, Natural Resources SA
	Mallee Landcare Group
	Greater Mallee Landcare Area Group
	North-east Singleton Wild Dog Association
	Central West Farming Systems group
	Mallee CMA
	Central Tablelands LLS (NSW)
	Western LLS (NSW)
	North-west LLS (NSW)
	Northern Tablelands LLS (NSW)
	North Coast LLS (NSW)
	Hunter LLS (NSW)
	Victorian DEDJTR
	Parks Australia
	Tasmanian Government DPIPW (TAS)
	Sydney Coast Councils Group
	NSW Office of Environment and Heritage (OEH) (NSW)
	Foundation of National Parks and Wildlife (NSW)
	King Island NRM (Tasmania)
	Phillip Island Council (VIC)
	Rockdale City Council (NSW)
	Kanangra to Wyangala (K2W)
	Bellarine Landcare Group (VIC)
	South Australian Department of Environment, Water and Natural Resources
	Natural Resources South Australia Murray-Darling Basin (SA)
	Natural Resources Northern & Yorke (SA)
	Central Highlands Resource Planning Use Cooperative (CHRRUP) (Qld)
	Kangaroo Island Council
	Natural Resources Kangaroo Island (SA)
	Kangaroo Island Natural Resources Management Board
	Western Plains Regional Council
	Greater Sydney Local Land Services
	Central West Local Land Services
	ACT Waterwatch
	Conservation Volunteers Australia (Green Army)
	New Zealand Landcare Research
1L11. Prioritising adaptation actions for managing invasive animals under climate change	Queensland Department of Agriculture and Fisheries
	Far North Queensland Regional Organisation of Councils
	Commonwealth Scientific and Industrial Research Organisation
	Queensland University of Technology

OUTPUT	COLLABORATIONS
	University of Queensland
	Terrain Natural Resource Management
	National Research Institute of Agronomy
1L21. Mechanised extraction and next generation sequencing for the analysis of trace DNA in predator scats	Tasmanian Department of Primary Industries, Parks, Water and Environment
	University of Canberra
	Queen Victoria Museum
	Tasmanian Museum and Art Gallery
	Holsworth Wildlife Research Endowment
	NRM North Community
	New Zealand Landcare Research
1L22. Detection and monitoring for fox incursion in Tasmania	Department of Primary Industries, Parks, Water and Environment Tasmania
	University of Canberra
	New Zealand Landcare Research
1L23. Risk assessment for new fox control techniques	Charles Sturt University
	Nick Mooney (private)
	Cawthron Institute NZ
1L24. Long-term strategy for the Tasmanian fox program	University of Queensland
	CSIRO
	NSW Department of Primary Industries
	University of Tasmania
	University of Canberra
	New Zealand Landcare Research
1W1. The Utility of eDNA as a Tilapia surveillance tool	Queensland Department of Agriculture, Fisheries and Forestry
	James Cook University
1W2. New eDNA surveillance for multiple high risk invasive aquatic species	University of Canberra
	CSIRO
	Primary Industries & Regions South Australia
	NSW Department of Primary Industries
	Tasmanian Inland Fisheries Service
	Northern Territory Government
	Curtin University
	Cawthron Institute NZ
	University of Waikato, NZ
	The Nature Conservancy, USA
	Secretariat of the Pacific Community, New Caledonia

OUTCOME 2: IMPROVED PREDICTION AND CONTROL OF EMERGING OUTBREAKS

THEME LEADER:

Dr Simon Humphrys, Invasive Animals Limited

The theme leader oversees two themes. Highlights of each theme are mentioned below, and outputs from outcome 2 and the collaborations are listed in on page 43. Full progress against project milestones is provided in Appendix A.

NEW TOXINS

Advancing a new pest bird toxin and more efficient and sustained control of mouse outbreaks:

Reducing the impact of starlings on intensive agriculture and enabling local preparation of grain-based bait; research and development of a new humane rat and mouse toxin; and development of a mouse outbreak response system.

New tactical tools and feral pig management products:

Enabling registration of a carbon monoxide pressure fumigator for burrowing animal control and lethal trap device, and undertaking field trials in the USA to enable registration of HOGGONE® in Australia and the USA.

Research highlights and impacts:

- › Two manufactured PAPP bait products, Dogabait and Foxecute have been launched into the Australian market via Animal Control Technologies Australia (ACTA)
- › Completed full assessment of attractiveness, palatability, effectiveness and stability of HogGone paste prototype in Australia in field trials which has resulted in ACTA submitting the HogGone product registration package to APVMA for review.



A global consortium of researchers' have been developing formulations of sodium nitrite to create a potential new and additional bait (HogGone) for feral pig control. Sister projects include the registration of HOGGONE in NZ (led by Connovation) and in the USA (led by the United States Department of Agriculture's (USDA) National Wildlife Research Center) for wild hog control.

To get a feel for the work required to set up a trial in Australia, Australian researchers invited Dr Nathan Snow (from the USDA) to Australia for the field trial preparation. Dr Snow and the team (Dr Simon Humphrys and Mr Jason Wishart) built up quite the appetite from the long hours in the field.

They visited the famous Nindigully pub to try the 'Roadtrain Burger'. The patty alone was 1.25kg. Unfortunately the team couldn't finish the whole burger but we are proud to say they did finish their field work. Suffice to say, Dr Snow had quite a unique Australian experience.

- › Completed field studies that assessed and proved the effectiveness of two lethal trap device prototype products being developed for wild dog management.
- › Proof of concept studies showing that methylene blue (PAPP antidote) can safely be administered intraperitoneally, research ongoing.
- › Seasonal surveys of mouse abundance ongoing.

FERTILITY CONTROLS

Nonlethal periurban and urban kangaroo management tool:

Enabling APVMA registration of injectable fertility control — GonaCon™.

Oral delivery of immunocontraceptive fertility control agents:

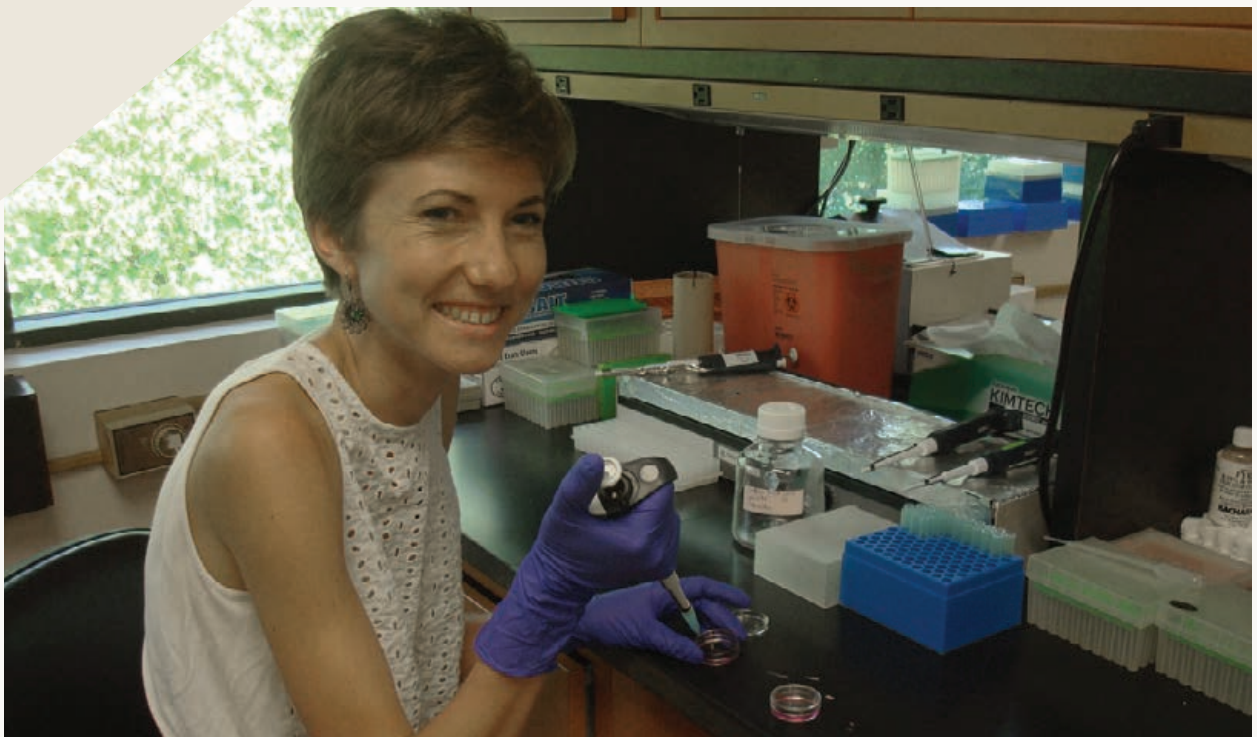
Proof of concept achieved but not enough for reproductive changes

Advancing species-specific bacteriophage-based platform fertility control technology:

Developing species-specific fertility control that can be applied to humanely manage those species where lethal control is not socially acceptable; and R&D of oral delivery of fertility control.

Research highlights and impacts:

- › Submitted registration application for GonaCon™ use in deer and macropods to the APVMA for assessment.
- › Successfully generated a library of peptides that target key cell types within the reproductive system.
- › Optimised peptides with reagents to create a 'bacteriophage' sterilising agent which targets fertility, and tested these in mice.



Dr Sally Hall and Dr Aleona Swegen (pictured) were Invasive Animals CRC PhD candidates based at the University of Newcastle. Supervised by Professor John Aitken, they were researching potential fertility control agents for invasive species, with a specific interest in brumby management. Both Sally and Aleona have had their PhDs conferred and are interested in continuing research in the area of non-lethal management options of wildlife. Aleona has just started a post-doc with the same lab, and Sally is continuing her career in pest species management, having joined the Crown-of-Thorns Starfish control program in North Queensland.

COLLABORATIONS

Outcome 2: improved prediction and control of emerging outbreaks

OUTPUT	COLLABORATIONS
2C1. Avicides	Meat and Livestock Australia
	Feed lot & piggery managers
	Grains Research and Development Corporation
	Grain storage facilities
	Australian Pork Limited
	United States Department of Agriculture
2C2. Rodenticides	Grains Research and Development Corporation
	Animal Control Technologies Australia
	University of Queensland
	United States Department of Agriculture
	New Zealand Landcare Research
2C3. Surveillance and forecasts for mouse outbreaks in Australian cropping systems	CSIRO
	Grains Research and Development Corporation
	NSW Department of Primary Industries
	New Zealand Landcare Research
2C4. HOGGONE – USA field trials and US registration	Animal Control Technologies Australia
	Queensland Murray Darling Committee
	Meat and Livestock Australia
	Animal and Plant Health Inspection Service, United States Department of Agriculture
	Texas Parks and Wildlife Department
2C5 Managing finalisation of new tactical tools	Department of Primary Industries NSW
	Livestock Pest and Health Authority State Management Council
	WB&G Manufacturing
	General Dogs Body
	Connovation
2C12 Fertility control oral delivery	CSIRO
	Meat and Livestock Australia
	United States Department of Agriculture
2C13 Development of reagents for the sterilisation of pest animal species	University of Newcastle
	University of Sydney
	Hunter Valley Brumby Association Inc.
	Found Animals Foundation, USA

OUTCOME 3: RECOVERY OF KEY LAND AND WATER REGIONS FROM RABBITS, WILD DOGS AND CARP

THEME LEADERS:

Rabbits: Greg Mutze, South Australian Department of Primary Industries and Regions, and Dr Tanja Strive, CSIRO

Wild dogs: Dr Peter Fleming, NSW Department of Primary Industries

Carp: Dr Dean Gilligan, NSW Department of Primary Industries

The theme leaders oversee three themes. Highlights of each theme are mentioned below, and outputs from outcome 3 and the collaborations are listed in Table 13. Full progress against project milestones is provided in Appendix A.

RABBITS

Approval, release and performance monitoring of RHDV1 K5 strain:

Gaining policy and regulatory approval for the release and monitoring of the RHDV1 K5 strain selected through the RHD Boost project, as part of an agreed national rabbit biocontrol release and monitoring plan.



John Matthews, Victorian Biosecurity Manager (pictured front of image) was the state coordinator for the Victorian release of RHDV1 K5, which consisted of more than 150 coordinated community release sites. Here is John with a couple of members of his team getting prepared to send out packs to release sites as part of the national release in March 2017 (image taken by Caroline Potter DEDJTR).

RABBIT HAEMORRHAGIC DISEASE (RHD) RESISTANCE MODEL:

Creating a comprehensive RHD resistance model and strategic knowledge to maintain RHDV as an effective biocontrol agent in Australia.

Strategic rabbit control:

Undertaking strategic, efficient and effective implementation of new and existing rabbit control methods through a transferable Rabbit Decision Support System and National Rabbit Facilitator

RESEARCH HIGHLIGHTS AND IMPACTS:

Australia

- › Registration of RHDV1 K5, a Korean strain of rabbit haemorrhagic disease virus, has been achieved and the national release undertaken in March 2017.
- › Since RHDV1 K5 release, there has been a national decline in observed rabbit numbers of 42% (based on 191 release sites who provided full count data).

- › Better understanding of the prevailing strains of RHD in the field that will inform which strain the Accelerator virus will likely have to outcompete.
- › Delivered a proof of concept that the RHD Accelerator project methods can be used to produce viruses with altered characteristics
- › Analysis techniques set up to track the spread of RHDV2 around Australia.
- › Economic Impact Assessment of *Eimeria* and RHDV2 undertaken.
- › Produced the Conservation and Production Decision Support System for rabbit management which are available through the PestSmart Connect website.

New Zealand

- › Genetic analysis of recently discovered NZ RCV strains indicate that they are most closely related to the Australian benign caliciviruses.
- › RCV diagnostic tools developed for analysis of NZ benign caliciviruses (adapted from Australian protocols).



A rabbit caught on remote camera consuming RHDV1 K5 virus-laced oats four hours after they were placed out (image supplied)

WILD DOGS

Researching the impacts of wild dogs on agriecosystems:

Determining if regional control of wild dogs influences populations of quolls, foxes, feral cats and native prey species. This will enable improved strategic wild dog management in sheep and cattle regions of Australia.

Improving policy for wild dog management across Australia:

Determining the legislative and policy incentives for, and barriers to, effective co-management of wild dogs.

Wild dogs in periurban areas:

Improving understanding of the ecology of periurban wild dogs in coastal eastern Australia, and the most effective management strategies and product mix to reduce wild dog impacts.

Nil-tenure regional management:

Increasing adoption of regional nil-tenure wild dog management, and integrated use of existing and new wild dog products and techniques.

Research highlights and impacts:

- › GPS collar data collection completed for 39 wild dogs, 5 foxes, 10 feral cats, 10 spotted-tailed quolls, 17 brush-tailed possums and 2 goannas, in the New England region. This research showcased that aerial baiting has negligible impacts on native species.



Each year, landholders and land managers in the Northern Tablelands of NSW undertake a largescale aerial baiting program for wild dog control. Our AWI-funded Northern NSW wild dog coordinator, Dave Worsley, helps facilitate this program, which is led by the NSW Northern Tablelands LLS. A long-term research trial assessing the impact of aerial baiting on both introduced and native predators has also been undertaken as part of our CRC research program. Our research, led by Drs Peter Fleming and Guy Ballard from NSW DPI, showcased that of the quolls which were being monitored, there were no deaths during the aerial baiting campaigns and more that 90% of the wild dogs which were being tracked did die from the baiting campaigns (image supplied by NSW Northern Tablelands LLS).

- › Completed all field research aspects of the ‘wild dogs in agri-ecosystems’ project showcasing that application of 40 baits over 10 baits per km more effective for targeted predator control and no spotted tail quoll deaths during baiting campaigns
- › Diet and movement data of peri-urban wild dogs has been collected, collated, analysed and described. Results confirm that wild dogs in peri-urban areas consume a wide variety of prey items, but appear largely dependent on small to medium-sized mammals. Results also supports that peri-urban wild dogs are not reliant on human-sourced foods.
- › Canid Pest Ejector (CPE) field trial undertaken in Queensland with results indicating that CPEs are target specific to dogs and foxes, with wildlife species usually showing interest, but little activity at ejector sites.
- › The national wild dog facilitator continues to support and mentor industry funded coordinators as well as providing support to state government wild dog management staff throughout the country.
- › National and regional industry and state funded wild dog facilitators continue to work closely with stakeholders in wild dog affected regions in order to assist with the delivery of effective wild dog management programs.

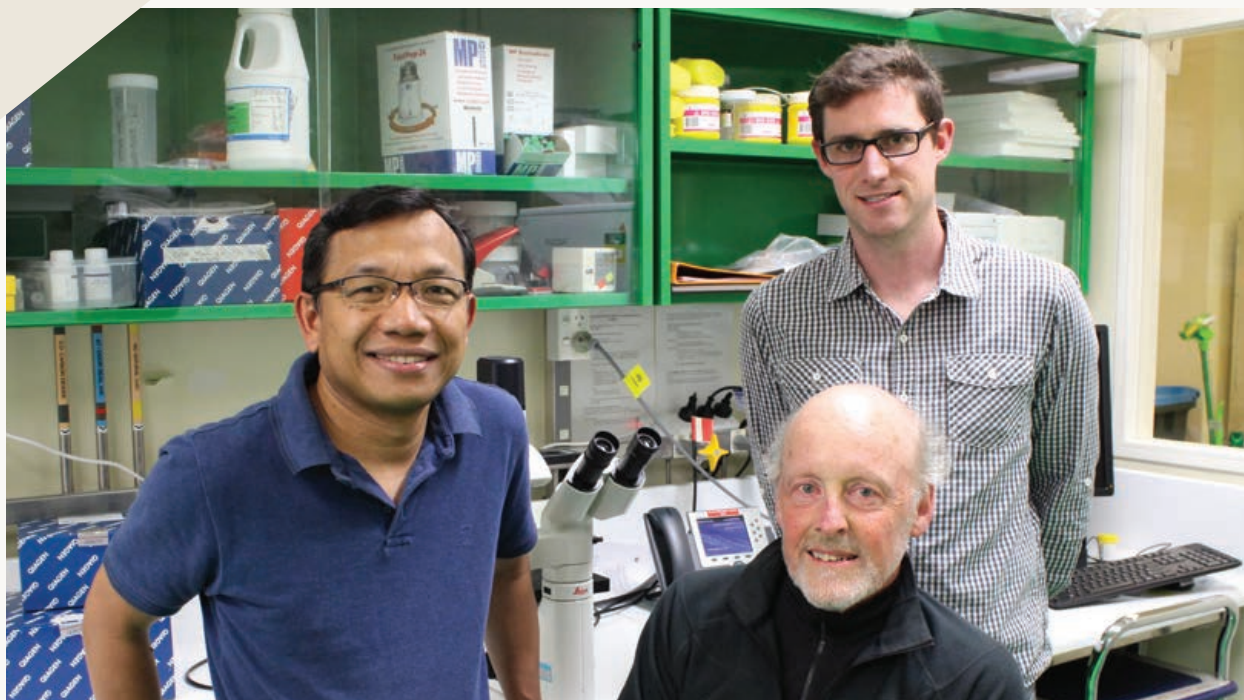
CARP

Carp biocontrol research, registration and approval:

Evaluating cyprinid herpesvirus 3 (CyHV-3) as a potential biological control agent for carp in Australia, with the expected outcome being reduction in carp populations over most of the Murray–Darling Basin. Along with the submission of a registration package for approval by APVMA.

Research highlights and impacts:

- › CyHV-3 confirmed to not effect 14 species of fish (13 native, 1 introduced), yabbies, a species of lamprey, two amphibian species, two reptile species, chickens and mice – suggesting spill over infections and species jumps are extremely unlikely.
- › Submission of application to import the carp herpesvirus (CyHV-3) under the *Quarantine Act 1908*.
- › Submission of registration package to the APVMA seeking registration of CyHV3 as a Carp control agent.
- › Multiple Aspects of this project led to the development of a \$15 million Australian Government funded National Carp Control Plan.



Since 2006, a potential biological control method - cyprinid herpesvirus (CyHV-3), has been investigated by Drs. Agus Sunarto, Ken McColl and Matt Neave (L-R) at CSIRO's Australian Animal Health Laboratory through an Invasive Animals Cooperative Research Centre collaboration that includes the Murray-Darling Basin Authority, NZ Department of Conservation, NSW DPI Fisheries and Vic Fisheries. This research was fundamental in the creation of the Australian Governments' National Carp Control Plan which is now undertaking further research and assessments to decide if they should release the virus by the end of 2018.



Without Michele, a national plan for wild dog management in Australia may not even exist. Here she is (right of image) with Jane Brownbill (ex-chief of Wool Producers Australia) and Federal Minister for Agriculture, Barnaby Joyce, launching the National Wild Dog Action Plan in July 2014 (image taken by Dave Robinson)

VALE MICHELE JACKSON – 1949 – 2017

Members of the National Wild Dog Action Plan stakeholder group have joined their voices in celebrating the life of Michele Jackson who passed away in May 2017 from an ongoing battle with cancer.

Michele was instrumental in the development of a national approach to wild dog management within Australia, which resulted in the *National Wild Dog Action Plan* being implemented in 2014.

She remained committed to the cause even after stepping down as the Action Plan Manager in December 2015.

Geoff Power, Chair of the National Wild Dog Action Plan stakeholder group said she has left a legacy that she would have been proud of.

“Michele and I went back a long way, I was chair of Wool Producers when we initiated the National Wild Dog Action Plan and Michele was an integral part of that.

“it is now up to us to collectively build on what Michele created,” Mr Power said.

Duncan Fraser, Chair of the National Wild Dog Action Implementation Steering Committee (ISC) said he was most impressed with Michele’s knowledge of wild dog issues.

“Michele (and Jane Brownbill) asked me to take on the Chair role for the ISC in May 2014 and during this time I thoroughly enjoyed working with Michele, whose life was sadly cut short.

“It was a privilege to work with Michele - a true professional,” Mr Fraser said.

Greg Mifsud, National Wild Dog Management Facilitator with the Invasive Animals Cooperative Research Centre said Michele was a pillar of strength and worked tirelessly for the cause.

“Without her drive, passion and commitment to the action plan it would not have been developed in just 12 short months.

“We became very good friends and developed an extremely productive professional relationship that resulted in the plan being funded for the last three years. She was an extremely enthusiastic and passionate person who didn’t do things by halves and always put others first.

Michele was the ultimate campaigner for a coordinated, national approach to wild dog management.

Her passing has left a gap in the hearts of all the stakeholders involved in the National Wild Dog Action Plan, but has also made them more determined to see the legacy that she helped create, live on.

Michele was the loved wife of Paul and amazing mother to Justin, Radar and Thea. Mother-in-law to Enrique. Very proud Nonna to Madison, Bella, Fletcher, Ben, Archie and Jackson. Loved daughter of Marie and Bill and loving sister to Susanne, Karen and Cathleen. Loved daughter of Peter and loving sister to Tony.

Outcome 3: Recovery of key land and water regions from rabbits, wild dogs and carp

OUTPUT	COLLABORATIONS
3L1. RHD Boost: roll-out of new RHDV strains	Australian Government Department of Agriculture and Water Resources
	Department of Primary Industries and Regions South Australia
	Western Australia Department of Primary Industry and Regional Development
	NSW Department of Primary Industries
	Queensland Department of Agriculture and Fisheries
	ACT Territory and Municipal Services Directorate
	ACT Environment and Sustainable Development Directorate
	Tasmanian Department of Primary Industries, Parks, Water and Environment
	NT Department of Primary Industries and Fisheries
	Victorian Department of Economic Development, Jobs, Transport and Resources
	Commonwealth Scientific and Industrial Research Organisation
	Australian Wool Innovation Ltd
	Meat and Livestock Australia Limited
	New Zealand Landcare Research
3L2. Comprehensive RHD resistance model	Department of Primary Industries and Regions South Australia
	CSIRO
	Department of Primary Industries NSW
	University of Adelaide
	Meat and Livestock Australia
	The University of Sydney
	Istituto Zooprofilattico Sperimentale, Brescia, Italy
3L3. Non-pathogenic rabbit caliciviruses	CIBIO, Universidade do Porto, Portugal
	CSIRO
	New Zealand Landcare Research
	University of Otago, NZ
3L4. RHD Accelerator	AgResearch, NZ
	CSIRO
	University of Canberra
	Department of Primary Industries NSW
	Australian Wool Innovation
	Meat and Livestock Australia
	Biosecurity SA
	University of Sydney
	University of NSW
	Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZS), Brescia, Italy
	Landcare Research New Zealand
3L5. New potential rabbit biocontrol agent prospecting and assessment	Department of Primary Industries and Regions South Australia
	University of Canberra
	Wildlife Health Australia

OUTPUT	COLLABORATIONS
	CSIRO
	Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZS), Brescia, Italy
3L6. Decision support systems for effective rabbit management	NSW Department of Primary Industries
	Queensland Department of Agriculture, Fisheries and Forestry
	Victorian Department of Economic Development, Jobs, Transport and Resources
	ACT Government Territory and Municipal Services
	Meat and Livestock Australia
	New Zealand Landcare Research
3L11. Co-management solutions for wild dogs in agri-ecosystems: predators, prey, plants and the triple bottom line	NSW Department of Primary Industries
	NSW Local Land Services
	NSW National Parks and Wildlife Service University of New England
	Australian Wool Innovation
	Meat and Livestock Australia
	Wild Dog Associations / Livestock Producers
	National Wild Dog Management Advisory Group
	National Wildlife Research Center, USA
3L13. Limiting the source – peri-urban wild dog control	Queensland Department of Agriculture, Fisheries and Forestry
	NSW Department of Primary Industries
	Meat and Livestock Australia
	Moreton Bay Regional Council
	Somerset Regional Council
	Logan City Council
	Sunshine Coast Regional Council
	Brisbane City Council
	Gold Coast City Council
	Tweed Shire Council
	University of Queensland
	University of NSW
	University of Southern Queensland
	National Wildlife Research Center, USA
3L14. Facilitating strategic management of wild dogs throughout Australia	Australian Wool Innovation
	Meat and Livestock Australia
	ACT Government Territory and Municipal Services
	Australian Bureau of Agricultural and Resource Economics and Sciences
	Queensland Department of Agriculture, Fisheries and Forestry
	NSW Department of Primary Industries
	Department of Environment and Primary Industries Victoria
	Department Primary Industries and Regions South Australia
	Western Australia Department of Primary Industries and Regional Development
	NSW local Land Services
	NSW Farmers

OUTPUT	COLLABORATIONS
	Wool Producers Australia
	Queensland Parks and Wildlife Service (Queensland Department of National Parks, Recreation, Sport and Racing)
	AgForce Queensland
	Granite Borders Landcare
	Victoria River District Conservation Association
	Gulf Rivers Landcare
	Northern Territory NRM
	Western LLS
	Rangelands Natural Resource Management WA
	Northern New England Landcare
	Northern Territory Cattlemen's Association
	Tilpa Progress Association
	Wanaaring Wild Dog Committee
	Northern Territory Government
	Barrier Ranges Landcare
	United Wild Dog Alliance Mid North Coast Inc
	Penn State University, USA
	USDA Wildlife Damage Unit
	French National Institute for Agricultural Research
3W1. Cyprinid herpesvirus-3 - CyHV-3: its potential as a biological control agent for carp in Australia	CSIRO
	Victorian Department of Environment and Primary Industries
	NSW Department of Primary Industries
	Murray-Darling Basin Authority
	New Zealand Department of Conservation
3W2. Cyprinid herpesvirus-3 - CyHV-3: registration, release and selected monitoring	NSW Department of Primary Industries
	Murray-Darling Basin Authority
	Commonwealth Environmental Water Office and Water Resources
	Department of Agriculture
	Commonwealth Department of the Environment
	Australian Pesticides and Veterinary Medicines Authority
	Australian Quarantine and Inspection Service
	Tasmanian Department of Primary Industries, Parks, Water and Environment - Inland Fisheries Service,
	Primary Industries and Regions SA –
	South Australian Research and Development Institute
	Victorian Department of Environment and Primary Industries
	Queensland Department of Agriculture, Fisheries and Forestry
	Western Australian Department of Fisheries
	ACT Territory and Municipal Services
	New Zealand Department of Conservation
	New Zealand Ministry of Primary Industries
	UK's Environment Agency and

OUTPUT	COLLABORATIONS
	Japan's Ministry of Agriculture, Forestry and Fisheries
	Australian Recreational Fishing Foundation
	National Farmers Federation
	National Irrigators Council
	Australian Conservation Foundation
	Invasive Species Council
	Cornell University
	Chautauqua Lake Association
	Centre for Environment Fisheries and Aquaculture Science
	KoVax, Dag Noy - Hazorea and Ma'agan Michael Fish Farms
	Japan's Research Institute for Humanity and Nature
	Japan's National Research Institute of Aquaculture Fisheries Research Agency

OUTCOME 4: STRENGTHENED SOCIAL NETWORKS AND INSTITUTIONAL 'ARCHITECTURE' AROUND PEST ANIMAL CONTROL

Theme leader: Professor Paul Martin, University of New England

The theme leader oversees one theme. Highlights of the theme are mentioned below, and outputs from outcome 4 and the collaborations are listed in Table #. Full progress against project milestones is provided in Appendix A.

COMMUNITY-LED PEST ANIMAL MANAGEMENT

Improving agricultural productivity from accelerated adoption of best-practice pest animal control strategies and technologies by facilitating collective action, establishing triggers for effective action, and reducing legal and institutional impediments.

RESEARCH HIGHLIGHTS AND IMPACTS:

- › Developed three Online modules in the 'Community Action Tool box' which are now available online via the 'Invasive Action Tool', 279 registered subscribers, so far.
- › Delivered the Community Engagement Masterclass in Western Australia involving 32 participants from across Australia, including many industry based regional facilitators.
- › A series of practitioner profiles have been completed and published online.
- › Enhanced awareness of policy makers and key of the extent to which these issues put at risk other reforms, particularly the increasingly central concept of 'shared responsibility'.
- › Established the Victorian Rabbit Action Network (VRAN) as a facilitating institution which has promoted community led rabbit action across the rabbit system, as evidenced by a growing emphasis on and preference towards collaboration especially between government agencies and community volunteer groups.
- › The systems strengthening approach is being adapted for use in other jurisdictions – SA and WA are investigating the use of systems mapping as a means of support community led action on rabbits.



Many of the the Community Engagement and Behaviour Change research team presented their findings at the 17th Australasian Vertebrate Pest Conference in May 2017, including the theme leader Professor Paul Martin, who was a keynote speaker on day 2.

Front row – Professor Daryl Low Choy; Katrina Dickson; Dr Tanya Howard

Middle – Dr Patty Please; Dr Lynette McLeod; Professor Don Hine; Roxane Blackley; Professor Paul Martin

Back – Ed Morgan; Darren Marshall; Vivek Nemane

Absent - Professor Ted Alter, Bill Shufstall, Walt Whitmer, Paloma Frumento, Jeff Bridger, Aaron Driver, Elodie LeGal, Kylie Lingard, Amy Cosby

Outcome 4: strengthened social networks and institutions around pest animal control

OUTPUT	COLLABORATIONS
4E1. Facilitate collective action	University of New England
	Meat and Livestock Australia
	Australian Wool Innovation
	Queensland Murray-Darling Committee
	Department of Primary Industries, Parks, Water and Environment Tasmania
	Department of Agriculture and Food WA
	Department of Primary Industries NSW
	Victoria Dept. of Economic Development, Jobs, Transport, and Resources (DEDJTR)
	School of Veterinary and Life Sciences, Murdoch University
	Penn State University, USA
	Cornell University, USA
4E2. Triggers for effective action	Sam Houston State University, USA
	Tasmanian Department of Primary Industries, Parks, Water and Environment
	Queensland Department of Agriculture and Fisheries
	City of Gold Coast Council
	NSW Department of Primary Industries
	Western Australia Department of Primary Industries and Regional Development
	South West NRM
	University of New England
	Queensland Murray Darling Committee
4E3. Reduction of legal and institutional impediments	Griffith University
	NSW Department of Primary Industries
	Tasmanian Department of Primary Industries, Parks, Water and Environment
	University of New England. Griffith University
	Meat and Livestock Australia Limited
	Queensland Murray Darling Committee
	Pennsylvania State University USA
4E4. Action driven coordination	NSW Department of Primary Industries
	Tasmanian Department of Primary Industries, Parks, Water and Environment
	City of Gold Coast Council
	Queensland Department of Agriculture and Fisheries
	University of New England
	Meat and Livestock Australia Limited
	Australian Wool Innovations Limited
	Griffith University
	Queensland Murray-Darling Council
	Pennsylvania State University USA
	Sam Houston University USA
	Cornell University USA

OUTPUT	COLLABORATIONS
4E6. Facilitating community led rabbit management in Australia	Victorian Department of Economic Development, Jobs, Transport, and Resources
	Victorian Department of Environment, Land, Water and Planning
	Victorian Catchment Management Authorities
	Queensland Department of Agriculture and Fisheries
	Parks Victoria
	University of New England
	Rabbit Free Australia
	Australian Wool Innovation
	Meat and Livestock Australia Limited
	Victorian Landcare Networks and Groups
	Victorian Farmers Federation
	Pennsylvania State University USA
4E11. VET Training packages on strategic pest management	NSW Department of Primary Industries
	University of New England
	Pennsylvania State University USA
4E12. National NRM Facilitator	NSW Department of Primary Industries
	NSW Office of Environment and Heritage
	NSW Local Land Services
	Victorian Department of Economic Development, Jobs, Transport, and Resources
	West Gippsland CMA
	Northern and Yorke NRM
	South West NRM
	South Coast NRM WA
	Northern Territory NRM
	Adelaide and Mt Lofty Ranges NRM
	Queensland Murray Darling Committee
	Agforce Queensland
	Braysher Consulting
	North East (NSW) Pest Animal Steering Group
	Pennsylvania State University USA
	New Zealand Landcare Research
4E21. Balanced Researcher Program	Plant Biosecurity CRC
	Commonwealth Scientific and Industrial Research Organisation
	University of Sydney
	University of Canberra



Pablo García-Díaz in the field collecting data on reptiles as part of his PhD research on incursions.



Dr Tony Buckmaster, Education Leader, Invasive Animals Ltd

The IA CRC's successful PhD training initiative, the Balanced Researcher Program, and the Vocational Education and Training theme, sits within the Community Engagement program.

HOW ARE WE TRACKING?

14 enrolled in the PhD program

- › 4 have been conferred – congratulations Drs.
- › 3 have submitted their theses for marking
- › 4 are due for submission by end of 2017
- › 2 are due for submission in 2018
- › 1 is due for submission in 2019

4 enrolled in the Professional Doctorate program

- › 3 are ongoing
- › 1 has left the program

EDUCATION & TRAINING

THEME	DOCTORAL STUDENTS
Incursion response and pest intelligence systems	5
Fertility controls	2
Strategic rabbit control	2
Strategic wild dog control	2
Community engagement	7
Total	18

POSTGRADUATE EDUCATION

The Balanced Researcher Program aims to create multi-skilled industry-ready graduates from the IA CRC's PhD program. Doctoral candidates undertake the 80-day professional development program over the course of their four-year research project and obtain skills that would not normally be possible through a traditional 'research-only' PhD program.

Skills are developed in areas such as leadership, management and stakeholder engagement. Training is also provided in statistical analysis and strategic communications. Candidates undertake at least 20 days' placement within industry to gain experience, and also to form enduring networks and linkages that add further depth to their research projects and intended careers.

To ensure that this additional training load does not adversely affect the candidates' ability to produce exceptional-quality research theses, the IA CRC fully funds an eight-semester scholarship.

The IA CRC has 18 doctoral research candidates enrolled in partner universities and actively engaged in IA CRC projects, including 4 professional doctorate students and 14 traditional PhD candidates.

Professional doctorate and traditional PhD candidates have the same status under level 10 of the Australian Qualifications Framework.

PROGRESS

All IA CRC traditional PhD candidates are enrolled in the Balanced Researcher Program, which started in 2013.

Four camps were held during the program and 12 out of the 14 PhD candidates have already participated in their industry placements as part of the program, with the remaining two candidates planning their placements. Candidates have had placements locally with the Australian Museum, Biosecurity South Australia and the NSW National Parks and Wildlife Service, as well as internationally with Parks South Africa, the Smithsonian Institute in Washington DC, Yellowstone National Park and the Centre for Agriculture and Bioscience International in Malaysia. 50% of PhD candidates have submitted their theses with the remaining candidates on track for completion as per below.

NAME	DRAFT THESIS TITLE	IA CRC RESEARCH PROJECT	THEME	COMMONWEALTH AGREEMENT OUTPUT	PARTNER UNIVERSITY	COMMENCEMENT DATE	COMPLETION DATE (*PROPOSED)
Pablo Garcia-Diaz	Exotic vertebrate risk analysis and invasion pathway analysis	1.L.4	Theme 1	1.1	University of Adelaide	Feb 2013	Conferred July 2017
Rheyda Hinlo	Parameterisation of eDNA detection probabilities for the identification of aquatic invasive species	1.L.4	Theme 1	3.1	University of Canberra	Jan 2013	April 2018*
Jonas Bylemans	Monitoring freshwater fish communities using eDNA metabarcoding	1.L.4	Theme 1	3.1	University of Canberra	Dec 2013	Dec 2017*
Elodie Modave	Distribution density in space and time and phylogeny of Tasmanian rodents using DNA in predators' scats and Next Generation Sequencing	1.L.21	Theme 1	1.2	University of Canberra	May 2013	May 2017
Catriona Campbell	Using next generation sequencing to determine ecosystem change and species interaction in Tasmania	1.L.21	Theme 1	1.2	University of Canberra	Jan 2013	July 2017
Aleona Swegen	Identification of targets for immunocontraceptive fertility control in horses	2.C.13	Theme 3	2.4	University of Newcastle	Feb 2013	Conferred Mar 2017

NAME	DRAFT THESIS TITLE	IA CRC RESEARCH PROJECT	THEME	COMMONWEALTH AGREEMENT OUTPUT	PARTNER UNIVERSITY	COMMENCEMENT DATE	COMPLETION DATE (*PROPOSED)
Sally Hall	Phage peptides fertility control for the non-surgical sterilisation of feral horses	2.C.13	Theme 3	2.4	University of Newcastle	Feb 2013	Conferred Aug 2017
Amy Iannella	Rabbit genetic resistance to RHDV variants in Australia	3.L.2	Theme 4	1.3	University of Adelaide	Feb 2013	November 2017*
Nadya Urakova	Identifying molecular virulence factors of RHDV	3.L.4	Theme 4	1.4	University of Canberra	Feb 2013	Conferred Sept 2017
Helen Morgan	Management of wild canids and trophic cascades: is vegetation influenced by top-order predators	3.L.11	Theme 5	1.5	University of New England	Aug 2013	Sept 2017*
Michał Smielak	The community ecology of threatened, critical weight range, terrestrial mammals in response to wild canid and feral cat control	3.L.11	Theme 5	1.5	University of New England	May 2013	May 2018*
Darren Marshall	Using tracking collars to build community involvement in feral pig control	4.E.1	Theme 7	4.1	University of New England	June 2015	Dec 2018*
Katrina Dickson	Transformative learning in human dimensions in organisations involved in invasive animal control	4.E.1	Theme 7	4.1	University of New England	Feb 2013	Dec 2017*
Bernadette York	Wild dog aware	4.E.2	Theme 7	4.2	University of New England	Feb 2013	Feb 2019*
Roxane Blackley	mApps for rangeland decision makers	4.E.2	Theme 7	4.2	University of New England	July 2013	June 2018*
Lynette McLeod	Improving the behavioural effectiveness of cat management programs	4.E.2	Theme 7	4.2	University of New England	Feb 2013	Feb 2017
Vivek Nemane	Reducing legal and institutional impediments	4.E.3	Theme 7	4.2	University of New England	Mar 2015	Mar 2019*
Lisa Yorkton	Social media: achieving active engagement	4.E.2	Theme 7	4.2	University of New England	Feb 2014	Left program

THEMES:

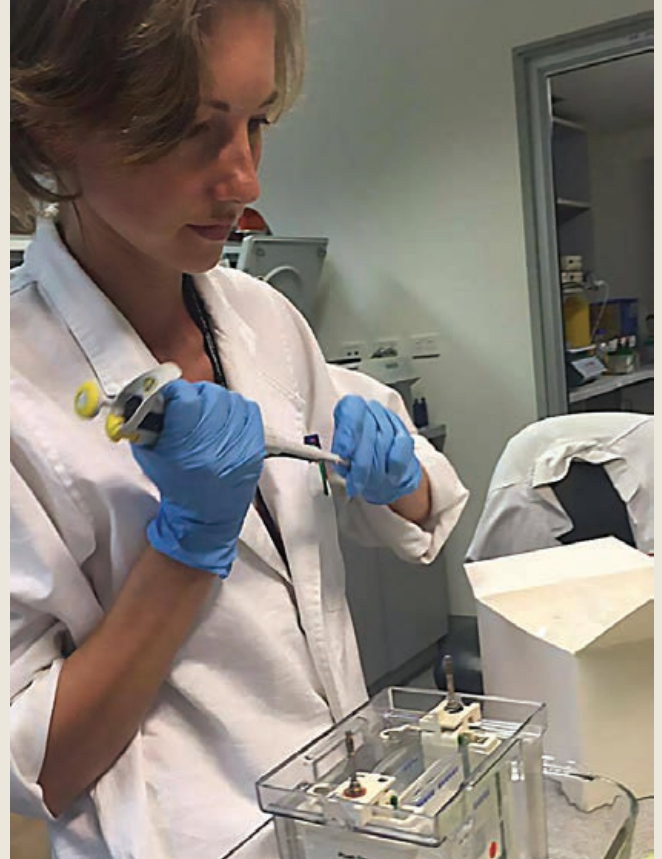
- 1 Incursion response and pest intelligence systems
- 3 Fertility control
- 4 Strategic rabbit control
- 5 Strategic wild dog control
- 7 Community engagement

OUR BALANCED RESEARCHER PROGRAM IS WORLD CLASS AND PREPARING OUR PHD CANDIDATES FOR WORK IN THE INDUSTRY



DR PABLO GARCIA-DIAZ

Pablo joined Landcare Research New Zealand with the Wildlife Ecology and Management team as a Quantitative Ecologist. This is a full-time position where Pablo is developing quantitative ecological models to support ongoing efforts to control and eradicate invasive vertebrates from New Zealand. His main focus is on optimising large-scale approaches to eradicate bovine tuberculosis from invasive Brushtail possum populations. Pablo is also collaborating with research projects funded through the B3 initiative to improve biosecurity in New Zealand. Pablo said that he thoroughly enjoyed being a part of the Invasive Animals CRC Balanced Researcher Program which he felt made him much more prepared for work outside of doctoral life. Pablo (right) is pictured here with his PhD supervisor, Associate Professor Phill Cassey.



DR ALEONA SWEGEN

Aleona accepted a post-doctoral fellowship with the Priority Research Centre for Reproductive Science at the University of Newcastle where she will be continuing work on developing novel immunocontraceptive approaches and pursue research on identifying unique factors of the equine pregnancy that can be targeted with a brumby fertility control agent. This will keep her busy for the next three years. Aleona said that the Balanced Researcher PhD program provided her with a fantastic network of fellow students and a repertoire of leadership skills that she has drawn upon every day of her post-doc life.

WE WISH THE BEST OF LUCK TO ALL OUR PAST, PRESENT AND FUTURE PHD CANDIDATES.



DR NADYA URAKOVA

Nadya is undertaking a post-doctoral research position at the University of Alabama in Birmingham. Nadya's PhD research was part of the Invasive Animals CRC rabbit biocontrol program where she was looking at molecular virulence factors for RHDV by systematically comparing the genetic building blocks of the pathogenic and non-pathogenic caliciviruses. Her thesis has been marked with minor changes requested and she was conferred with her PhD through the University of Canberra in September 2017. She is currently still in the virology research sector, but is now researching human viruses instead of animal ones.

VOCATIONAL EDUCATION AND TRAINING

The aim of the training and capacity-building program is to develop revised and nationally accredited vocational education and training (VET) pest training material that is consistent with the Australian Pest Animals Strategy and Nationally Training Packages. The program also promotes the adoption of these revised training packages to current and future pest managers.

The IA CRC has played a strong role in ensuring that industry skill requirements were reflected in the revised qualifications and units of competency for pest animal management. In this space in particular a number of Units have been included which best reflect the human dimension of pest animal management, informed by Program 4 of the IA CRC.

This revision has been completed and the new Training Package for Agriculture Horticulture and Conservation and Land Management (<http://training.gov.au/Training/Details/AHC>) has been endorsed. For pest managers the following qualifications are available:

- › Certificate III in Pest Management
- › Certificate IV in Pest Management
- › Diploma of Pest Management

The industry and accreditation standards for pest management planning has been enhanced through inclusion of two relevant units of competency around the human dimension of invasive species management into the current Certificate IV in Pest Management.





Ian Senior (ACTA) speaks with a NSW LLS employee about the new technologies and products currently available for use.

RESULTS

COMMERCIALISATION AND UTILISATION

The commercialisation and utilisation strategy adopted by IAL over the last 12 months was particularly focussed on accelerating pest animal management innovations, through the effective use of additional investment that the Centre was successful in attracting from the Department of Agriculture and Water Resources in May 2016. This additional value-add by the IA CRC was aimed solely at accelerating the delivery of commercially focused applied R&D projects, e.g. Hoggone, Lethal Trap Device, Carbon monoxide Generator, and PAPP bait glovebox antidote registrations so that return on total investment by CRC participants would be maximised and captured. In its final year, utilisation was fostered by the IA CRC by strengthened and broadened its community engagement reach, firstly through raising the awareness and then empowering local communities of interest to coordinate and participate in management programs. Two great examples were through facilitating the launch and implementation of Australia's Wild dog action plan, and the release of new RHDV strain for rabbit control. In 2016-17 the IA CRC has maintained its commitment to supporting projects that feed into new pest animal innovations that its two commercial participants have co-invested in, and will use to grow the longer-term viability of businesses that provide the tools for end-users to manage pest animals', more humanely and more cost effectively. This has brought products, for which there is a market need, but also a high risk of market failure, much closer to a practical reality for national and international customers seeking to integrate innovations in pest animal management into established invasive/pest animal management programs.

The IA CRC's strategy diversifies key risks that impact innovation in this field, such as:

- › technical failure
- › overcoming market failure to develop products that meet end-user needs and wouldn't be delivered without co-investment by industry and public good funding.
- › product development to meet market needs in terms of effectiveness, ease of use, animal welfare and human health concerns.

This brokering and co-investment value-creation model improves end-user, CRC R&D provider Participant and SME

Participant engagement, as well as building trust and credibility in research outputs in end users.

Initiatives of note are:

- › Continued development and field testing of a lethal trap device to enhance animal welfare outcomes of leg-hold trapping of wild dogs, foxes and feral cats. Status: Field-toxic prototypes testing completed in May 2017 and registration application in preparation. Submission of a new product application to the APVMA is planned during October 2017
- › Development of a new antidote for bait products containing PAPP that were approved for sale in Australia by the APVMA in early 2016. Status: An antidote that vets can purchase and use is now available. R&D towards a new veterinary medicine product that dog owners can purchase and use safely continues, and results to date support that outcome.
- › Registration and launch of a new rabbit virus products: freeze-dried RHDV (Czech and Korean strains). This will allow land managers to apply a more effective rabbit virus in the field without the heavy costs of transporting the virus in a liquid form that readily degrades. Status: Registration approval 2015 and 2016. Release in March 2017.
- › Approval for the release of a new strain of RHDV to bolster the overall effectiveness of rabbit biocontrol within integrated management programs. Status: Coordinated release of the Korean RHDV strain is planned for March 2017.
- › Implementing studies for the registration of Australia's first wildlife fertility control product for non-lethal kangaroo management in collaboration with the ACT government and CSIRO, as well as the preparation and submission of an APVMA application for this product's approval for use in deer, kangaroos, and horses.
- › Research into new rodenticides that can be safely used by land managers and producers. Status: 2 chemicals have been identified as lead candidates and regulatory studies are progressing on both chemicals as potential new rodenticides. Oral toxicity in the target species and secondary poisoning risks will be complete by Dec 31, 2017.

In conjunction with the product initiatives listed above, a community engagement research program has been integrated into the structure of the IA CRC extension program. The community engagement research outputs will be used to

enhance the adoption of the above and other CRC project outputs, grow and make the pest animal management market providers/industry more sustainable, and feed into greater effectiveness of all multispecies integrated pest management globally.

INTELLECTUAL PROPERTY MANAGEMENT

Intellectual property royalties, including from previous CRCs (IA CRC 2005–12 and Pest Animal Control CRC pre-2012)

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 that is novated and/or managed by IAL is related to the commercialisation of:

- › PIGOUT®, 2016–17 financial year royalty of \$3,114, distributed to Pest Animal Control CRC Participants
- › HOGHOPPER, 2016–17 financial year royalty of \$2,345, retained by IAL
- › RODEMISE®, 2016–17 financial year royalty of \$459, retained by IAL
- › PAPP, 2016–17 financial year royalty of \$61, retained by IAL

INTELLECTUAL PROPERTY STRATEGY

IP as defined in the Participants Agreement encompasses all assets resulting from intellectual endeavour. Public Good IP will continue to be managed in the same way as previous years and the previous CRC — that is, all IP is 100% vested in IAL (called Centre IP) and available to all CRC Participants for their own use in research, training and adoption.

IP with commercial potential is managed distinctly differently from Public Good IP:

- › Co-investors (Participants) in a commercially oriented project (Specified Project) are allowed to 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.

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, although its application in the control of rodents and invasive birds, and potentially other feral animals, is being researched. Patented IP managed during the reporting period includes:

- › Australian granted patent AU 30526245 — 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 8 795 649 B2 — Nitrite Salts as Poisons in Baits for Omnivores
- › Canadian granted patent 2677935 — Nitrite Salts as Poisons in Baits for Omnivores.

DIGITAL ASSETS

The IA CRC has a research program aimed at assisting communities to adopt best-practice integrated pest management. In an environment of reduced government funding and decreasing available labour, digital tools that inform and assist community engagement are an indispensable asset.

The IA CRC has developed a series of pest management digital tools, including:

- › PestSmart Connect (knowledge hub) — www.pestsmart.org.au
- › FeralScan (field monitoring website and app) — www.feralscan.org.au
- › Community engagement tools (trial version) — <http://invasives.contentlogic.com.au>
- › Decision Support Tools (rabbits) — <https://landcare.shinyapps.io/SimRab>
- › Field Guide to Pest Animals of Australia (app) — [iTunes Apple store](#)

Digital technology has been embraced by IAL and is seen as a core enabler of present and future best-practice pest animal management. In 2017 and beyond, our digital tools will be enhanced and integrated to enhance uptake as we execute our digital strategy, and provide end users with improved community features and better ways to connect.

SMALL-TO-MEDIUM ENTERPRISE AGREEMENT

The IA CRC is committed to working across the entire value chain of pest animal product delivery, and this is reflected in our business, research and communications strategies. End users for the IA CRC include both private and public land managers, and land management groups (natural resource management boards, catchment management authorities, Landcare Groups, and local communities of interest). The IA CRC engages with and connects these end-users, to R&D providers and importantly our two SME Participants — Animal Control Technologies Australia Ltd (ACTA) and Connovation (New Zealand) to innovate. The Centre's inputs to these SME's included: • product development • APVMA registration consultation and application preparation • joint displays with IA CRC Participants and commercial SMEs at agricultural and predator field days • co-branding and joint distribution of product updates • regular commercialisation meetings involving SMEs and other R&D provider Participants • support for promotion of best-practice products from SMEs for invasive animal's management. In 2016–17, the IA CRC was also

the conduit for the potential exclusive access to US-generated IP (CRADA IP) on behalf of our ACTA, to whom we have licensed the right to commercialise patent protected IP.

At the product delivery end of the R&D spectrum the IA CRC also participated in the planning of the launch of various products as they become available, such as the new canid baits containing PAPP. Complimenting the launch of these products, the IA CRC facilitated consultation with stakeholders critical to their adoption, the Australian Veterinary Association and Royal Society for the Prevention of Cruelty to Animals. This ensured that key messages around the advantages and risks of using the new baits, as well as the safe and effective application of the antidote, in the case of accidental consumption by pest/working dogs was promoted effectively and consistently to land managers, animal welfare advocates, and veterinarians treating animals.

Intellectual property currently held for commercial purposes

IP DESCRIPTION AND PRODUCT NAME	IP CREATION DATE	IP OWNERS AND OWNERSHIP SPLITS	LICENCE NATURE
Blue Healer trademark	2005	100% IAL	Not applicable
HOGGHOPPER design and manufacturing specifications	2010	100% IAL	Exclusive (worldwide)
Rodenticide pen/field efficacy studies	2005–2008	100% IAL	Exclusive (in Australia)
Nitrite-based pesticide products: Commercialisation of granted patents (Aus, NZ, USA and Canada)	2007	100% IAL	Exclusive (worldwide)
PIGOUT pen/field efficacy studies	2003–2005	50% Pest Animals Control CRC Participants 50% Meat & Livestock Australia novated to IAL	Exclusive
PAPP wild dog and fox bait and toxin	2005–2014	95% Australian Wool Innovation 5% IAL	Exclusive (worldwide)
PestSmart registered trademark	2012	100% IAL	Not applicable
LandSmart trademark	2015	100% IAL	Not applicable
FarmSmart trademark	2015	100% IAL	Not applicable
AntSmart trademark	2017	100% IAL	Not applicable
AVPC trademark	2015	100% IAL	Not applicable
Centre for Invasive Species Solutions registered trademark	2015	100% IAL	Not applicable

Option agreements to commercialise intellectual property

IP DESCRIPTION AND PRODUCT NAME	IP CREATION DATE	IP OWNERS	LICENCE NATURE
Rodenticide (CRADA)	2013–2017	USDA/IAL	Exclusive (worldwide)
HOGGONE USA (CRADA)	2013–2017	USDA/IAL	Exclusive (worldwide)
Microencapsulated sodium nitrite formulations (CRLA)	May 2015	IAL/ACTA	Exclusive (worldwide)

ACTA = Animal Control Technologies Australia (IA CRC Commercial Participant); CRADA = Collaborative Research and Development Agreement (United States Department of Agriculture); CRLA = Collaborative Research and Licence Agreement (Texas Parks and Wildlife Department)

Note: IP ownership will be shared based on project inputs.



COMMUNICATION

Communication is critically important to the CRC's mission to promote awareness and adoption of best practice pest animal management. The IA CRC's communication strategy aims to engage end-users, increase the profile of pest animal issues, and the role of the IA CRC as a centre for partnership-based invasive species solutions.

In addition to our PestSmart best practice management platform, we led major communication campaigns associated with the roll out of new wild dog, rabbit and carp control products and management strategies. The aim is to have a collaborative approach to managing these community engagement and outreach campaigns in partnership with our participant organisations and stakeholders.

STAKEHOLDER ENGAGEMENT

PestSmart Toolkit Publications and Technical Reports

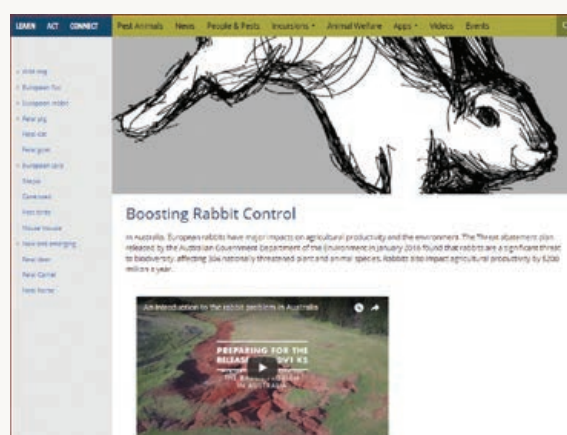
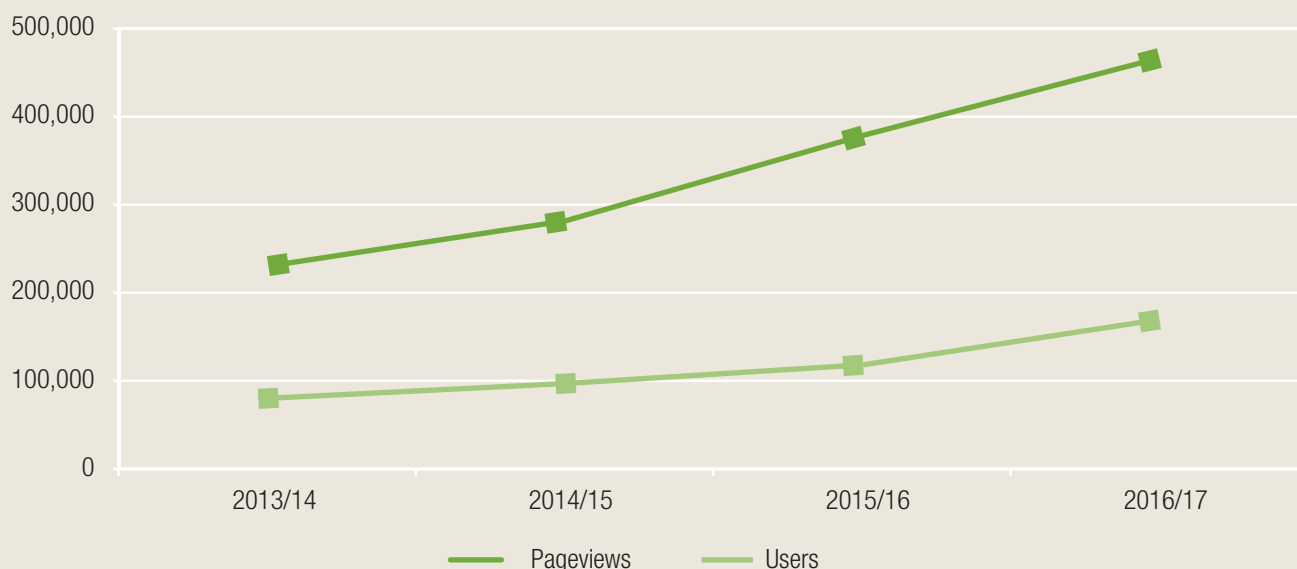
We publish a range of publications including fact sheets, case studies, guides and technical reports which are all made publicly available at the [PestSmart Connect](#) website and available in print form.

The toolkit was developed in 2011 and now totals 207 publications. In the 2016/17 financial year our PDF toolkit documents were downloaded 18,456 and were printed for distribution at multiple conferences, field days and agricultural and environmental management specific events.

PESTSMART CONNECT

The new [PestSmart Connect](#) website went live in March 2015, replacing the [feral.org.au](#) site, which had been a key digital

The pageviews and user trends of [feral.org.au/PestSmart Connect](#) over time



Boosting rabbit control through PestSmart Connect

PestSmart Connect hosted the national web portal with all the relevant public information associated with the national release of RHDV1 K5.

The portal contained a series of informative videos relating to the release, along with links to sign up to an e-newsletter and further information about FAQs, pet rabbit protection, the outbreak of RHDV2 and so forth.

Through strategic promotion via our partners, the landing page received more than 22,000 visits during the financial year, of which more than 12,000 of these views were during the January-March 2017 period.

This was our second most viewed landing page for the year, showcasing PestSmart's importance as a national digital hub for major pest animal projects and management programs.



platform for the IA CRC since 2005. PestSmart Connect provides end-users with a toolkit of pest animal management information and knowledge, and is a significant upgrade and improvement to the previous website.

The website is built around a 'Learn, Act, Connect' model to assist end-users with practical on-ground action in an easy to use format. All end-user and technical publications are available on the website, making it a useful tool for both land managers and researchers.

The website is mobile friendly which is important as we know that one third of the website users access our information from a mobile or tablet device.

Over the past financial year the awareness of the site has increased with visitations up by 23% and number users up by 43%. Analytics over a two-year period (July 2015-June 2017) show that the site has received 844,886 page views and just over 38,000 document downloads. Trends show that page views and users have been increased to the site each year.

PestSmart Connect will soon be undergoing an upgrade to enhance its usability among its end-users and we aim to maintain this increasing trend into the future.

Top ten most popular website pages (16/17 FY)

1. Homepage (24,716) ↑ 14%
2. RHDV1 K5 landing page (22,268) ↑ 385%
3. Pest Animal Species landing page (22,208) ↑ 29%
4. European fox toolkit (9,523) ↑ 50%
5. RHDV1 K5 FAQ (11,494) ↑ 647%
6. Camel Toolkit (11,028) ↑ 207%
7. European rabbit toolkit (10,618) ↑ 10%
8. Wild dog toolkit (10,037) ↑ 20%
9. Feral cat toolkit (8,336) ↑ 6%
10. Feral pig toolkit (7,445) ↑ 20%



Invasive Animals CRC Corporate Website

Our corporate website received more than 19,000 visitors over the course of the financial year and 53,675 page views. This website was used to highlight the IA CRC research program, it will be archived from November 2017 (via the National Library of Australia Pandora web archive project) and all corporate information will be housed on www.invasives.com.au. Where possible, we continue to drive end users to PestSmart Connect for toolkit information and the latest research information.

FeralScan website and Apps

The FeralScan program has over 15,000 registered users and more than 100,000 pest animal sightings has been added to the national monitoring map, which is growing daily and being used a go-to resource by land managers to assist them in their management and control operations.

The FeralScan mobile app was launched in 2015, marking an important milestone for this community tool for mapping pest animal sightings, impacts and control activities. The app is available for both Apple and Android devices and has been downloaded more than 13,000 times.

e-newsletters

Feral Flyer is the fortnightly newsletter that aims to inform subscribers of the latest IA CRC achievements, research, publications, events and related external news. The newsletter is aimed at a diverse audience including researchers, farmers, land managers, students and journalists. There were 2422 subscribers as of end of June 2017, a net increase of 11% from the previous year.

As part of our major campaigns, e-newsletters were also created to focus on the release of RHDV1 K5, 15 e-newsletters have been distributed as part of this project to engage with those



who are interested in learning more about the national release of the virus. This list currently has 1375 subscribers including all those who expressed interest to be involved in the release. The Invasive Animals CRC also assists with creating and distributing the Communiques for the National Wild Dog Action Plan and NRM Notes, news from our National NRM Facilitator.

You can sign up to all our e-newsletters in one place via www.pestsmart.org.au/subscribe

TOTAL E-NEWS SUBSCRIBERS

13/14	1868
14/15	2482
15/16	3558
16/17	4084

Internal Communications

Recognising the IA CRC's Board, staff and researchers are in diverse locations around Australia and internationally, internal communications is of utmost importance to encourage collaboration, sharing of ideas and to facilitate being part of the IA CRC team. Internal communication is facilitated through:

Regular teleconferences and email conversations: the research committee meets quarterly via teleconference and many of the research groups discuss project requirements and outcomes via email.

Theme meetings: each theme group (incursions, rabbits, wild dogs, fertility control and toxins, pest fish, training and community engagement) aims to have at least one face-to-face meeting annually to discuss and share progress associated with their research.

Participants Forum: participant representatives gathered in Canberra in November 2016 for the AGM and participants forum.



PUBLIC AWARENESS AND OUTREACH

Media

Media is used to generate broader public awareness of our research and researchers. Media is a critical part of our communications strategy to continue to develop our profile, and generate awareness and support among our key audiences.

During the 2016/17 financial year we have focused on building strong relationships with key journalists who can reach our stakeholders. Like previous years, this has again resulted in quality media engagement through key programs such as ABC Landline and the ABC Rural network, as well as the major rural press publications such as The Land, The Queensland Country Life and the Weekly Times as examples. We also received media coverage through the major metro press on certain topics of interest to these communities, such as snake incursions and our carp research.

During 2016/17, 1337 mentions of the IA CRC in online media were picked up by our media monitoring service (note that this does not include television, radio or newspaper coverage that is not online). This was up 85% on the previous financial year and again includes two ABC Landline feature segments. Our communications team issued a total of 15 media releases and 6 media releases focused on our rabbit and carp biocontrol research and future funding announcements, were distributed through the Deputy Prime Minister and Minister for Agriculture and Water Resource's office:

IA CRC media releases

- › NSW Government gets behind new invasive species research centre - 05 June 2017
- › New invasive species research centre to maintain momentum - 10 May 2017
- › Nationwide incursion planning - have your say - 02 May 2017

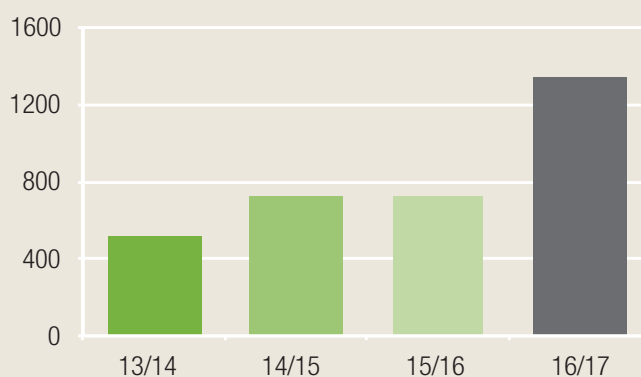
- › New plan to prevent exotic snakes as future pests - 03 April 2017
- › Wild deer management in the headlight - 16 March 2017
- › New strain of calicivirus confirmed in pest rabbits - 14 March 2017
- › New rabbit control video series to support farmers - 13 January 2017
- › FeralScan wins top national environmental award - 01 December 2016
- › Leading carp virus researcher honoured - 25 November 2016
- › The science behind identifying 'pest poo' - 10 November 2016
- › Feral Photo winners highlight a national problem - 30 September 2016
- › Last week to expose a feral - 29 August 2016
- › Innovative app to track rabbit control - 3 August 2016
- › Monitoring fish DNA with a bottle of water - 12 July 2016
- › RHDV2 now confirmed in European brown hares - 4 July 2016

Ministerial media releases

- › Carp plan going swimmingly – 05 June 2017
- › Growing Australia's agriculture, fisheries and forestry – 09 May 2017
- › Funding for innovation in pest animal and weed management – 02 May 2017
- › New rabbit control win for community and environment – 26 February 2017
- › New weapon in war on wild rabbits – 27 October 2016
- › Minister Joyce appoints 'The Carpinator' – 26 October 2016

Top ten outlets mentioning IA CRC and our research

OUTLET	COVERAGE	ITEMS
Get Farming	National	36
The Land	NSW	27
Queensland Country Life	QLD	17
Stock and Land	Victoria	15
ABC Network	National	13
Stock Journal	SA	12
North Queensland Register	QLD	10
Sheep and Grain Central	Special	8
Weekly Times	Victoria/SA	7
Farm Online	National	7



IA CRC online media mentions trends per FY.

Media highlights

- › Two ABC Landline segments on the national release of RHDV1 K5 (Feb 2017) and the impact of RHDV1 K5 (Apr 2017).
- › ABC RN Big Ideas program ran nationally on June 8 with a discussion on the future of pest animal control in Australia
- › Sydney Morning Herald syndicated article featuring Australia's first national snake incursion plan.
- › Canberra Times syndicated article featuring the use of RabbitScan and new Rabbit Biocontrol Tracker.
- › SBS NITV highlighted our Feral Photos competition feat. pest animal management in WA/NT.
- › Canberra Times syndicated article featuring the \$20 million budget announcement for the Centre for Invasive Species Solutions.



Prue Adams
@ruralprue

With Dr Tarnya Cox looking 4 dead rabbits from K5 virus. I'm the 1 with hat, black top & sunnies! @abclandline



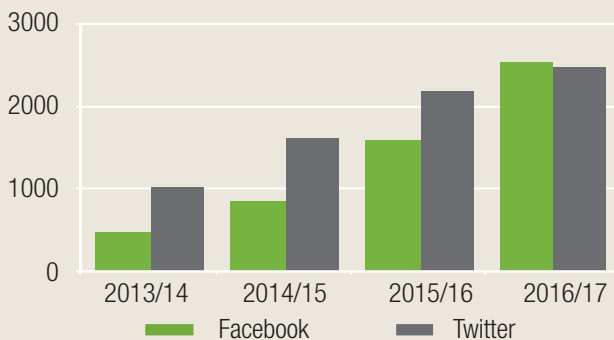
Prue Adams visited Dr Tarnya Cox and her team just shortly after the release of RHDV1 K5, to see how it was tracking – Prue was tweeting about her adventures while travelling

Social Media

The IA CRC has been very active on social media with the aim of engaging the audience in invasive animal management issues, building the profile of invasive species and directing users to the correct links for more information.

Twitter and Facebook

A total of 679 tweets and 818 Facebook posts were sent out during the financial year to our social media audience of over 5000 followers. This resulted in approximately 44,000 clicks on links to find out more information. Followers on Facebook and Twitter increased by 58% and 13% respectively, with our posts reaching over 1,285,000 accounts. PestSmart also started an Instagram account to showcase our suite of images from our Annual Photo Competition, this currently has just over 150 followers to date.



Trends in social media followers per FY.

YouTube

The PestSmart YouTube channel has received more than 75,000 views over the course of the financial year, up 12.5% from last year. Twenty-two new videos were added to the page including information on rabbit and carp biocontrol and our wild dog research. Our videos on rabbit and carp biocontrol, and the wild dog problem in Australia have all been viewed more than 1,300 times.

Feral Photos Competition

A suite of astonishing images highlighting the interactions between invasive animals and other species featured in our popular national Feral Photos competition. However, this time, we also asked for video footage, which didn't disappoint.

More than 309 images and 23 videos were entered by more than 150 entrants.

This year, the winning image of a 'fox attacking a native egret' was taken by Mary-Anne Addington, while visiting the Hunter Wetlands Centre in NSW.

THE POWER OF A STRONG NATIONAL NETWORK AND COLLABORATION

Leading the national communications approach for the RHDV1 K5 release - February 26th to March 5th 2017

1 shell media release

developed through the Invasive Animals CRC

10 state, territory and

federal Government media releases distributed

620+ online media articles,

PLUS multiple TV and radio interviews

ONE BECOMES MANY



Multiple video projects were undertaken during the financial year to enhance awareness of our tools and products, this includes tutorials on our FeralScan digital platform, and how to prepare for the release of RHDV1 K5



David Lord, Producer and AWI rabbit advisory committee chair, speaks with Prue Adams from ABC Landline about the release of RHDV1 K5.

FINANCIAL PERFORMANCE

The Invasive Animals Ltd (IAL) is a non-profit scientific institution that promotes a managed and co-operative approach to collaborative research, development and education in the field of invasive pest animal management so as to maximise the benefits from that research and education.

IAL's short term objective was to govern and manage the Invasive Animals Cooperative Research Centre (IA CRC), in accordance with the Commonwealth Agreement and Participants Agreement until the expiration of its term of operation on 30th June 2017.

IAL's long term objective, also in accordance with those Agreements, was to establish an enduring service provider, the Centre for Invasive Species Solutions (CISS). The Centre was officially launched by the Honorable Mr Barnaby Joyce, Minister for Agriculture and Water Resources, on 15th September 2017. CISS will be a service provider facilitating the efficient design, promotion, investment, brokering and management of large-scale collaborative invasive species RD&E programs to deliver new humane pest animal management tools and approaches building on the work of the previous CRC's.

The Invasive Animals CRC, was a 27-member collaboration. It has now completed the final year of its 5-year term. IAL has a demonstrated commitment to continual development, strong fiscal stewardship and robust, effective financial management which underpinned the broader strategic objectives of the IA CRC and assisted in achieving the many outcomes delivered by the IA CRC.

For the 2017 financial year there was a continual review of internal control systems, policies and procedures and a continued enthusiasm to support the IA CRC program of work through proficient administration. IAL again kept core governance and management costs to less than 10%.

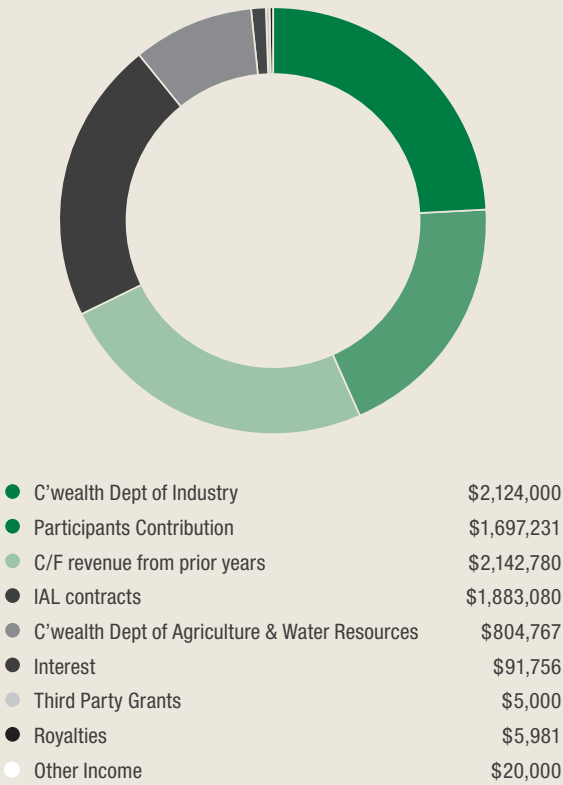
The total revenue for the 2017 year was \$8,774,596 with \$2,124,000 being provided by the Commonwealth Department of Industry, \$1,697,231 being invested by the Participants, \$804,767 being provided by the Commonwealth Department of Agriculture and Water Resources, \$2,142,780 being carried forward revenue from prior years with the balance from sources

as listed below in the graph. Contracts secured by Invasive Animals Ltd (IAL) continue to be sourced to support and augment the CRC's research initiatives and in this year provided additional research funds of \$1,883,081

With the inclusion of \$11,762,000 for the 2017-year In-kind contributions, provided by the Participants in support of IA CRC, the total combined resources available were \$20,536,596.

The following broadly summarises the financial performance of IAL and the IA CRC.

FY17 Revenue (consolidated)

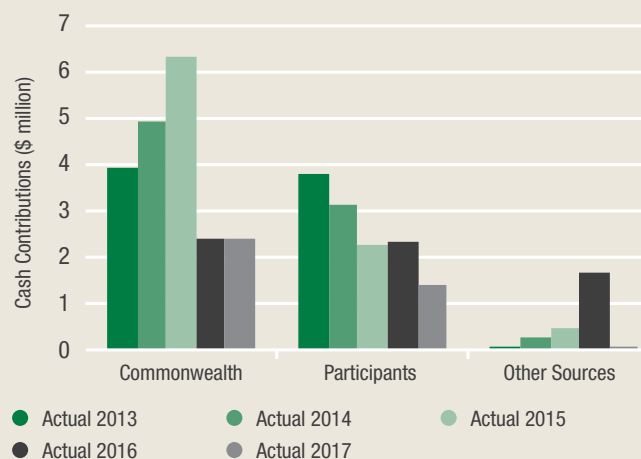


ACHIEVEMENT AGAINST COMMONWEALTH CONTRACT BUDGET

CRC activities were supported by the Australian Government and Participants to the level as shown.

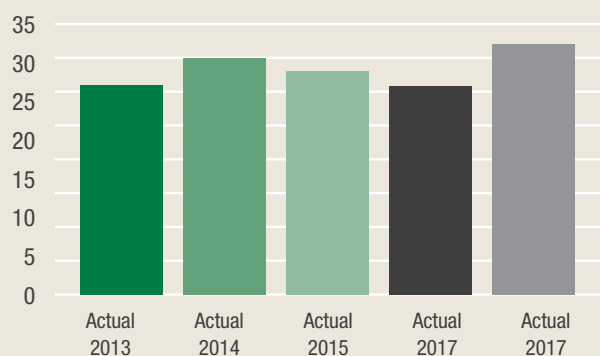
For the 2016-17 Financial Year our target for contributions of personnel time was 21.4 full time equivalents (FTE). The actual level of contributions obtained was 37 FTE, again reflecting the commitment of the Participants.

Commonwealth Agreement Cash Contributions 2012–16

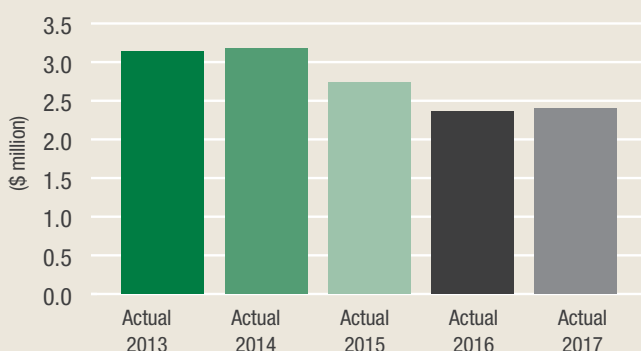


The target of \$494,000 for non-personnel In-kind contributions in 2016-17 was again exceeded, with \$2,447,000 of contributions confirmed by participants.

Commonwealth Agreement In-kind Contributions to 2012–17 (Staff FTE)



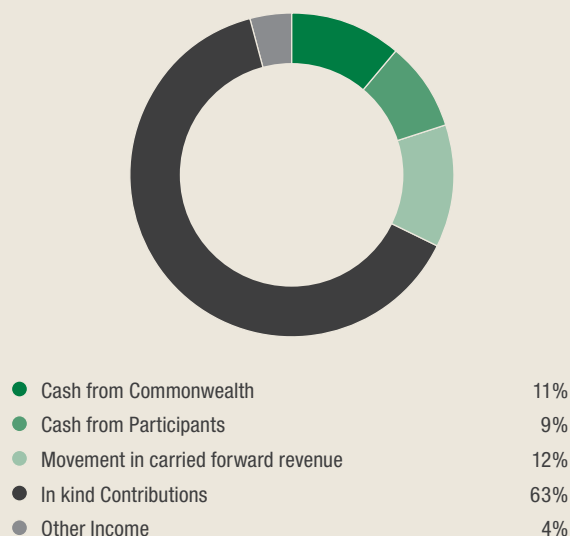
Commonwealth Agreement In-kind Contributions to 2012–17 (Non-Staff FTE)



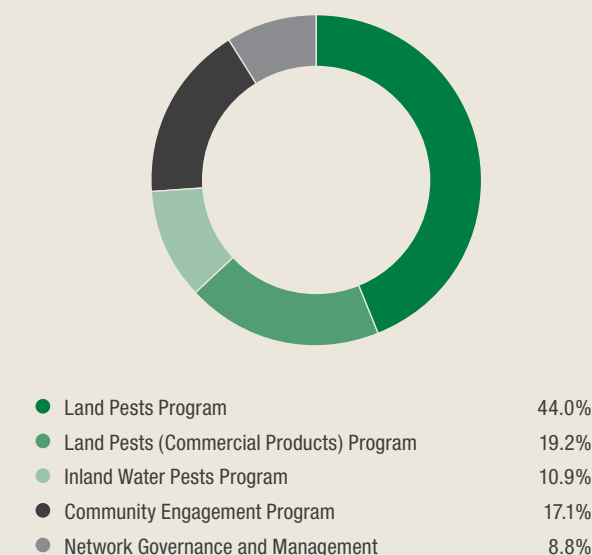
FINANCIAL STRATEGY AND MANAGEMENT

The available resources were derived and applied to the four main areas of CRC focus: (1) Land Pests Program; (2) Land Pests (Commercial Products) Program; (3) Inland Water Pests Program (4) Community Engagement Program and to Network Governance and Management.

CRC Resources Available 2016–2017 (\$18.622M)



CRC Resources Applied 2016–2017 (\$19.462M)

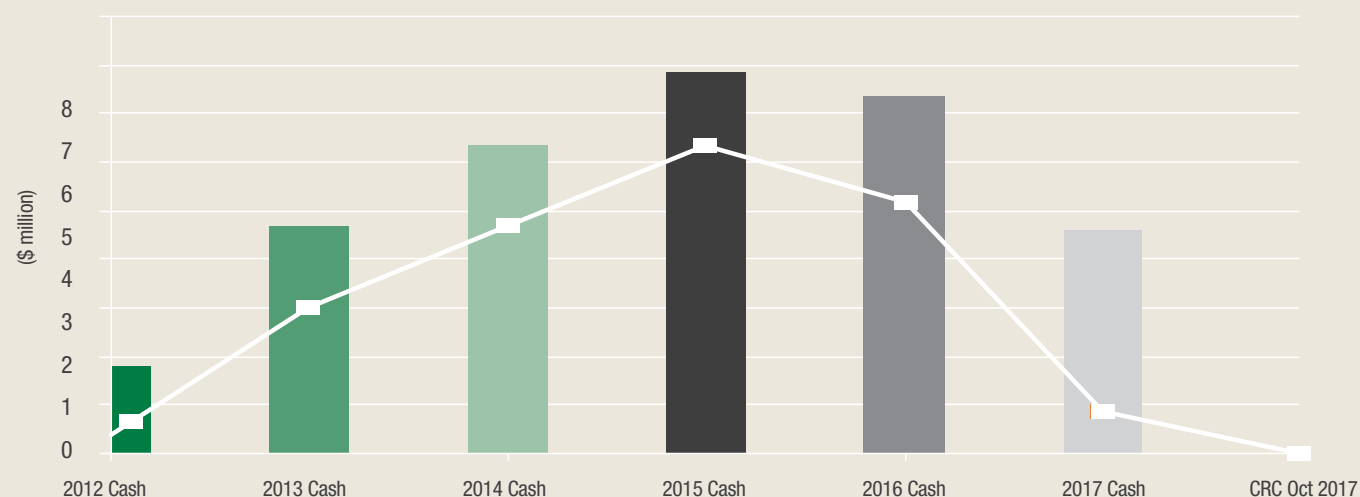


The positive financial position with consolidated cash position, at June 2017 of \$4,611,947 represents sufficient cash flow to meet both entities combined liabilities of \$4,967,568. The current asset ratio (a measure of liquidity) was 1.18.

As indicated the IA CRC Bank account was closed in October 2017 on submission and completion of all final reports.

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

Consolidated Cash at Bank and CRC Cash Balance





OTHER ACTIVITIES & GRANTS

No new activities this year.

IAL received the following new grants during the reporting period:

- › Malleefowl Conservation funded through the NSW Department of Environment - to manage, plan and deliver on-ground actions for a Malleefowl Conservation project in the Mt Hope region of Central NSW.
- › Rabbit parasites as additional biocontrol agents for the European rabbit funded through the Australian Government Department of Agriculture and Water Resources Ag White Paper initiative.



APPENDIX A

MILESTONE

REPORT

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
1L1	R1.1.7	Incursion response strategy reviewed and nationally endorsed by Vertebrate Pests Committee	30 June 2014	In Progress	National Incursions Response Strategy reviewed and public consultation process completed. Finalisation and noting by IPAC (formerly Vertebrates Pest Committee) will be completed under the new Centre for Invasive Species Solutions (CISS) project.	Completion and implementation to be progressed through a CISS project.
1L1	R1.1.8	Incursion response training program developed	30 June 2014	Yes	Hazard Analysis and Critical Control Point (HACCP) model training manual has been developed.	
1L1	R1.1.10	Two further incursion response plans developed	30 June 2015	Yes	Plan 2, IS-HACCP concept plan, developed, reviewed by IPAC Vertebrate Incursions Expert Group, and is awaiting submission to IPAC for noting out of session. Plan 3, a strategic toolkit, has been developed as an online living document and is in review by the IPAC Vertebrate Incursions Expert Group.	
1L1	R1.1.11	Training programs aligned with activities and functions of the incursion response strategies developed	30 June 2015	In Progress	IS-HACCP model training manual developed. Workshop material also available; as well as factual extension material on 10 iconic National Surveillance Targets.	Following review by IPAC Vertebrate Incursions Expert Group, the IS-HACCP training manual will be submitted to IPAC for noting, with permission being sought to publish it as a PestSmart publication. The 10 icons will also be reviewed by the IPAC Vertebrate Incursions Expert Group, and submitted to IPAC for noting.

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
1L1	U1.1.1	One incursion response plan and one case study adopted by Vertebrate Pests Committee	30 June 2015	Yes	The National Incursion Response Plan for Terrestrial Snakes endorsed by IPAC.	
1L23	U1.2.1	Risk assessment report considered and alternative fox control strategies endorsed by Tasmanian Government	30 June 2015	In Progress	The risk assessment report is under consideration. Due to the ongoing changes to the Tasmanian DPIPWE structure, the formal endorsement of the Tasmanian 'Vertebrate Pest Incursion Response Plan' was delayed.	Endorsement of these recommendations will happen through their inclusion in the long-term strategy, and ultimately their inclusion in the Tasmanian Vertebrate Pest Incursion Response Strategy.
1L1	R1.1.15	Incursion response plans reviewed and nationally endorsed by Vertebrate Pests Committee.	30 June 2016	In Progress	Plan 2, HACCP concept plan, developed, reviewed, and pending noting by IPAC. Plan 3, a strategic toolkit, developed as a living document and is in review.	Expected noting of Plan 2 by IPAC out of session. Completion date for Plan 3 dependent on IPAC Vertebrate Incursions Expert Group review process.
1L1	U1.1.2	Two incursion response plans and two case studies utilised by Vertebrate Pests Committee.	30 June 2016	Yes	Plan 1, National Incursion Response Plan for Terrestrial Snakes, endorsed and in use by IPAC and jurisdictions. Plan 2, IS-HACCP concept plan, developed, reviewed, and pending noting by IPAC. Plan 3, a strategic toolkit, developed as a living document and is in review. Further utilisation of Plan 3 dependent on IPAC Vertebrate Incursions Expert Group review process.	
1L1	U1.1.3	Incursion response training program adopted by Vertebrate Pests Committee members.	30 June 2016	In progress	IS-HACCP model training developed, and is pending noting by IPAC.	Expected noting by IPAC out of session, including permission to publish as a PestSmart publication.
1L2	U1.1.5	Findings from incursion response case studies adopted as best practice by end users.	30 June 2017	Yes	Analysis Incursions of Indian ringed-neck parakeets – work informed VIC DEDJTR operational responses. Analysis of red-eared slider turtles – eradication modelling in collaboration with VIC DEDJTR Analysis of starling management strategies in WA – informed DAFWA management strategies.	

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
1L5	R1.1.17	Integrated datasets on pest animal distribution and abundance made accessible to end users via secure shared data platform.	30 June 2017	Yes	Pest animal data sets have been consolidated and are now accessible to all major biosecurity and land management stakeholders via FeralScan with password protection accessibility rights. Key datasets are also available in GIS data layers for established pests where data from state and national surveys have been matched with FeralScan data.	
1L4	R1.1.18	One PhD project completed.	30 June 2017	Yes	Pablo García-Díaz submitted his PhD thesis titled 'Alien vertebrate risk assessment and invasion pathway modelling' in February 2017. PhD conferred 31 July 2017.	
1L24	R1.2.14	Long term response strategy and associated report completed.	30 June 2016	In progress	The development of the long-term response strategy is well underway. The project modeller, who is needed to complete the work, is on maternity leave and will not be able to finalise a manuscript for submission until end of March 2018.	The draft strategy has had an initial internal review by the Tasmanian DPIPWE branch management. A completed draft will be reviewed by former Fox Eradication Program Technical Advisory Panel members before finalisation. Milestone management has been transferred to the Tasmanian DPIPWE. The milestone will be achieved in early 2018.
1L24	R1.2.15	Long term response strategy implementation process developed.	30 June 2016	Yes	The long-term strategy for foxes is being incorporated into the Tasmanian DPIPWE's 'Invasive Animals Incursion Response Strategy and Framework', the guiding document for operational procedures. As part of the development of the implementation process, key operational documents are being reviewed to assess their adequacy, and highlight gaps. Work will be completed and submitted by 15 July 2017.	
1L22	U1.2.3	Report on detection probabilities submitted and recommendations considered by Tasmanian Government.	30 June 2017	Yes	Ramsey, D., Barclay, C., Harris, S. (2014). Detection and Monitoring for Fox Incursion in Tasmania. Unpublished client report to Tasmanian Department Primary Industries, Water and Environment. Arthur Rylah Institute.	

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
1L24	U1.2.4	Implementation of long term response strategy started by Tasmanian Government.	30 June 2017	Yes	Many of the long-term strategy components have already been adopted by Biosecurity Tasmania. In some instances, they were incorporated into procedures as the research recommendations were being made. The strategy will be more fully implemented from July 2017, after which time the dedicated incursion response program, funded by the Australian Government, will cease, and the broader vertebrate pest incursion prevention strategy will commence.	
1L24	R1.2.16	Long term response strategy implementation started.	30 June 2017	Yes	Many of the long-term strategy components have already been adopted by Biosecurity Tasmania. In some instances, they were incorporated into procedures as the research recommendations were being made. The strategy will be more fully implemented from July 2017, after which time the dedicated incursion response program, funded by the Australian Government, will cease, and the broader vertebrate pest incursion prevention strategy will commence.	
1L21	R1.2.17	Two PhD projects completed.	30 June 2017	Yes	Elodie Modave submitted her thesis in May 2017: Next-generation sequencing in ecology: DNA analysis of predator scats in Tasmania. Catriona Campbell submitted in July 2017: Ecosystem change and species interactions using next generation sequencing. Management of PhD students transferred to University of Canberra.	
3L1	R1.3.5	RHD Boost RHDV strain(s) released in accordance with national release plan and post release monitoring commenced at selected sites	30 June 2015	Yes	RHD Boost RHDV1 K5 released in accordance with national release plan and post release monitoring commenced at 584 selected sites in March 2017.	

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
3L1	U1.3.5	Once approved, RHD Boost virus strain released by Vertebrate Pests Committee agency staff in accordance with agreed national release and monitoring plan and protocols	30 June 2015	Yes	Registration of RHDV1 K5 approved by APVMA, and permitted by EPBC Act and Biological Control Act. RHD Boost RHDV1 K5 strain released in accordance with national release plan and post release monitoring commenced at 584 selected sites in March 2017.	
3L2	R1.3.8	Genetic basis of RHD resistance determined and a RHD resistance mechanistic model produced.	30 June 2016	Attempted, Not Achieved	Genetic markers were not adequate to screen RHD resistance in Australian rabbit populations for developing a mechanistic model.	Attempted, not able to be achieved.
3L1	R1.3.9	Monitoring completed and national report on effectiveness of RHD Boost release published.	30 June 2017	In Progress	Due to delayed release of RHDV1 K5 until March 2017, post release monitoring has been extended to January 2018 with a final report expected August 2018.	Milestone management transferred to NSW Dept. of Primary Industries.
3L1 and 3L2	R1.3.10	Two PhD projects completed.	30 June 2017	Attempted, not achieved	Amy Ianella's thesis submission is due in August 2017. A second PhD student was not recruited.	Management of PhD student transferred to University of Adelaide.
3L1 and 3L2	R1.3.11	Four peer-reviewed journal papers on RHDV K5 release and RHD resistance submitted.	30 June 2017	In Progress	RHD Resistance Model project: 7 research papers published. RHD Boost project: 1 paper published, with more to come following RHDV1 K5 release evaluation.	Milestone responsibility re RHD Boost project publications transferred to NSW Dept. of Primary Industries.
3L1	U1.3.6	Post release monitoring at selected sites evaluated. Final report on effectiveness of new RHD Boost virus strain prepared and submitted to Vertebrate Pests Committee and industry partners.	30 June 2017	In progress	Post release monitoring has been extended to January 2018 with a final report expected August 2018.	Milestone responsibility transferred to NSW Dept. of Primary Industries.
3L1	U1.3.7	Findings from release and monitoring studies refined into best practice recommendations for on-going use of RHDV as a biocontrol agent.	30 June 2017	In progress	Post release monitoring has been extended to January 2018 with a final report expected August 2018.	Milestone responsibility transferred to NSW Dept. of Primary Industries.

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
3L4	R1.4.9	Platform technology used to select for virus variant that can replace newly released field strains (subject to 'RHD Boost: Roll Out' successfully releasing a new RHDV strain.	30 June 2017	Attempted, not achieved	A virus variant was selected, however experimental characterisation to date suggests that the variant is not sufficiently superior to warrant registration as a product, as the arrival of RHDV2 has changed the requirements for the next Accelerator virus. Mitigated by milestone R1.4.10.	A new Accelerator strategy will be developed to take into account the effects of RHDV2 during the last year of the project.
3L4	R1.4.10	Strategy developed to use Accelerator Platform Technology to select for virus strains that can overcome genetic resistance in rabbits and potentially other pest species, eg. carp.	30 June 2017	In Progress	A new Accelerator strategy will be developed to take into account the effects of RHDV2 during the last year of the project. Delivery expected in June 2018. The strategy has also been adapted for the development of carp biocontrol strategies.	Milestone responsibility transferred to CSIRO.
3L4	R1.4.11	Three peer reviewed journal papers submitted.	30 June 2017	Yes	To date eight peer-reviewed papers were published or submitted as a direct result of this project, and several more are yet to be published.	
3L4	R1.4.12	One PhD project completed.	30 June 2017	Yes	Nadya Urakova has had her PhD thesis, 'Identifying virulence factors of Rabbit Haemorrhagic Disease Virus (RHDV)', accepted and is now awaiting her conferral.	
3L4	R1.4.13	If successful, candidate virus strain for future virus release identified.	30 June 2017	In progress	A virus variant was selected, however experimental characterisation to date suggests that the variant is not sufficiently superior to warrant registration as a product, as the arrival of RHDV2 has changed the requirements for the next Accelerator virus. Mitigated by milestone R1.4.10.	A new Accelerator strategy will be developed to take into account the effects of RHDV2 during the last year of the Invasive Animals CRC project. Delivery expected in June 2018. Milestone management transferred to CSIRO.
3L4	U1.4.4	Recommendations derived from project results in the development of new, long term rabbit control strategies considered by Vertebrate Pests Committee and/or government agencies.	30 June 2017	Yes	Long term rabbit biocontrol strategy document compiled following extensive consultation, noted by IPAC in November 2016. Two key agents identified: Eimeria parasite and RHDV2. Feasibility study of Eimeria Parasite funded through Department of Agriculture and Water Resources Agriculture White Paper grant.	

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
3L11	R1.5.11	Integrated strategies for management of wild canids and feral cats for conservation of native predators and threatened macropods, while mitigating livestock and human amenity losses, proposed and reviewed by advisory committee.	30 June 2016	Yes	A project developing an integrated strategy for managing predators for mitigating livestock losses and enhancing faunal biodiversity was summarised and presented to the National Wild Dog Action Plan meeting held in Brisbane 27-29th February 2017. The project, Reset, Rebuild, Restore is detailed in, Ballard, G., Fleming, P.J.S, and Meek, P.D. (2016). Strategic recommendations for co-the management of wild canids & feral cats in mesic agri-ecosystems. PestSmart Toolkit publication, Invasive Animals Cooperative Research Centre, Canberra, Australia.	
3L11	U1.5.4	Concurrent research on the legislative and policy incentives for, and barriers to, effective strategic co-management of wild dogs completed.	30 June 2016	Yes	In-depth analysis of the institutional issues impacting invasive species management conducted, including of wild dogs. Outcomes reflected in the following reports: 1. P. Martin, D. L. Choy, E. LeGal, and K. Lingard, "Effective citizen action on invasive species: The institutional challenge," Invasive Animals Cooperative Research Centre, Canberra ACT, 2016. 2. P. Martin and D. L. Choy, "Recommendations for the reform of invasive species management institutions," Invasive Animals Cooperative Research Centre Canberra ACT, 2016. 3. D. Low Choy, S. Serrao-neumann, G. Schuch, and P. Martin, "Scenario Planning for Institutional Improvements to Support Citizen Action in Invasive Animal Management," Invasive Animals Cooperative Research Centre Canberra ACT, 2017.	

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
3L11	U1.5.6	Strategic recommendations for co-management of wild dogs in mesic agro-ecosystems submitted to industry, and National, State and local government policy makers and managers (e.g. VPC, AWI, MLA, DAFF, SEWPaC, State EPAs).	30 June 2016	Yes	<p>Interim recommendations published in a PestSmart report, and were presented to the National Wild Dog Action Plan stakeholder meeting in Brisbane, March 2017.</p> <p>The strategic landscape management approach called 'Reset, Rebuild, Restore' has been presented to a number of stakeholder meetings, including LLS and NSW DPI Executive and a Reset project is under consideration by the new CISS.</p> <p>Aerial bait rates research outcomes are being redrafted for application to APVMA for changing aerial bait rate maximum from 10 baits/ km to 40 baits/ km.</p>	
3L11	R1.5.12	Two peer reviewed journal papers submitted.	30 June 2017	Yes	25 papers published 01/2013-12/2016. Publication of eight peer-reviewed papers in 2016-17.	
3L11	R1.5.13	At least two PhD projects completed.	30 June 2017	In progress	<p>The two Invasive Animals CRC PhD students are expected to submit their theses by December 2017.</p> <p>Three project-associated (non- CRC) PhD graduates were conferred in 2016; another two are expected to submit by in 2017.</p>	Management of PhD students transferred to University of New England.
3L11	R1.5.14	Final project reports, including findings, conclusions and recommendations for further work, completed.	30 June 2017	In progress	12 months delayed start to project, means data collection concluded in June 2017, rather than December 2016 and hence detailed analyses and syntheses for control and conservation is delayed and will be completed after conclusion of IA CRC.	It is anticipated that this work will be furthered under CISS.
3L13	U1.5.7	Final peri-urban tool evaluation completed and incorporated into strategies for peri-urban management of wild dogs.	30 June 2017	Attempted, not achieved	A vast amount of information has been collected on the ecology, impacts and management of wild dogs in PU areas. This information has been critical to inform the development of, and recommend appropriate strategies for future testing. These strategies need replicated testing in space and time that is outside the resources of this project.	Work may continue under CISS to test alternative management strategies identified though this project e.g. point of impact control, rather than population-level control.

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
3L11, 3L13 and 3L14	U1.5.8	Project findings, and conclusions, recommendations, and policy implications for the management of wild dogs in agricultural, peri-urban and conservation ecosystems presented to, and endorsed by National Wild Dog Management Advisory Group, and Vertebrate Pests Committee and 5 th and final annual update provided to advisory committee and other stakeholders.	30 June 2017	Yes	<p>The policy outcome of the co-management solutions project (Reset) was presented to a National Wild Dog Action Plan meeting in Brisbane, March 2017. Reset has also been presented to a number of stakeholder meetings, including LLS and NSW DPI Executive.</p> <p>Aerial bait rates research outcomes are being redrafted for application to the APVMA for changing aerial bait rate maximum from 10 baits/ km to 40 baits/ km.</p> <p>A final PestSmart report on the Peri-urban wild dog control project outcomes is completed.</p> <p>Outcomes from the National Wild Dog Facilitator Project have regularly been presented to National Wild Dog Action Plan Stakeholder Consultative Group meetings, and at a recent Barcaldine field trip.</p>	
2C1	U2.1.2	Results of pen and field studies published, and presented and promoted to end-users, stakeholders and potential investors.	30 June 2016	In progress	A manuscript is in preparation. Submission to a suitable journal such as Applied Animal Behaviour Science or Physiology & Behaviour is expected before the end of December 2017.	Invasive Animals Ltd and the USDA are taking responsibility for developing the manuscript.
2C1	U2.1.3	Registration package compiled.	30 June 2017	Cancelled	Project failed Stop/Go point.	
2C1	U2.1.4	Avicide registration package submitted to the APVMA.	30 June 2017	Cancelled	Project failed Stop/Go point.	
2C2	R2.2.3	Preferred rodenticide actives formulated and free-choice pen efficacy trials completed	30 June 2015	In progress	<p>Achieved for sodium nitrite.</p> <p>In progress for lead chemicals from the US database.</p>	This milestone will be achieved during Dr Simon Humphrys' Fulbright project in the US (Sept – Dec 2017).

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
2C2	U2.2.1	Results of Achilles' heel search and proof-of-concept studies if a promising active exists published, and presented and promoted to end-users, stakeholders and potential investors	30 June 2014	In progress	Milestone is in the process of being achieved. A short-list of chemical leads has been recommended to GRDC and circulated in confidence to the project's commercial partner, as well as potential formulation partners in AUS and internationally. A presentation to the National Mouse Monitoring Working Group (NMMWG) was made on the 21/22 Feb 2017. Proof-of-concept oral toxicity studies are being completed with project partner USDA, with supplemental investment via Dr Humphrys' Fulbright Scholarship to maximise the global market/potential of study results.	Results will remain commercial in confidence until approval from GRDC is received to publish the research outputs.
2C2	R2.2.4	Domestic registration and field/pen trials started for the most promising rodenticides.	30 June 2016	In progress	Large rodent proof enclosure studies at University of Queensland are dependent on the oral toxicity studies being completed by the USDA, with the added investment of Dr Humphrys' Fulbright Scholarship. The domestic registration large enclosure studies have already been pre-emptively coordinated and will be initiated in January 2018 should a lead chemical warrant additional testing prior to field studies being conducted.	May be progressed if a promising active is identified and successfully progressed to the field testing stage.
2C2	U2.2.2	Results of pen and field studies published, and presented and promoted to end-users, stakeholders and potential investors.	30 June 2016	In progress	This milestone is dependent on completion of milestones R2.2.3 and R2.2.4.	This milestone will be achieved by communicating results of R&D to the GRDC and NMMWG.
2C2	R2.2.5	Registration field/pen efficacy studies completed.	30 June 2017	In progress	This milestone was outside the scope of this project and was always envisaged to be encompassed in a new round of project investment if a chemical lead looked worth progressing.	Some of these regulatory studies will be achieved in the next 12 months extension, but not all required studies.
2C2	U2.2.3	Rodenticide registration package submitted to the APVMA.	30 June 2017	In progress	This milestone may be pursued if a chemical lead is identified and deemed to be worth progressing, and related field and pen study milestones are successfully completed.	This milestone may be pursued if a chemical lead is identified and deemed to be worth progressing.

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
2C4	R2.3.3	Toxic field trials of feral pig baits in the USA started	30 June 2015	In progress	This milestone is dependent on the US EPA approving the Experimental Use Permit submitted on the 28 th June 2016. EPA has up to 16 months to assess the application. Anticipated milestone start date is thus Jan 2018.	Anticipated field trials start date January 2018. Milestone management transferred to Animal Control Technologies Australia (ACTA) and US Dept. of Agriculture.
2C4	U2.3.1	HOGGONE® and a nitrite concentrate registration package submitted to APVMA in Australia	30 June 2013	In progress	The Hoggone registration package was submitted to the APVMA on 4 th August 2017. A nitrite concentrate is not being pursued, at this time.	Milestone management transferred to Animal Control Technologies Australia (ACTA).
2C4	U2.3.3	30% of manufactured feral pig bait market share in Australia achieved	30 June 2015	In progress	Requires achievement of U2.3.1	Milestone management transferred to Animal Control Technologies Australia (ACTA).
2C4	R2.3.4	Toxic field trials of feral pig baits in the USA completed.	30 June 2016	In progress	This milestone is dependent on the US EPA approving the Experimental Use Permit that was submitted on the 28 th of June 2016. EPA has up to 16 months to assess the application. Anticipated start date is thus Jan 2018.	Assuming a start date during Jan 2018, field trials in the USA are planned for completion prior to the end of April 2018. Milestone management transferred to Animal Control Technologies Australia (ACTA) and US Dept. of Agriculture.
2C4	U2.3.4	Results of field studies published, and presented and promoted to end-users and stakeholders.	30 June 2016	In progress	Two peer reviewed journal articles have been published or were accepted for publication in the past 12 months. However, US toxic work has not yet commenced. Australian field trials have not been published, rather they have been assembled for APVMA registration. Australian field trial results, and US pen and bait preference studies have however been presented at Australian and US conferences. The most recent Australian field trial results and progress towards US registration approval were presented at the May 2017 Australian Vertebrate Pest Conference.	Milestone management transferred to Animal Control Technologies Australia (ACTA) and US Dept. of Agriculture.

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
2C4	U2.3.5	Full US feral pig bait registration package completed and submitted to US EPA.	30 June 2017	In progress	The bulk of the registration package application has been completed and submitted in the form of an Experimental use permit (EUP) application to the EPA. Additional product stability and field trial efficacy/non-target safety, operator safety and environmental toxicology study data will be added to the EUP application to create the full registration package.	Milestone management transferred to Animal Control Technologies Australia (ACTA) and US Dept. of Agriculture.
2C4	U2.3.6	50% of manufactured feral pig bait market share in Australia achieved.	30 June 2017	In progress	Dependent on APVMA approval of HOGGONE.	Milestone management transferred to Animal Control Technologies Australia (ACTA).
2C11	U2.4.1	GonaCon™ registration package prepared and submitted to APVMA	30 June 2013	Yes	The GonaCon™ registration package was submitted to the APVMA during the first quarter of 17/18 financial year. Acceptance of the package for assessment is pending.	
2C11	U2.4.2	Once approved by APVMA, GonaCon™ launched in Australia	30 June 2015	In progress	Requires APVMA registration assessment and approval (see U2.4.1).	Acceptance by the APVMA of the Gonacon package for assessment is currently being considered by the Authority.
2C11	U2.4.3	GonaCon™ applied by the ACT Government as an effective kangaroo fertility control	30 June 2015	In progress	The ACT Government has an APVMA approved permit for a field trial to assess the effectiveness of Gonacon darted into eastern grey kangaroos as a fertility control product. This trial began in 2016 and interim results appear to support the products use as an effective 1-shot-fertility control product. The duration of effectiveness of darting versus hand injection will be assessed over the next 3 years in this study.	Monitoring of kangaroo fertility will continue until 2020.
2C13	R2.4.5	Field/enclosure trials of any successful anti-fertility formulations conducted.	30 June 2016	No	Immunising stallions with modified sperm/sperm proteins to reduce fertility was planned but sufficient numbers were not available from the Hunter Valley Brumby Association to start an immunisation study in horses. A study using mice as a model species was used instead. Testing of bacteriophage generated reagents in rodent enclosure trials continues so that optimisation of anti-fertility formulations can be achieved.	Milestone is being pursued by the University of Newcastle.

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
2C13	R2.4.6	Horse bacteriophage reagents tested in pen studies.	30 June 2017	No	Use of bacteriophage generated reagents to induce sterility in mares will not be tested because bacteriophage reagents have not been generated.	Due to technical challenges, the project has pivoted to focus on alkylated sperm proteins. A fertility trial in mice was completed successfully however.
2C13	R2.4.7	Two PhD projects completed.	30 June 2017	Yes	Both PhD students were awarded their doctorates in 2016/17. Sally Hall 'Permanent methods of fertility control for sustainable feral horse management' and Aleona Swegan 'Identifying novel targets for immunocontraceptive fertility control in feral horses'.	
2C12	U2.4.4	Registration package for an orally deliverable GnRH-based immunocontraceptive or bacteriophage peptide sterility inducing agent prepared and submitted to APVMA.	30 June 2017	No	Stop/Go Failed	Attempted, unable to be achieved.
1W2	R3.1.12	Protocol for water sampling and DNA extraction (eDNA) in practical situation developed and trialled in a practical situation.	30 June 2017	Yes	Experiments were performed at different stages of the eDNA analysis to show which combinations of methods give the best recovery rate for eDNA.	
1W2	R3.1.13	Two PhD projects completed.	30 June 2017	In Progress	Both PhD students expected to submit by 30 th November 2017.	Milestone responsibly transferred to the University of Canberra.
1W1	U3.1.2	Validation study of eDNA tilapia detection technique to delineate tilapia range in state by QLD DAFF completed.	30 June 2017	Achieved	Applied eDNA method to look for evidence of tilapia in Eureka Creek, the location of a previous infestation that was the focus of an eradication program by QLD DAF. Compared eDNA methods to alternative methods such as electrofishing and proven to be an effective and efficient surveillance tool for tilapia. As well, the technology has been taken up by James Cook University and is being offered as a commercial service through TropWater. The Fitzroy Basin Authority and Reef Catchments Solutions have both taken advantage of the service to survey for tilapia.	

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
1W2	U3.1.3	Prototype multi-species eDNA technique trialled and evaluated by state fisheries agencies	30 June 2017	In progress	Due to a delay in prior milestone of developing the multi-species detection method, this has subsequently delayed evaluation by state agencies. Also, it required scheduling with agencies to fit in with other field work activities.	Expected to be completed by 31 st Dec 2017. Milestone transferred to University of Canberra.
3W2	R3.2.4	National KHV release, monitoring and evaluation plan prepared (including plans for post release carp clean-up)	30 June 2015	Yes	A framework plan has been prepared. Further development and refinement of the draft clean-up plan will continue under the National Carp Control Plan (NCCP) through the Fisheries Research & Development Corporation (FRDC).	Responsibility for management of this milestone transferred to the FRDC.
3W2	U3.2.2	KHV registration package submitted to government regulators	30 June 2015	Yes	The APVMA registration package was submitted on 28 th June 2017. EPBC Act application is now a deliverable under the National Carp Control Plan and has been transferred to FRDC, NSW Dept. of Primary Industries and Aust. Dept. of Agriculture & Water Resources.	Responsibility for management of the EPBC Act and Biological Control Act approval processes has been transferred to FRDC.
3W2	R3.2.7	Spread and localised impact of KHV on carp monitored and evaluated	30 June 2017	In progress	Requires successful completion of previous milestone U3.2.4, and release of KHV.	Milestone responsibility transferred to FRDC and advanced under the NCCP.
3W2	U3.2.3	Once approved, KHV released at selected sites and spread monitored (in accordance with the national KHV release, monitoring and evaluation plan).	30 June 2017	In progress	Release cannot occur until regulatory approvals are obtained.	Milestone responsibility transferred to FRDC and advanced under the NCCP.
3W2	U3.2.4	KHV spread monitored at selected sites and evaluated. Findings reported back to Vertebrate Pests Committee, Australian Fisheries Forum and MDBA and then more widely.	30 June 2017	In progress	Dependent on achievement of milestone U3.2.3.	Milestone responsibility transferred to FRDC and advanced under the NCCP.
4E1	R4.1.7	International forum on best practice support and engagement in community-based management of invasive pests held.	30 June 2016	Yes	Workshop conducted at Pennsylvania State University, USA, with collaborators, August 2016.	

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
4E1	R4.1.8	Edited book on best practice methods for effective engagement, extension and adoption published.	30 June 2017	In Progress	Book reviewed and accepted by publisher, and a revised submission date has been negotiated – 31 st December 2017. A second book is also being developed.	Book reviewed and accepted by publisher, and a revised submission date has been negotiated – 31 st December 2017.
4E1	R4.1.9	Web-based support system completed.	30 June 2017	Yes	Web-based support system was completed December 2016. Invasives Action Tool: http://invasives.contentlogic.com.au/	
4E1	R4.1.10	One PhD project completed.	30 June 2017	In Progress	PhD student Katrina Dickson is planning to submit her thesis in December 2017.	Management of PhD student transferred to the University of New England.
4E1	U4.1.3	Research findings incorporated by end-users, including IA CRC participants, in design and delivery of regional pest animal control programs.	30 June 2017	Yes	Learning from the very successful 2016 Masterclass has been adopted by approximately 30 projects across Australia to date. It has also influenced innovative approaches being adopted in two large-scale projects in WA. Other adoptions include a change in engagement design and delivery, and uptake of case studies and story-telling devices in communication of the wild dog program and the Victorian Rabbit Action Network.	
4E2	R4.2.8	Report on behavioural strategies to achieve effective community action published.	30 June 2016	Yes	<p>Written as a chapter in Lynette McLeod's PhD thesis: 'Using Behavioural Science to Improve the Management of Invasive Animals: A Domestic Cat Case Study' (see R4.2.10).</p> <p>As well, included in the following journal publications:</p> <ul style="list-style-type: none"> • Journal publication 1: Review of Online Communication Strategies for Domestic Cat Management (accepted pending revision). • Journal publication 2: Assessing the Impact of Different Persuasive Messages on the Intentions and Behaviour of Cat owners (currently under review). • Journal publication 3: Prioritising Community Behaviours and Identifying Barriers to Improve Wild Dog Management in Peri-Urban Areas (due for submission June 2017). 	

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
4E2	R4.2.9	Book and/or other form of substantial publication on the use of behavioural science to improve invasive animal control programs completed.	30 June 2017	In progress	Development of online modules for behaviourally effective communications and communications audit. Book proposal submitted to CSIRO and accepted May 2017. Chapters on behaviour change, segmentation and message targeting, and media management all under development.	To be completed Dec 2017 by University of New England.
4E2	R4.2.10	One PhD project completed.	30 June 2017	Yes	Lynette McLeod's PhD thesis submitted February 2017 and has been accepted; 'Using Behavioural Science to Improve the Management of Invasive Animals: A Domestic Cat Case Study'. Student is now awaiting formal conferral.	
4E2	U4.2.3	Research findings incorporated by end-users, particularly IA CRC participants involved in project, in new extension materials and programs.	30 June 2017	Yes	<p>Peri-Urban Wild Dogs (PUWD) Behaviour Change Project – research findings incorporated into City of Gold Coast communications on reporting wandering dogs. Communications intervention implemented May 2017. QLD DAFF implemented learnings from PUWD Behaviour Change Project and integrated them into their Rural Wild Dogs Behaviour Change Project (Invasive Animals CRC as secondary partner in this project) and other pest behaviour change projects.</p> <p>SW Natural Resource Management integrated research findings on cluster fencing into their plans for community engagement.</p> <p>Videos developed for Domestic Cat Containment project being used by local councils in Tasmania.</p>	

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
4E3	U4.3.1	Research findings and recommendations considered by Vertebrate Pests Committee, and other relevant groups, such as National Wild Dog Advisory Group.	30 June 2016	Yes	IPAC noted the Invasive Animals CRC report, <i>Recommendations for the reform of invasive management institutions</i> , and its implications to strengthen the 'shared responsibility' approach at its meeting on 1 August 2016. The Committee also agreed to forward the report to the National Biosecurity Committee for consideration. See also: Martin, P., Choy, D. L., LeGal, E., & Lingard, K. (2016). Effective citizen action on invasive species: The institutional challenge. Canberra ACT: Invasive Animals Cooperative Research Centre.	
4E3	R4.3.8	Proposal for institutional reform to improve the effectiveness of community action on invasive animal control completed.	30 June 2017	Yes	Martin, P., & Choy, D. L. (2016). Recommendations for the reform of invasive species management institutions. Canberra ACT.	
4E3	R4.3.9	One PhD project completed.	30 June 2017	In progress	Late recruitment has meant that the student will not be in a position to submit until 2019.	Management of PhD student has been transferred to the University of New England.
4E3	U4.3.2	Proposal considered by Vertebrate Pests Committee, and other relevant groups, such as National Wild Dog Advisory Group.	30 June 2017	Yes	Institutional issues analysis widely circulated to relevant institutional stakeholders, such as IPAC and the Intergovernmental Agreement on Biosecurity (IGAB) Review Panel. Also presented at Australasian Vertebrate Pest Conference May 2017 as a plenary presentation.	
4E21	R4.4.5	At least 15 PhD projects completed and theses submitted.	30 June 2017	In Progress	Due to the spaced-out enrolment of PhD and professional doctorate students only six submitted their theses by the 30 th June 2017. Another nine students are expected to submit at varying times till 2019, most by the end of the 2017 calendar year.	Students' progress is being managed by their respective Universities.
4E21	R4.4.6	Robust longitudinal evaluation of the Balanced Researcher program and its predecessor, the Balanced Scientist program completed.	30 June 2017	In progress	Both manuscripts are prepared and have been submitted to journals. Both journals have returned the papers indicating that they require revision prior to re-submission.	Revisions to both manuscripts will be completed by December 2017. Milestone being managed by Invasive Animals Ltd.

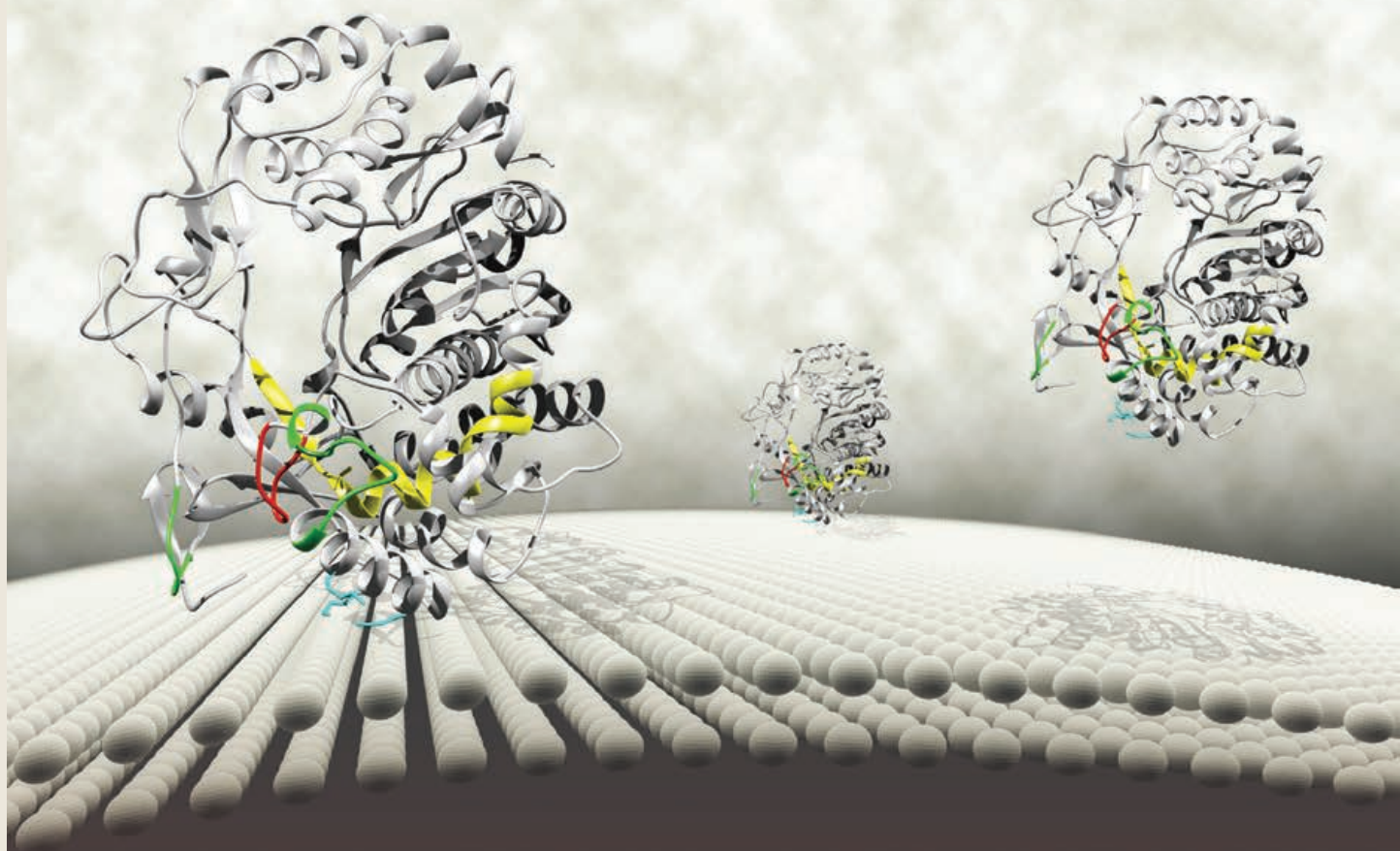
PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
4E21	U4.4.1	At least 15 PhD students graduate from Balanced Researcher program.	30 June 2017	In progress	Due to the spaced-out enrolment of PhD and professional doctorate students only six submitted their theses by the 30 th June 2017. Another nine students are expected to submit at varying times till 2019, most by the end of the 2017 calendar year.	Students' progress is being managed by their respective Universities.
4E11	R4.5.6	Rollout of revised and nationally accredited training packages completed.	30 June 2017	Yes	<p>Revised units of competency have been endorsed and are available for Registered Training Authority's and trainers to deliver.</p> <p>Two imported units of competency have been included which reflect industry skills requirements around human dimensions of pest animal management in the qualification for pests weed management AHC Training package.</p> <p>Training and assessment tools developed to facilitate Registered Training Organisation get new units of competency on their scope of course/units delivered.</p>	
4E11	U4.5.5	Revised training packages adopted by RTO's and relevant state agencies. 40 % of pest managers in NSW trained in the new courses at the Certificate II and IV levels, 30% of senior managers at the Diploma level and all trainers at the appropriate higher level.	30 June 2017	Yes	<p>Training material and tools have been developed for the Unit BSBPMG418 Apply project stakeholder engagement techniques. 54 invasive species management professionals have completed training to date including participants from NSW, Western Australia and Queensland. To date 17 have been assessed against the Unit BSBPMG418 Apply project stakeholder engagement techniques and marked competent.</p> <p>A schedule has been developed to bring more qualified trainers into the VET system to deliver the ASET short course into the future across all states.</p> <p>IA CRC online "Invasive Action Tool" evaluation commenced for delivery and assessment of the Unit CHCCDE010 Develop and lead community engagement strategies to enhance participation.</p>	

PROJECT NO.	OUTPUT/ MILESTONE NUMBER	DESCRIPTION	CONTRACTED ACHIEVEMENT DATE	ACHIEVED	REASON/DETAILS	STRATEGIES TO ACHIEVE UNMET MILESTONE
2C5	01.3	Operational performance of rabbit warren fumigator determined under field-simulated conditions	30 June 2013	In progress	Milestone delayed due to protracted legal negotiations with WG&B Manufacturing. A memorandum of understanding has now been executed that sets out the responsibilities for each party in achieving the commercialisation of warren fumigators globally. Two commercialisation agreements have also been executed that provide a clear path to market.	Three fumigator units are being currently being made, for field trials that are already approved and ready to begin in NSW. Milestone management transferred to Invasive Animals Ltd and WG&B Manufacturing.
2C5	01.4	National APVMA registration package for rabbit warren fumigator submitted	30 June 2013	In progress	Milestone delayed as is contingent on achievement of milestone 01.3. Drafting of documentation for the APVMA registration package is well advanced, and will be completed as soon as practical after the field trial data is incorporated into the Part 8 Efficacy and non-target species safety data package, as well as Part 6 OH&S data package (data warranting).	Milestone management transferred to Invasive Animals Ltd and WG&B Manufacturing. IAL will facilitate transfer of rights to a 3 rd party to progress commercial manufacture of the units. Sale and distribution of the carbon monoxide generators will be subject to a call for expressions of interest from Invasive Animals CRC participants and other third parties, as per the IA CRC participant's agreement, and commercial agreements executed between IAL and WG&B Engineering (owner and contributor of background IP).



viruses

IMPACT
FACTOR
3.465



Exposing a Buried Rabbit Calicivirus Polymerase Motif



mdpi.com/journal/viruses

ISSN 1999-4915

Dr Nadya Urakova (successful PhD candidate from the IA CRC) had her recent scientific publication on RHD viruses highlighted on the front cover the journal publication, *Viruses* (Image used with permission)

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APPENDIX B

PUBLICATIONS

Table #: IA CRC Project Publication List for 2016-17

CODE	PUBLICATION TYPE*		TOTAL NUMBER
1.1	Formal publications	Book	-
1.2		Book chapter/s	1
1.3		Articles in scholarly refereed journals	58^
1.4		Full written conference paper – refereed proceedings	-
2.1	Publications and reports for end-usersv	Conference abstract in a non-refereed proceedings publication	38
2.2		PestSmart Technical Report	9
2.3		PestSmart Glovebox Guide, Factsheet or webpage	21
2.4		PestSmart Case Study	3
2.5		PestSmart DVD/Multimedia product	17
2.6		Invasive Animals CRC newsletter, including e-Newsletter	20
2.7		Other IA CRC or agency related factsheet or report	3

* not all publication types listed in appendix

^ 55 future articles planned for publication in scholarly refereed journals

OUTCOME 1: NO NEW VERTEBRATE PESTS ESTABLISHED IN AUSTRALIA

1.3 Article in scholarly-refereed journal				
Oct 2016	Inferential and forward projection modelling to evaluate options for controlling invasive mammals on islands	Ecological Application	D.P. Anderson, P. McMurtrie, K-A. Edge, P.W.J. Baxter, A.E. Byrom,	1L2
Oct 2016	Improved surveillance for early detection of a potential invasive species: the alien Ring-necked Parakeet <i>Psittacula krameri</i> in Australia	Biological Invasions	Vall-Ilosera, M., A. P. Woolnough, D. P. Anderson, P. Cassey	1L2
June 2017	A bio-economic decision process for in broadscale eradication of invasive pests and disease.	Biological Invasions	Anderson, D. P., A. M. Gormley, D. S. L. Ramsey, G. Nugent, P. A. J. Martin, M. Bosson, P. Livingstone, A. E. Byrom	1L2

OUTCOME 1: NO NEW VERTEBRATE PESTS ESTABLISHED IN AUSTRALIA

June 2017	Challenges in confirming eradication success of invasive red-eared sliders.	Biological Invasions	García-Díaz, P., Ramsey, D.S.L., Woolnough, A.P., Franch, M., Llorente, G.A., Montori, A., Buenetxea, X., Larrinaga, A.R., Lasceve, M., Álvarez, A., Traverso, J.M., Valdeón, A., Crespo, A., Rada, V., Ayllón, E., Sancho, V., Lacomba, J.I., Bataller, J.V., Lizana, M.,	1L2
May 2017	Integrating transport pressure data and species distribution models to estimate invasion risk for alien stowaways	<i>Ecography</i>	Tingley R, García-Díaz P, Arantes CRR, Cassey P	1L4
Feb 2017	Leaky doors: private captivity as a prominent source of bird introductions in Australia	<i>PLoS ONE</i>	Vall-Ilosera M, Cassey P	1L4
Jan 2017	The Global Distribution and Drivers of Alien Bird Species Richness	<i>PLoS Biology</i>	Dyer EE, Cassey P, Redding DW, Collen B, Franks V, Gaston KJ, Jones KE, Kark S, Orme CDL, Blackburn TM	1L4
Jan 2017	Patterns of selectivity in introductions of mammal species worldwide	<i>NeoBiota</i>	Blackburn TM, Scrivens S, Heinrich S, Cassey P	1L4
Mar 2017	'Do you come from a land down under?' Characteristics of the international trade in Australian endemic parrots	<i>Biological Conservation</i>	Vall-Ilosera M, Cassey P	1L4
Jan 2017	Physical attractiveness, constraints to the trade and handling requirements drive the variation in species availability in the Australian cagebird trade	<i>Ecological Economics</i>	Vall-Ilosera M, Cassey P	1L4
Sept 2016	Biological invasions and natural colonisations are different—the need for invasion science	<i>NeoBiota</i>	Wilson JRU, García-Díaz P, Cassey P, Richardson DM, Pyšek P, Blackburn TM	1L4
Aug 2016	Managing the risk of wildlife disease introduction: pathway level biosecurity for preventing the introduction of alien ranaviruses	<i>Journal of Applied Ecology</i>	García Díaz P, Ross JV, Woolnough AP, Cassey P	1L4
Oct 2016	The illegal wildlife trade is a likely source of alien species	<i>Conservation Letters</i>	García Díaz P, Ross JV, Woolnough AP, Cassey P	1L4
Nov 2016	Improved surveillance for early detection of a potential invasive species: the alien Rose-ringed parakeet <i>Psittacula krameri</i> in Australia	<i>Biological Invasions</i>	Vall-Ilosera M, Woolnough AP, Anderson D, Cassey	1L4
Mar 2017	Finding the best management policy for spatial ecological networks with simultaneous actions	<i>Journal of Applied Ecology</i>	Nicol S, Sabbadin R, Peyrard N, Chades I.	1L11
Jul 2017	Mini-barcode for species identification.	GigaScience	Modave, E., MacDonald, A.J., Sarre, S.D	1L21
Jul 2017	Framework for developing and validating taxon-specific primers for specimen identification from environmental DNA	Molecular Ecology Resources	MacDonald, A.J. Sarre, S.D.	1L21
Mar 2017	Environmental governance for urgent and uncertain problems.	Invasion Biology	Moon, K. Blackman, D., Brewer, T.D., Sarre, S.D.	1L21
Jan 2017	Detecting rare carnivores using scats: implications for monitoring a fox incursion into Tasmania.	Ecology and Evolution	Ramsey, D.S.L., Barclay, C., Campbell, C., Dewar, E., MacDonald, A.J., Modave, E., Quasim, S., Sarre, S.D.	1L21 1L22

OUTCOME 1: NO NEW VERTEBRATE PESTS ESTABLISHED IN AUSTRALIA

Nov 2016	An environmental DNA (eDNA) based method for monitoring spawning activity: a case study using the endangered Macquarie perch (<i>Macquaria australasica</i>).	Methods in Ecology and Evolution	Bylemans J., Furlan E.M., Hardy C.M., McGuffie P., Lintermans M., Gleeson D.M.	1W2
Jan 2017	Environmental DNA monitoring and management of invasive fish: comparison of eDNA and fyke netting.	Management of Biological Invasions	Hinlo R, Furlan E, Suitor L, Gleeson D.M.	1W2
2.1 Conference paper – non-refereed proceedings				
Oct 2016	Assessing the extent and abundance of pest animal populations across NSW through expert knowledge	NSW Vertebrate Pest Management Symposium	Trotter, A., Crittle, T., Hart., West., P	1L5
Oct 2016	Releasing the biocontrol agent RHDV K5: processes, progress and community engagement	NSW Vertebrate Pest Management Symposium	Cox, T. Sawyers, E and West., P	1L5
Nov 2016	RHDV Boost - Community participation on a national scale	Australasian Wildlife Management Conference	Sawyers, E., West., P and Cox, T.	1L5
May 2017	Community-based invasive species surveillance: bringing innovation to information sharing and improved management	17th Australasian Vertebrate Pest Conference	West, P	1L5
May 2017	The release and tracking of RHDVS in Australia's rabbit population	17th Australasian Vertebrate Pest Conference	Cox T, Sawyers E, Ramsey D, Strive T, West P, Mutze G, Campbell S, Elsworth P, Matthews J, Hart Q, Askey-Doran M, Saville P, Tracey J	1L5
May 2017	Assessing the extent and abundance of pest animal populations across NSW through expert knowledge	17th Australasian Vertebrate Pest Conference	Trotter A, Crittle T, Hart Q, West P	1L5
May 2017	Separating the twitter from the chatter: monitoring and forecasting mouse plagues in Australian grain growing regions	17th Australasian Vertebrate Pest Conference	Henry S, Brown PR, Hinds, LA, Cruz J, Byrom A, Anderson D, Pech R, West P.	1L5
May 2017	RVDV Boost: community participation on a national scale	17th Australasian Vertebrate Pest Conference	Sawyers E, West P, Cox T.	1L5
Sep 2016	An environmental DNA-based method for monitoring spawning activity: a case study, using the endangered Macquarie perch (<i>Macquaria australasica</i>).	Annual conference of the Australian Society for Fish Biology	Bylemans J., Furlan E.M., Lintermans M., Hardy C.M. Gleeson D.M.	1W2
May 2017	Optimizing sampling protocols for fish community assessments through environmental DNA metabarcoding	17th Australasian Vertebrate Pest Conference	Bylemans J., Furlan E.M., Lintermans M., Hardy C.M. Gleeson D.M.	1W2
2.2 PestSmart Technical Report				
April 2017	National Incursion Response Plan for Terrestrial Snakes	Response Strategy https://www.pestsmart.org.au/national-incursion-response-plan-for-terrestrial-snakes/	Christy, M (2016). National Incursion Response Plan for Terrestrial Snakes. PestSmart Toolkit publication, Invasive Animals Cooperative Research Centre, Canberra, Australia.	1L1

OUTCOME 1: NO NEW VERTEBRATE PESTS ESTABLISHED IN AUSTRALIA

May 2017	National Incursion Prevention and Response Strategy for Potentially Invasive Animals 2017 to 2022 - Consultation Draft	Consultation draft https://www.pestsmart.org.au/national-incursions-strategy-consultation/	Christy, M (2017). Consultation Draft. National Incursion Prevention and Response Strategy for Potentially Invasive Animals (2017-2022). PestSmart Toolkit publication, Invasive Animals Cooperative Research Centre, Canberra, Australia.	1L1
June 2017	National Incursion Management Standard: Adapting the HACCP Model to Manage Incursions of Invasive Species	Not yet online	Christy, M (2017) National Incursion Prevention and Response Program - A National Incursion Management Standard: Adapting the HACCP Model to Manage Incursions of Potentially Invasive Species. Draft Concept Plan. Invasive Animals Cooperative Research Centre, Canberra, Australia.	1L1
2.5 PestSmart DVD / Multimedia product				
Feb 2017	How to use RabbitScan to improve your rabbit control outcomes	YouTube video - https://youtu.be/RhFwC0jGbp0	West, P.	1L5
Feb 2017	How to submit rabbit disease data into RabbitScan	YouTube video - https://youtu.be/xgoUUq6NTpY	West, P.	1L5
Aug 2016	WildDogScan App tutorial	YouTube video - https://youtu.be/EWx4hUh1JPw	West, P.	1L5

OUTCOME 2: IMPROVED PREDICTION AND CONTROL OF EMERGING OUTBREAKS

1.3 Article in scholarly-refereed journal				
June 2017	Development of Toxic Bait to Control Invasive Wild Pigs and Reduce Damage	Wildlife Society Bulletin	Snow, N. P., Foster, J. A., Kinsey, J. C., Humphrys, S. T., Staples, L. D., Hewitt, D. G. and Vercauteren, K. C	2C4
Oct 2016	Non-surgical sterilisation methods may offer a sustainable solution to feral horse (<i>Equus caballus</i>) overpopulation	Reprod. Fertil. Dev.	Hall, S.E., Nixon, B., and Aitken, R.J.	2C13
Jan 2017	Electrophilic aldehyde products of lipid peroxidation selectively adduct to heat shock protein 90 and arylsulfatase A in stallion spermatozoa	Biol Reprod,	Hall, S.E., Aitken, R.J., Nixon, B., Smith, N.D., and Gibb, Z.	2C13
2.1 Conference abstract in a non-refereed proceedings publication				
May 2017	Separating the twitter from the chatter: monitoring and forecasting mouse plagues in Australian grain-growing regions	17th Australasian Vertebrate Pest Conference	Henry, S.	2C3
May 2017	Assessing the field efficacy of HOGGONE® feral pig bait, containing sodium nitrite, for controlling feral pigs in Australia	17th Australasian Vertebrate Pest Conference	Wishart, J.	2C4
May 2017	What is missing from feral pig management – comparisons between the USA and Australia	17th Australasian Vertebrate Pest Conference	Staples, L.D., and VerCauteeren, K.C.	2C4

OUTCOME 2: IMPROVED PREDICTION AND CONTROL OF EMERGING OUTBREAKS

2.3 PestSmart Guide, Factsheet or webpage June 2017

Jun 2017 (updated)	IA CRC Product Status Update	PestSmart website - https://www.pestsmart.org.au/iacrc-product-status-update/	Humphrys, S.	
Jul 2016	Monitoring mice in Australia	PestSmart website - https://www.pestsmart.org.au/monitoring-mice-australia-july-2016/	Henry, S. & Brown., P. et al.	2C3
Dec 2016	Monitoring mice in Australia	PestSmart website - https://www.pestsmart.org.au/monitoring-mice-australia-december-2016/	Henry, S. & Brown., P. et al.	2C3
Mar 2017	Monitoring mice in Australia	PestSmart website - https://www.pestsmart.org.au/monitoring-mice-australia-march-2017/	Henry, S. & Brown., P. et al.	2C3

OUTCOME 3: RECOVERY OF KEY LAND AND WATER REGIONS AFTER HUMANE CONTROL OF RABBITS, WILD DOGS AND CARP

Rabbits

1.3 Article in scholarly-refereed journal

July 2017	Different serological profiles to co-occurring pathogenic and non-pathogenic caliciviruses in wild rabbits across Australia	Journal of Wildlife Disease	Cox TE, Liu J, van de Ven R and Strive T	3L1
Nov 2016	High adaptive variability and virus-driven selection on major histocompatibility complex (MHC) genes in invasive wild rabbits in Australia	Biological Invasions	Schwensow N, Mazzoni CJ, Marmesat E, Fickel J, Peacock D, Kovaliski J, Sinclair R, Cassey P, Cooke B, Sommer S.	3L2
Dec 2016	RHDV2 overcoming RHDV immunity in wild rabbits (<i>Oryctolagus cuniculus</i>) in Australia	Veterinary Record	Peacock D, Kovaliski J, Sinclair R, Mutze G, Iannella A and Capucci L	3L2
Jun 2017	Benign rabbit calicivirus in New Zealand.	Appl Environ Microbiol	Nicholson, LJ, Mahar, JE, Strive, T, Zheng, T, Holmes, EC, Ward, VK, Duckworth, JA	3L3
Oct 2016	Benign Rabbit Caliciviruses Exhibit Evolutionary Dynamics Similar to Those of Their Virulent Relatives	Journal of Virology	Mahar, JE, Nicholson, L, Eden, JS, Duchene, S, Kerr, PJ, Duckworth, J, Ward, VK, Holmes, EC, Strive, T	3L3
Mar 2017	An <i>in vivo</i> system for directed experimental evolution of rabbit haemorrhagic disease virus.	PLoS One	Hall, R. N., L. Capucci, M. Matthaei, S. Esposito, P. J. Kerr, M. Frese and T. Strive	3L4
Jan 2017	RNA-Dependent RNA Polymerases of both Virulent and Benign Rabbit Caliciviruses Induce Striking Rearrangement of Golgi Membranes	PLoS One	Urakova, N., Strive, T. and Frese, M.	3L4
Feb 2017	Detection of RHDV2 in European Brown Hares (<i>Lepus Europaeus</i>) in Australia.	Veterinary Record	Hall, R. N., D. E. Peacock, J. Kovaliski, J. E. Mahar, R. Maurant, M. Piper, and T. Strive.	3L4

OUTCOME 3: RECOVERY OF KEY LAND AND WATER REGIONS AFTER HUMANE CONTROL OF RABBITS, WILD DOGS AND CARP				
Apr 2016	Purification and Biochemical Characterisation of Rabbit Calicivirus RNA-Dependent RNA Polymerases and Identification of Non-Nucleoside Inhibitors	Viruses Basel	Urakova, N., N. Netzler, A. G. Kelly, M. Frese, P. A. White and T. Strive	3L4
Jul 2016	Detection of RHDV2 in European brown hares (<i>Lepus europaeus</i>) in Australia	Veterinary Record	Robyn N. Hall, David E. Peacock, John Kovaliski, Jackie E. Mahar, Ros Mourant, Melissa Piper, Tanja Strive	3L4 3L5
Feb 2017	Wild opportunities with dedomestication genetics of rabbits	Restoration Ecology	Thulin, C.-G., Alves, P. C., Djan, M., Fontanesi, L. and Peacock, D.	3L5
July 2017	Proposal for a unified classification system and nomenclature of lagoviruses	Journal of General Virology	Le Pendu, J. <i>et al.</i>	3L5
2.1 Conference abstract in a non-refereed proceedings publication				
Dec 2016	RHDV Boost – Community participation on a national scale	Australasian Wildlife Management Society conference	Emma Sawyers, Peter West and Tarnya Cox	3L1
May 2017	The impact of rhdv2 on rabbit populations across Australia	17th Australasian Vertebrate Pest Conference	Tarnya Cox, Robyn Hall, David Ramsey, Emma Sawyers, Tanja Strive and John Tracey	3L1
May 2017	The release and tracking of RHDVs in Australia's rabbit population	17th Australasian Vertebrate Pest Conference	Tarnya Cox, Emma Sawyers, Dave Ramsey, Tanja Strive, Peter West, Greg Mutze, Susan Campbell, Peter Elsworth, John Matthews, Quentin Hart, Michael Askey-Doran, Peter Saville, Oliver Orgill and John Tracey	3L1
May 2017	RHDV Boost – Community participation on a national scale	17th Australasian Vertebrate Pest Conference	Emma Sawyers, Peter West and Tarnya Cox	3L1
July 2016	The source of myxomatosis and RHDV/RHDV2: Could the Americas' leporids provide Australia's next rabbit biocontrol?	5th World Lagomorph Conference, 11th – 15th July, Turlock, California (USA).	David E. Peacock, Greg J. Mutze	3L5
Dec 2016	Arrival and spread of a new variant of Rabbit Haemorrhagic Disease Virus in Australia	Australasian Wildlife Management Society Conference	Robyn E. Hall, Jackie Mahar, David E Peacock, John Kovaliski, Andrew J Read, Tarnya Cox and Tanja Strive	3L5
May 2017	The different roles of myxomatosis and RHD in in the suppression of the Turretfield rabbit population	17th Australasian Vertebrate Pest Conference	David Peacock, Greg Mutze, Ron Sinclair, Peter Kerr, John Kovaliski and Lorenzo Capucci	3L5
May 2017	RHDV2 in the Australian landscape: 2015-2016	17th Australasian Vertebrate Pest Conference	Jackie E Mahar, Robyn N Hall, David Peacock, John Kovaliski, Melissa Piper, Ros Mourant, Nina Huang, Susan Campbell, Andrew Read, Nadya Urakova, Tarnya Cox and Tanja Strive	3L5

OUTCOME 3: RECOVERY OF KEY LAND AND WATER REGIONS AFTER HUMANE CONTROL OF RABBITS, WILD DOGS AND CARP

2.2 PestSmart Technical Report				
Dec 2016	Recommendations for a long-term rabbit biocontrol research and innovation plan	Technical Report (unpublished)	T. Strive, compiler	3L4
2.3 PestSmart Glovebox Guide, Fact Sheet or webpage				
Jan 2017	Rollout of RHDV1 K5 in Australia: information guide	Glovebox Guide http://www.pestsmart.org.au/rollout-of-rhdv1-k5-in-australia-information-guide/	Wishart, J. & Cox, T.	3L1
Feb 2017	Measures to minimise RHDV1 infection in pet 'domestic' rabbits	PestSmart website - https://www.pestsmart.org.au/minimise-rhdv1-infection-in-pet-rabbits/	P.D. Kirkland and A.J. Read	3L1
March 2017	Boosting Rabbit Control in Australia	Web Portal https://www.pestsmart.org.au/boosting-rabbit-biocontrol-rhdv-k5-national-release/		3L1
Jun 2017	Production lands DSS	PestSmart website - https://www.pestsmart.org.au/pest-animal-species/european-rabbit/dss-for-rabbit-management/production-land-dss/	Warburton B, Howard S, Cruz J, Allen W.	3L6
Nov 2016	Conservation DSS	PestSmart website - https://www.pestsmart.org.au/pest-animal-species/european-rabbit/dss-for-rabbit-management/conservation-land-dss/	Warburton B, Howard S, Cruz J, Allen W.	3L6
2.5 PestSmart DVD or multimedia product				
Jan 2017	<u>An introduction to the rabbit problem in Australia</u>	YouTube video - https://youtu.be/e8pCXwWWNE0	Cox, T.	3L1
Jan 2017	<u>How to lay RHDV (rabbit virus) baits on your site</u>	YouTube video - https://youtu.be/H5oB5pP1gVs	Somerset, C.	3L1
Jan 2017	<u>How to spotlight count for rabbits on your site</u>	YouTube video - https://youtu.be/QS0PGcG18bY	Cox, T.	3L1
Jan 2017	<u>Rabbit warren ripping and harbour destruction</u>	YouTube video - https://youtu.be/9irEQZl-AvxA	Somerset, C.	3L1
Jan 2017	<u>Rabbit warren fumigation</u>	YouTube video - https://youtu.be/GfnkMkgWmLk	Somerset, C.	3L1
Jan 2017	<u>Poison Baiting for Rabbit Control</u>	YouTube video - https://youtu.be/hZwdDUbOKi4	Somerset, C.	3L1
Apr 2017	<u>How to collect samples from a dead rabbit for disease testing</u>	YouTube video - https://youtu.be/e8pCXwWWNE0	Cox T.	3L1

OUTCOME 3: RECOVERY OF KEY LAND AND WATER REGIONS AFTER HUMANE CONTROL OF RABBITS, WILD DOGS AND CARP

Wild Dog

1.3 Article in scholarly-refereed journal

2017	Can we save large carnivores without losing large carnivore science?	Food Webs.	Allen, Benjamin L., Allen, Lee R., Andrén, Henrik, Ballard, Guy, Boitani, Luigi, Engeman, Richard M., Fleming, Peter J. S., Ford, Adam T., Haswell, Peter M., Kowalczyk, Rafał, Linnell, John D. C., David Mech, L. and Parker, Daniel M.	3L11
2017	Large carnivore science: Non-experimental studies are useful, but experiments are better.	Food Webs.	Allen, Benjamin L., Allen, Lee R., Andrén, Henrik, Ballard, Guy, Boitani, Luigi, Engeman, Richard M., Fleming, Peter J. S., Ford, Adam T., Haswell, Peter M., Kowalczyk, Rafał, Linnell, John D. C., David Mech, L. and Parker, Daniel M.	3L11
2017	<i>Homo sapiens</i> is the apex animal: anthropocentrism as a Dionysian sword.	Australian Zoologist	Fleming, P. J.S. and Ballard, G.	3L11
2017	Roles for the Canidae in food webs reviewed: Where do they fit?	Food Webs.	Fleming, P.J.S., Nolan, H., Jackson, S.M., Ballard, G-A., Bengsen, A., Brown, W.Y., Meek, P.D., Mifsud, G., Pal, S.K. and Sparkes, J.	3L11
Sep 2017	The Wayward Dog: Is the Australian native dog or Dingo a distinct species?	Zootaxa	Jackson, S.M., Groves, C.P., Fleming, P.J.S., Aplin, K.P., Eldridge, M.D.B., Gonzalez, A. and Helgen, K.M.	3L11
2017	Trophic cascades and dingoes in Australia: does the Yellowstone wolf–elk–willow model apply?	Food Webs	Morgan, H.R., Hunter, J.T., Ballard, G., Reid, N.C.H. and Fleming, P.J.S.	3L11
2017	The trophic cascades concept may constrain Australian dingo reintroduction experiments: A response to Newsome et al.	Food Webs	Morgan, H.R., Hunter, J.T., Ballard, G. and Fleming, P.J. S.	3L11
2017	Making a New Dog?	BioScience	Newsome, Thomas M., Fleming, Peter J. S., Dickman, Christopher R., Doherty, Tim S., Ripple, William J., Ritchie, Euan G. and Wirsing, Aaron J.	3L11
2017	Predicted Spatial Spread of Canine Rabies in Australia.	PLOS Neglected Tropical Diseases	Johnstone-Robertson, Simon P., Fleming, Peter J. S., Ward, Michael P. and Davis, Stephen A.	3L11
2017	Social, conservation and economic implications of rabies in Australia.	Australian Zoologist	Sparkes, J., Ballard, G., Fleming, P. and Brown, W.	3L11
2016	Dingoes at the doorstep: home range sizes and activity patterns of dingoes and other wild dogs in peri-urban areas of north-eastern Australia.	Animals	McNeill A. T., Leung L. K. P., Goullet M. S., Gentle M. and Allen B. L.	3L13

OUTCOME 3: RECOVERY OF KEY LAND AND WATER REGIONS AFTER HUMANE CONTROL OF RABBITS, WILD DOGS AND CARP

2017	The longevity of PAPP wild dog baits and the implications for effective and safe baiting campaigns.	Environmental Science and Pollution Research	Gentle, M., Speed, J., Allen, B., Harris, S., Haapakoski, H. and Bell, K.	3L13
Jul 2017	<i>Do female dingo–dog hybrids breed like dingoes or dogs?</i>	Australian Journal of Zoology	Marina S. Cursino, Lana Harriott, Benjamin L. Allen, Matthew Gentle, and Luke K.-P. Leung	3L13
2.1 Conference abstract in a non-refereed proceedings publication				
Nov 2016	<i>Echinococcus granulosus</i> and other zoonotic pathogens of peri-urban wild dogs in south-east Queensland.	5th Queensland Pest Animal Symposium	Harriott L., Gentle M., Traub R., Soares Magalhaes R. J. and Cobbold R.	3L13
Nov 2016	Peri-urban wild dogs: Diet and movements in north-eastern Australia.	5th Queensland Pest Animal Symposium	Allen B. L., Allen L. R., Amos M., Carmelito E., Gentle M. N., Goulet M., Leung L. K. P., McNeill A. T. and Speed J.	3L13
Nov 2016	Dingoes, domestic dogs, or hybrids? Genetics of peri-urban wild dogs in north-eastern Australia.	5th Queensland Pest Animal Symposium	Gentle, M., Oakey, J., Speed, J., Allen, B.L., Allen, L.R.	3L13
Nov 2016	The persistence of PAPP in wild dog baits and considerations for peri-urban baiting campaigns.	5th Queensland Pest Animal Symposium	Gentle M., Speed J., Allen B. L., Harris S. and Haapakoski H.	3L13
2.1 PestSmart Technical Report				
Mar 2017	Strategic recommendations for co-the management of wild canids & feral cats in mesic agri-ecosystems	PestSmart Report (unpublished)	Ballard, G., Fleming, P., & Meek, P.	3L11
June 2017	Peri-urban wild dogs in north-eastern Australia: Ecology, Impacts and Management.	PestSmart Report	Gentle, M., Allen, B.L. and Speed, J.	3L13
2.4 PestSmart Case study				
June 2017	Western division wild dog control – Western NSW	Case Study report - https://www.pestsmart.org.au/national-wild-dog-action-plan/case-studies/western-nsw/	G. Mifsud, J. Littlejohn and N Searle	3L14
June 2017	Carnarvon Rangelands Biosecurity Association – Western Australia	Case Study report - https://www.pestsmart.org.au/national-wild-dog-action-plan/case-studies/carnarvon-wa/	G. Mifsud, J. Littlejohn and AgKnowlegde	3L14
Jan 2017	Community action for wild dog management	Case Study report - https://www.pestsmart.org.au/national-wild-dog-action-plan/case-studies/community-action-wild-dog-management/	Howard et al.	3L14
2.5 PestSmart DVD or multimedia product				
Sep 2016	Canid Pest Ejector (CPE) for fox and wild dog control	YouTube video - https://youtu.be/3p1nFr9ZHEo	Hunt, R.	3L15
Jan 2017	Dogabait and Foxecute – Additional tools for pest predator management in Australia.	YouTube video - https://youtu.be/Fmte-eK1rI	Roach. C et al	3L15
May 2017	An introduction to wild dogs in Australia	YouTube video - https://youtu.be/IBYONziL6M8	Allen, B. and Gentle G,	3L15

OUTCOME 3: RECOVERY OF KEY LAND AND WATER REGIONS AFTER HUMANE CONTROL OF RABBITS, WILD DOGS AND CARP**European Carp****1.3 Articles in scholarly refereed journals**

Dec 2016	Cyprinid herpesvirus 3 as a potential biological control agent for carp (<i>Cyprinus carpio</i>) in Australia: susceptibility of non-target species	Journal of Fish Diseases	McColl KA, Sunarto A, Slater J, Bell K, Asmus M, Fulton W, Hall K, Brown P, Gilligan DM, Hoad J, Williams LM, Crane MStJ	3W1
Feb 2017	Transcriptomic analysis of common carp anterior kidney during <i>Cyprinid herpesvirus 3</i> infection: Immunoglobulin repertoire and homologue functional divergence	Scientific Reports	Neave MJ, Sunarto A, McColl KA	3W1
Apr 2017	Safe and effective biocontrol of common carp.	Nature Ecology & Evolution	McColl KA, Sheppard A, Barwick M	3W1
Dec 2016	Cyprinid herpesvirus 3 and its evolutionary future as a biological control agent for carp in Australia	Virology Journal	McColl KA, Sunarto A, Holmes EC	3W1

2.1 Conference abstract in a-refereed proceedings publication

May 2017	Cyprinid herpesvirus 3: a potential biological control for carp in Australia.	17th Australasian Vertebrate Pest Conference	McColl, K	3W1
May 2017	Immune response of common carp, <i>Cyprinus carpio</i> , to cyprinid herpesvirus 3 infection: implications for viral control	17th Australasian Vertebrate Pest Conference	Neave, M.	3W1

2.2 PestSmart Technical Report

Nov 2016	Final report: Phase 3 of the carp herpesvirus project (CyHv-3)	PestSmart report - https://www.pestsmart.org.au/final-report-phase-3-carp-herpesvirus-project-cyhv-3/	McColl, K.	3W1
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2.7 Other IA CRC or agency related factsheet or report

June 2017	Baseline data collection to monitor the aquatic ecosystem response within the Murray Darling Basin to the proposed release of the Cyprinid herpesvirus.	Department of Primary Industries – Fisheries Final Report Series.	Stocks, J. and Gilligan, D.	3W2
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Other**1.3 Article in scholarly refereed journal**

2017	Enumerating a continental-scale threat: How many feral cats are in Australia?	Biological Conservation.	Legge, S., et al.	
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2.2 PestSmart Technical Report

Nov 2016	2016 National Workshop on Deer Management Proceedings	Proceedings - http://www.pestsmart.org.au/2016-national-workshop-deer-management-proceedings/	Forsyth D, Pople T, Page B, Moriarty A, Ramsey D, Parkes J, Wiebkin A, & Lane C (Eds)	
May 2017	Proceedings of the 17th Australasian Vertebrate Pest Conference	Proceedings - https://www.pestsmart.org.au/avpc-2017-proceedings/	Buckmaster, T (ed)	

OUTCOME 4: NEW SOCIAL NETWORKS AND INSTITUTIONAL 'ARCHITECTURE' ENHANCED AROUND PEST ANIMAL CONTROL

1.2 Book chapters				
2016	Next Generation Rural Natural Resource Governance: A Careful Diagnosis	Legal Aspects of Sustainable Development.	P. Martin and J. Williams	4E2
1.3 Article in scholarly-refereed journal				
Nov 2016	Constantly chasing dogs: assessing landholder stress from wild dog attacks on livestock using quantitative and qualitative methods,	Australasian Journal of Environmental Management.	S. Ecker, P. Please, and D Maybery	
Oct 2016	Evaluation of a natural resource management program: an Australian case study	Australasian Journal of Environmental Management	M. Verbeek, P. Martin, M. Fortunato, T. Alter, J. Bridger, and R. Radhakrishna	
Sep 2016	Ecological restoration of rural landscapes: stewardship, governance, and fairness	Restoration Ecology	P. Martin	
2016	Collective action in invasive species control, and prospects for community-based governance: The case of serrated tussock (<i>Nassella trichotoma</i>) in New South Wales, Australia	Land Use Policy	G. Marshall, M. Coleman, B. M. Sindel, I. J. Reeve and P. J. Berney	
2.1 Conference abstract in a non-refereed proceedings publication				
May 2017	"The community won't be ignored": lessons for community engagement from case studies of wild dog management groups	17th Australasian Vertebrate Pest Conference	Howard, T. and Mifsud, G.	
May 2017	Community engagement for invasive species management: take home messages from a four-year collaboration	17th Australasian Vertebrate Pest Conference	Howard, T. and Alter, T.	
May 2017	Important lessons from the IA CRC 'Facilitating Effective Citizen Action' research and practice improvement program 4E use' core principles Perceptions: Progress on	17th Australasian Vertebrate Pest Conference	T. Alter, A. Cosby, D. Low Choy, D. Hine, T. Howard, P. Martin, P. Please, and L. Thompson	
May 2017	What Will It Take To Future-Proof Shared responsibility	17th Australasian Vertebrate Pest Conference	P. Martin	
May 2017	Evaluation and continuous improvement in the human aspects of invasive species management	17th Australasian Vertebrate Pest Conference	P. Martin and S. Hester	
Nov 2016	Behavioural science and rural wild dog management	5th Queensland Pest Animal Symposium	P. Skoien, P. Please, P.M. and D. Hine,	
Nov 2016	Behavioural science and peri-urban wild dog management	5th Queensland Pest Animal Symposium	P. Please, D. Hine, P. Skoien, K. Phillips, M., Morgan, and I Jamieson	
Nov 2016	It's All About the People": Capacity Building for Invasive Species Management	NSW Vertebrate Pest Management Conference	T. Howard	
Dec 2016	How to use behavioural science to increase participation in wild dog management in peri-urban and rural landscapes.	Australasian Wildlife Management Society Conference	P. Please, D. Hine, P. Skoien and K. Phillips	
Dec 2016	Managing the managers – Applying behavioural science for more effective management outcomes.	Australasian Wildlife Management Society Conference	L. McLeod, D. Hine and A. Bengsen	
May 2017	Insights into facilitating cooperative approaches for rabbit management.	17th Australasian Vertebrate Pest Conference	Michael Reid, Lisa Adams, Theodore R. Alter, Brian Furze, Lauren Hull, Andrew P. Woolnough	4E6

OUTCOME 4: NEW SOCIAL NETWORKS AND INSTITUTIONAL 'ARCHITECTURE' ENHANCED AROUND PEST ANIMAL CONTROL				
May 2017	A new paradigm for invasive species management: application of a systems strengthening approach	17th Australasian Vertebrate Pest Conference	Woolnough, A., Williams, S. Reid M. Hider, J.	4E11
May 2017	Maintaining the Capability Pipeline: IA CRC Balanced Researcher Program	17th Australasian Vertebrate Pest Conference	Buckmaster T. and Sarre S.	4E21
2.2 PestSmart Technical Report				
Apr 2017	Stakeholder views on pest management in Australia	PestSmart Report - https://www.pestsmart.org.au/stakeholder-views-pest-management-australia	Martin, P. and Lingard, K.	4E4
Nov 2016	Recommendations for the reform of invasive species management institutions	PestSmart Report (unpublished)	P. Martin and D. L. Choy	
Nov 2016	Community Development Online: A Review of Best Practices for Engaged Collaboration	PestSmart Report - https://www.pestsmart.org.au/community-development-online-review-best-practices-engaged-collaboration/	Balfour, B. and Alter, T.	
2.3 PestSmart Glovebox Guide, factsheet or webpage				
May 2017	<u>Engaging with Communities Leader Profile - Barry Davies</u>	PestSmart webpage - https://www.pestsmart.org.au/engaging-communities-leader-profile-barry-davies/	Howard, T.	
May 2017	<u>Engaging with Communities Leader Profile - Brett Carlsson</u>	PestSmart webpage - https://www.pestsmart.org.au/engaging-communities-leader-profile-brett-carlsson/	Howard, T.	
May 2017	<u>Engaging with Communities Leader Profile - Lisa Adams</u>	PestSmart webpage - https://www.pestsmart.org.au/engaging-communities-leader-profile-lisa-adams/	Howard, T.	
May 2017	<u>Engaging with Communities Leader Profile – Darren Marshall</u>	PestSmart webpage - https://www.pestsmart.org.au/engaging-communities-leader-profile-darren-marshall/	Howard, T.	
May 2017	<u>Engaging with Communities Leader Profile - Greg Mifsud</u>	PestSmart webpage - https://www.pestsmart.org.au/engaging-communities-leader-profile-greg-mifsud/	Howard, T.	
May 2017	<u>Engaging with Communities Leader Profile - Jess Marsh</u>	PestSmart webpage - https://www.pestsmart.org.au/engaging-communities-leader-profile-jess-marsh/	Howard, T.	
May 2017	<u>Engaging with Communities Leader Profile – Mike Reid</u>	PestSmart webpage - https://www.pestsmart.org.au/engaging-communities-leader-profile-michael-reid/	Howard, T.	

OUTCOME 4: NEW SOCIAL NETWORKS AND INSTITUTIONAL 'ARCHITECTURE' ENHANCED AROUND PEST ANIMAL CONTROL

May 2017	<u>Engaging with Communities Leader Profile – Dr Ben Allen</u>	PestSmart webpage - https://www.pestsmart.org.au/engaging-communities-leader-profile-ben-allen/	Howard, T.	
May 2017	<u>Engaging with Communities Leader Profile – Harley West</u>	PestSmart webpage - https://www.pestsmart.org.au/engaging-communities-leader-profile-harley-west/	Howard, T.	
May 2017	<u>Engaging with Communities Leader Profile – Dr Matthew Gentle</u>	PestSmart webpage - https://www.pestsmart.org.au/engaging-communities-leader-profile-matthew-gentle/	Howard, T.	
May 2017	<u>Engaging with Communities Leader Profile – Dr Peter Fleming</u>	PestSmart webpage - https://www.pestsmart.org.au/engaging-communities-leader-profile-peter-fleming/	Howard, T.	
May 2017	<u>Engaging with Communities Leader Profile – Dave Berman</u>	PestSmart webpage - https://www.pestsmart.org.au/engaging-communities-practitioner-profiles-dave-berman/	Howard, T.	
2.5 PestSmart DVD or multimedia product				
May 2017	<u>Engaging with Communities Leader Profile - Barry Davies</u>	YouTube Video - https://youtu.be/lmWHZlv9go	Davies, B.	4E4
May 2017	<u>Engaging with Communities Leader Profile - Brett Carlsson</u>	YouTube Video - https://youtu.be/tVoKgQSKtgE	Carlsson, B.	4E4
May 2017	<u>Engaging with Communities Leader Profile - Lisa Adams</u>	YouTube Video - https://youtu.be/OYUVpwPF09c	Adams, L.	4E4
May 2017	<u>Engaging with Communities Leader Profile – Darren Marshall</u>	YouTube Video - https://youtu.be/QF3SntiqEgM	Marshall, D	4E4
May 2017	<u>Engaging with Communities Leader Profile - Greg Mifsud</u>	YouTube Video - https://youtu.be/OfeyVB3Utjo	Mifsud, G.	4E4
May 2017	<u>Engaging with Communities Leader Profile - Jess Marsh</u>	YouTube Video - https://youtu.be/eGZDnRhGByl	Marsh, J.	4E4
May 2017	<u>Engaging with Communities Leader Profile – Mike Reid</u>	YouTube Video - https://youtu.be/WJ_FoYFNrj8	Reid, M.	4E4
2.7 Other IA CRC or agency related factsheet or report				
Dec 2016	Formative evaluation of the Victorian Rabbit Action Network	Report	Brian Furze	4E6
Jan 2017	Community Engagement – moving people towards action. Training resource “Participant activities and notes”	VET training resource	Bartlett-Taylor J. & Verbeek, B,	4E11

ACRONYMS AND ABBREVIATIONS

ACTA Animal Control Technologies Australia

APVMA Australian Pesticides and Veterinary Medicines Authority

CISS Centre for Invasive Species Solutions CRC cooperative research centre

CSIRO Commonwealth Scientific and Industrial Research Organisation

CyHV-3 cyprinid herpesvirus 3

eDNA environmental DNA

IA CRC Invasive Animals Cooperative Research Centre

IAL Invasive Animals Limited

IP intellectual property

NSW DPI New South Wales Department of Primary Industries

PAPP para-aminopropiophenone

PIRSA Primary Industries and Regions South Australia

R&D research and development

RD&E research, development and extension

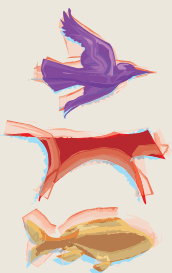
RHD rabbit haemorrhagic disease

RHDV rabbit haemorrhagic disease virus

SME small-to-medium enterprise

TOGETHER, CREATE AND APPLY SOLUTIONS

Invasive Animals CRC



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