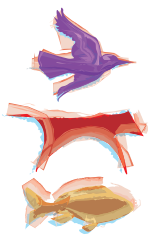


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INVASIVE ANIMALS
COOPERATIVE RESEARCH CENTRE
ANNUAL REPORT

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OUR PARTICIPANTS



Supported under the Australian Government's Cooperative Research Programme





After eight years of research, Dr Ken McColl and his team of researchers based at the Australian Animal Health Laboratory (AAHL, CSIRO) in Geelong, Victoria are confident that the carp herpesvirus is specific to carp and won't cause disease in any other fish, animal or to humans. Building on the substantial body of research undertaken to date, the Australian Government has committed \$15 million to develop a National Carp Control Plan over the next two and half years, which will include comprehensive planning for a proposed national release and clean up strategy.

Information about our carp herpesvirus research can be found at www.clearerwaters.org.au

CONTENTS

Our participants	1
Introduction	5
‘Together, create and apply solutions’	5
Our Purpose.....	5
Our Outcomes.....	5
Our Programs.....	5
National Science and Research Priorities.....	5
Chair’s Foreword	7
Stakeholder Endorsements	9
CEO’s Report	11
CEO’s Executive Summary	12
Structure and Governance	25
Research Achievements	33
Outcome 1: No new vertebrate pests established in Australia.....	35
Outcome 2: Improved prediction and control of emerging outbreaks.....	41
Outcome 3: Recovery of key land and water regions from rabbits, 45 wild dogs and carp	52
Outcome 4: Strengthened social networks and institutional ‘architecture’ around pest animal control.....	57
Education and Training	58
Postgraduate Education.....	64
Vocational Education and Training.....	67
Results	68
Commercialisation and Utilisation.....	68
Intellectual Property Management	69
Small-to-medium Enterprise Agreement.....	71
Communications.....	71
Stakeholder Engagement	73
Public Awareness and Outreach.....	79
Financial Performance	80
Achievement against Commonwealth Contract Budget	80
Financial Strategy and Management	80
Other Activities and Grants	83
Performance Review	84
Appendix A: Milestone Report	87
Appendix B: Publications	101
Acronyms and Abbreviations	112



Dr Tarnya Cox, RHD Boost Project Leader, out in the field collecting information about rabbit populations as part of the National RHDV Monitoring Program and national release of RHDV1 K5 initiative (image supplied by NSW DPI).

Information about the national roll-out of RHDV1 K5 can be found at www.healthierlandscapes.org.au

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.

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

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.
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.

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.

Table 1: National Science and Research Priorities

Science and Research Priority	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.



Fox running through a paddock in the Moira Shire of Victoria (image taken by Rebecca Duffy)



CHAIR'S FOREWORD

2015–16 has been a most remarkable and rewarding year as the Invasive Animals CRC strong performance continues. Now in our final year we have an extremely positive outlook for an exciting future driven by the success achieved through outstanding IA CRC collaboration across governments, SME's and industry. Underpinning this success is our winning CPR formula of Collaboration, People and Relationships. Obviously the stronger these segments are at all levels, the more successful our efforts will be to combat the impact of invasive species.

During the past year these key priorities have been integral in achieving the Centre for Invasive Species Solutions(CISS) structure and meeting IA CRC's 5th goal. I acknowledge the role Participants have played in formulating the structure and thank you for your willingness to meet with IAL Directors and Andreas in very open and honest dialogues.

The recognition and commitment to minimise the impact of invasive species across all aspects of the Australian landscape, has grown significantly since the first IA CRC bid in 2004/5. In this year's election there was strong bipartisan recognition of the severe impact invasive species have on the Australian economy and community wellbeing and the need for a proactive approach. The Coalition Government has committed \$20 million over 5years to support a new national collaborative pest animal RD&E program, to be established under the new CISS - this is a game changing commitment.

This announcement sees the culmination of the hard work of many dedicated people:

From the CRC for the Biological Control of Vertebrate Pest Populations and the Pest Animal Control CRC to the Invasive Animals CRC 1 & 2: the work of two

talented CEO's Andreas Glanznig and Dr Tony Peacock plus their teams that shaped the networking, the collaboration and implemented the IAL Governing Boards strategic foresight over the two IA CRC's: and the strong commitment of vigilant Directors who maintained a good strategic balance between outcomes and vision, ensuring our stakeholder's intentions, objectives and investments were in safe-hands.

The IA CRC community does have a deep understanding of the blight that invasive species will have throughout the Australian landscape and on the national economy, if they are not

- addressed through long term strategic planning, that is:
- implemented with a transparent sharing of responsibility;
- housed in a genuine collaborative operational base;
- and built upon strong relationships between dedicated people.

Australia's National Biosecurity System continues to strengthen under the Government's National Biosecurity Committee (NBC) and underlying national sectoral committees, which includes the Invasive Plants and Animals Committee(IPAC) responsible for the Australian pest animal and weed strategies (APAS & AWS).The establishment and investment in CISS gives IPAC an efficient way to enable and deliver collaborative RD&E aligned to the shared innovation and research priorities of the APAS and related industry strategies.

The recently revised draft APAS confirms the massive impact of rabbits, which with current biological intervention keeps rabbit numbers to about 15% of their potential. At this level they still impact on 304 threatened species and cost agriculture over

\$200 million per annum: however without this biological intervention, rabbits will impact the 304 threatened species and biodiversity more severely, and the cost to agriculture will increase to a staggering \$2 billion per annum.

The success with rabbits results from the long term benefit of biological control since the release of Myxo in the 1950's and over the last 65 years a concerted effort and commitment of resources by tens of thousands of farmers and land managers to control rabbit numbers as they spread across the landscape; we have funded strategic R&D projects covering rabbit biology, ethology and ecology as well as the effectiveness of possible control mechanisms; we benefited from the release of the RHD calicivirus and will have a further control opportunity with the imminent release of RHD K5; plus further supporting strategic measures planned for the future.

Long-term pipeline strategies, as we have formulated for rabbits, are essential for successful management across the range of invasive species targeted by IA CRC.

IAL Board focus in 2016–17 is firmly fixed on a successful completion of the IA CRC program portfolio and a smooth transition into the Center for Invasive Species Solutions.

The IAL Board and management have set in place a tight and timely schedule to ensure CISS is launched on July 1 2017 with an excellent governance system and a 5year innovation portfolio in place, both collaboratively developed between the IAL Board and prospective CISS Members who identified themselves in the EOI process. The CISS strategy that balances the imperative to develop and apply invasive species management solutions with the need to create an enduring organisation, underpins both development processes. I do thank K&L Gates Law Firm for their generous pro bono work on the new Constitution.

I welcome Peter Noble to the IAL Board. Elected in 2015, Peter's legal background includes risk management and governance, strategic acquisition, integration management and sustainability. He is the current Executive Chairman Australian Meat Processors Corporation and a member of the United Nations Environment Program Finance Initiative and an Adjunct Professor, Law and Agriculture at University of New England. Peter is already a great asset to Board discussions and decision-making.

Director Helen Scott-Orr has stepped down to take up the inaugural position of Inspector-General of Biosecurity under the Biosecurity Act 2015. Helen's deep knowledge of legislation, government at all levels, and agriculture through her role as NSW Chief Veterinary Officer and her many years in capacity building projects in Indonesia have all been invaluable to IAL discussions over her 9years Directorship. We wish her well in this new role.

My sincere thanks to Participants and all in the IA CRC community for your dedication and hard work over many years, it is your efforts that produced the collaborative collective that bore fruit this year enabling CISS to get real legs.

My congratulations to Andreas, and his team for an outstanding job throughout an exceptionally demanding year, the Board truly appreciates your efforts, well done. I endorse Andreas comments and extend the Boards sincere thanks to Keryn Lapidge whose excellent communication skills laid the solid foundation for our Feral Flyer e-news and PestSmart publications.

Our IAL Directors have diverse backgrounds, experience and knowledge to draw on and this mix always creates good insightful Board discussions. My sincere thanks to all IAL Directors, for your support and for your careful and thorough deliberations, to ensure the best possible IA CRC and CISS outcomes.

The coming year will again be very demanding, I am very confident that in the IA CRC community we have the capacity, the capability and the dedication to achieve a successful IA CRC closure plus a robust and energised CISS start up.



Helen Cathles

**Chair
Invasive Animals Limited**

STAKEHOLDER ENDORSEMENTS



Stuart McCullough

CEO, Australian Wool Innovation

“Australian Wool Innovation is committed to funding research, development and extension which will help enhance the profitability, international competitiveness and sustainability of the Australian wool industry and to increase the demand and market access for Australian wool. We believe that collaboration between landholders and with other key stakeholders, locally and across shires is an integral part of pest animal control activities and have proudly supported the Invasive Animals CRC as a participant for many years and look forward to continuing this partnership in future years.”



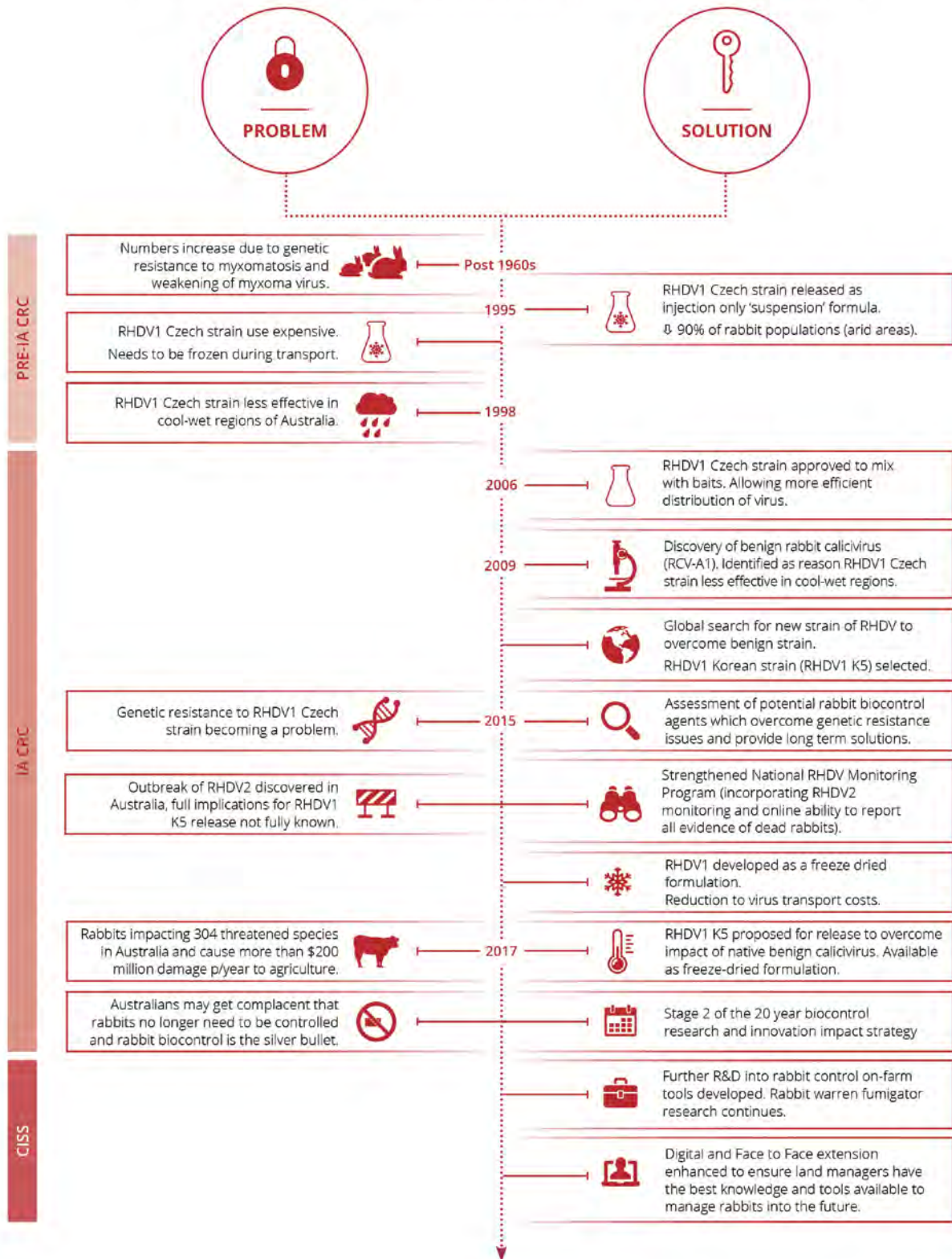
Gregory Andrews

Threatened Species Commissioner

“We all have a role to play in saving Australian wildlife from extinction and protecting farmers’ incomes. In mid-2015, we launched the National Threatened Species Strategy which sets out a new national approach to threatened species. The Plan prioritises effort and work to protect threatened species in partnership with the community and government over a 5 year period. The work of the Invasive Animals CRC and its successors, is vital in achieving our goals over the next five years, as we can’t conserve threatened species without managing invasive species.”

IMPACT THROUGH COLLABORATION

The innovation pathway for development of strengthened rabbit control in Australia





CEO'S REPORT

Impact through Collaboration. These three words are what the Invasive Animals CRC is all about.

A great example of collaboration in practice is how our CRC is providing the glue to build the national government-industry-community partnership to drive the forthcoming release of the first new rabbit biocontrol agent (RHDV1 K5) in 20 years. This partnership has not only funded the research and innovation program to select this RHDV1 strain but will be working with hundreds of community and farmer groups to monitor rabbits before and after the release, as part of the National RHDV Monitoring Program.

The National RHDV Monitoring Program is also playing a critical role in ascertaining the spread of RHDV2 (an outbreak of a new rabbit virus of unknown origin) and its implications for the release of RHDV1 K5. This will provide important knowledge about their potential to act in concert to knock down rabbit numbers and reduce their agricultural and environmental impact.

As we move into our final year, rubber is hitting the road. This includes the release of the first new wild dog and fox toxic bait in 50 years developed through Australian Wool Innovation, Animal Control Technologies Australia and the Australian government through the IA CRC. This Annual Report highlights this achievement as well as progress over a broad innovation front spanning new digital planning tools to community engagement approaches.

The CRC, and our field more generally, have been fortunate to have attracted considerable new investment from the Australian government over the past year. This has enabled the CRC to move its digital surveillance work to the next level through the Wild Dog Alert system, as well as fund the first stage of the Australian Government led National Carp Control Plan, which will progress risk assessment work associated with the national release of the first ever potential carp biocontrol agent in Australia. Most recently the Australian government has committed \$20 million to enable a successful transition from the

IA CRC to our new collaborative body – the Centre for Invasive Species Solutions (CISS).

The above examples epitomise the 'shared responsibility' principle being applied through the National Biosecurity System. They show that the Invasive Animals CRC is a prime example of how this principle can be successfully applied in practice. The CRC already brings government, industry and the community into a grand collaboration, and in doing so addresses a major identified vulnerability of the National Biosecurity System by enabling an efficient coordinated RD&E approach.

The CRC outlook is positive with 77% of our required commonwealth milestones now achieved and the remaining 23% in progress. We are on track to have 31 (82%) of the 38 research and utilisation outputs, and some 85% of Commonwealth milestones being achieved within the CRC's duration or in the 12 months thereafter, and up to 36 (94%) of the 38 outputs, and some 95% of Commonwealth milestones ultimately being achieved. A showcase of the many achievements of CRC associated researchers and innovators will be presented at the 17th Australasian Vertebrate Pests Conference to be held in Canberra in May 2017. I encourage you to attend.

On a final note, I would like to sincerely thank Keryn Lapidge for her fabulous communication efforts over many years to connect the CRC with pest animal managers and our many stakeholders. The lauded PestSmart toolkit is a testimony to her high calibre work.

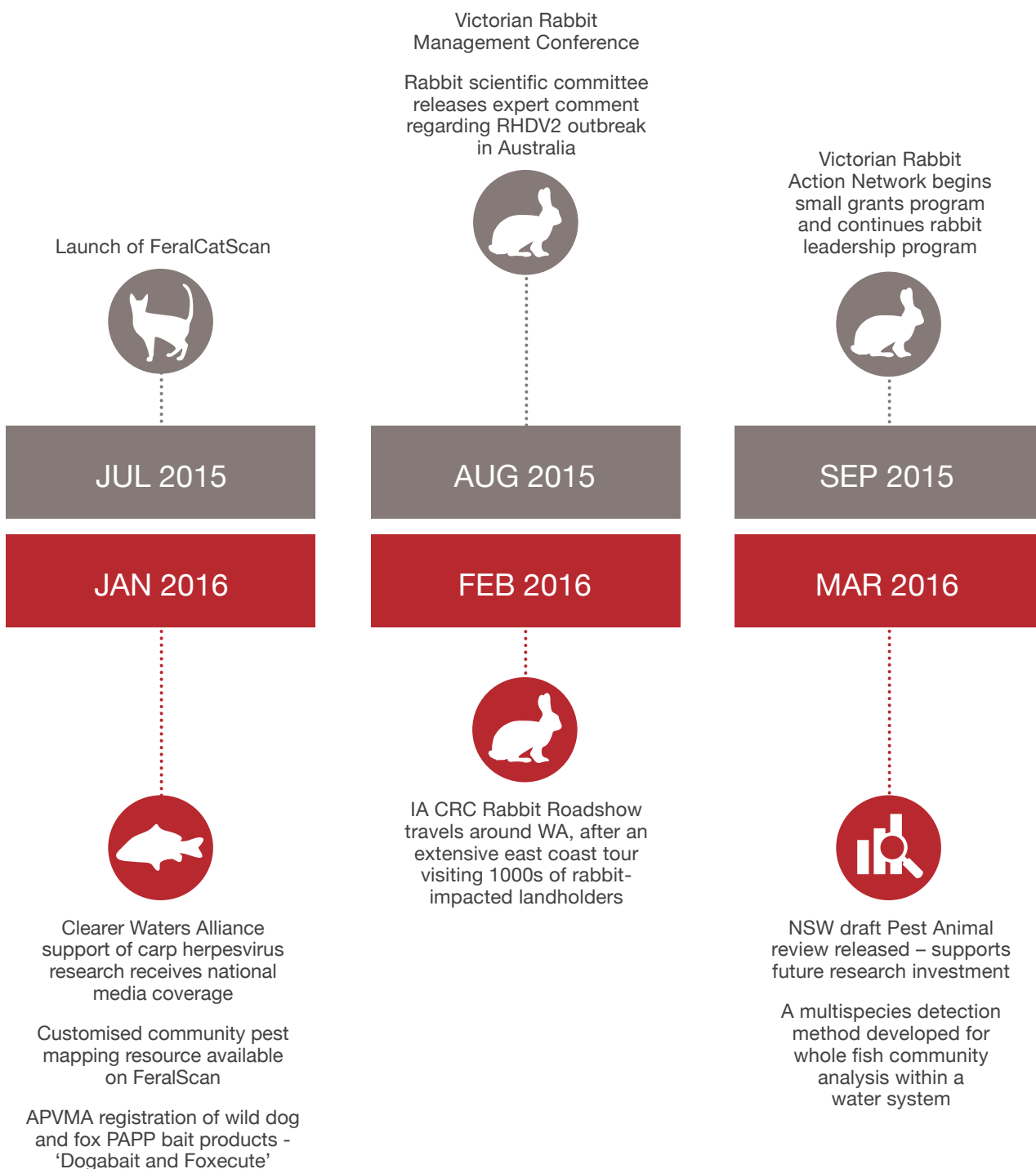
I commend this Annual Report to you.

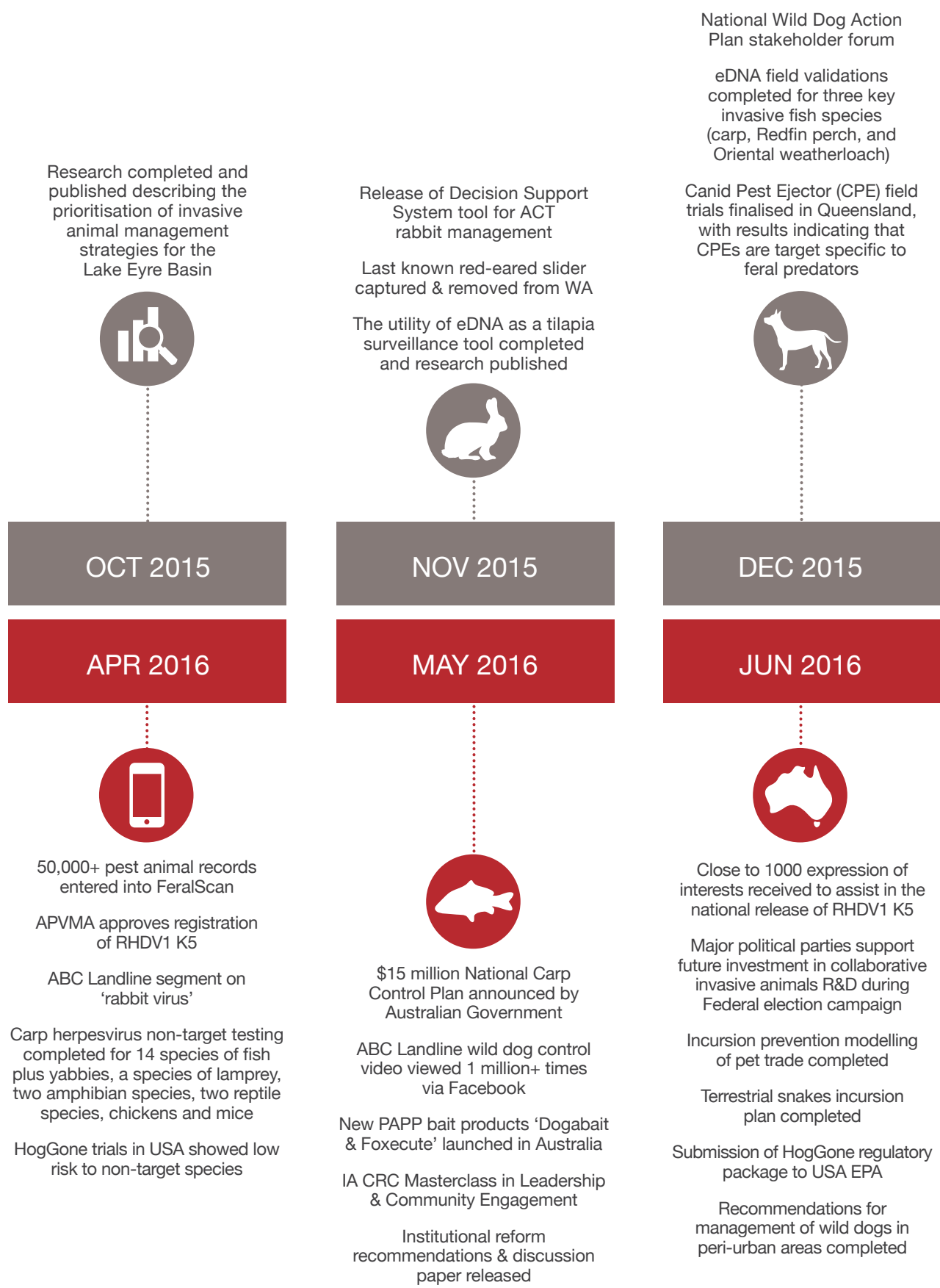
Andreas Glanznig

**Chief Executive Officer
Invasive Animals CRC**

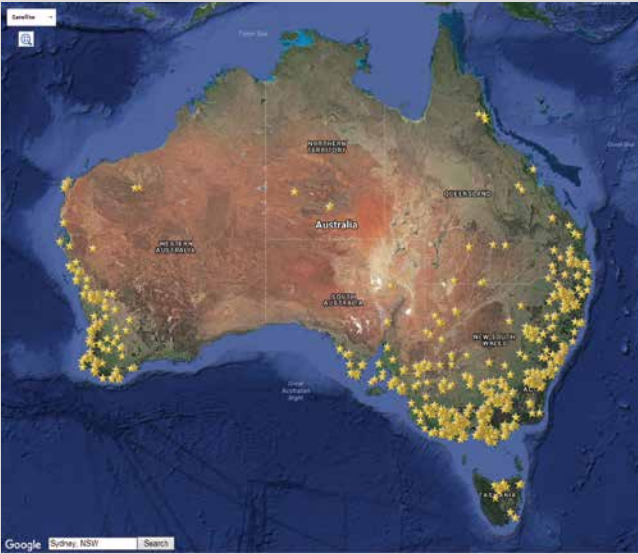
CEO'S EXECUTIVE SUMMARY

THE YEAR IN REVIEW





RESEARCH AND COLLABORATION HIGHLIGHTS



Distribution of applications received from around Australia to be involved in the national release of RHDV1 K5 (image supplied via RabbitScan)



Dr Guy Ballard and UNE PhD Candidate Catie Gowen putting a GPS collar on a wild dog to monitor its movements (image supplied by Guy Ballard)

Communities to boost Australia's rabbit biocontrol action

Since November 2015, the RHD Boost research team has put the call out to all Australians to get involved in the release of RHDV1 K5 and monitoring of all RHD viruses. Landholders, farmers, community groups and councils across the country were invited to express their interest to participate and support the release, via an online portal. Over a six month period, close to 1,000 sites around Australia were received as potential release sites. This data has now been collated and selected by the state operational leads and these release sites were notified in September 2016.

“We feel it is our responsibility as a council to facilitate community-led action and we have already had a lot of interest from Landcare groups and landholders in our area to do this.”

Heather Wellington, Councillor for the Surf Coast Shire Council, Victoria – 5th November 2015

Wild canids in Agri-Ecosystems project partners with NSW government

In one of the largest studies of landscape scale pest animal management in Australia, our researchers, from NSW DPI and University of New England, have been collecting GPS collar data from a variety of wildlife and feral animal species in NSW. Drs Guy Ballard, Peter Fleming and Paul Meek have been collaborating with NSW Local Land Services, UNE, the NSW National Parks & Wildlife Service and Forestry Corporation of NSW on the GPS collar trial. In 2016, more than 40 wild dogs were trapped, collared and released as the research collects information about movement behaviour and interaction with control programs to inform future wild dog management.

“Through this research we're able to closely monitor wild dog behaviour and see what changes occur as a result of coordinated management programs conducted by land managers.”

Guy Ballard, NSW DPI scientist and Project Leader, Invasive Animals CRC – 6th June 2016



Dr Elise Furlan collecting water samples as part of the environmental DNA survey in Lake Sorell, Tasmania (image taken by Jonah Yick)



It is estimated that more than five million Australians fish recreationally, worth billions to the economy (image supplied by Dean Norbiato)

Environmental DNA technology adopted by Tasmanian government for pest fish control

Dr Elise Furlan, a Postdoctoral Research Fellow from the University of Canberra, recently returned to Tasmania to continue her work in environmental DNA (eDNA) detection. Working in collaboration with the Tasmanian Carp Management Program, she analysed samples from a known, low-density carp population in Lake Sorell and from the site of a recently eradicated carp population in Lake Crescent. The work has been extremely valuable to help understand how many water samples must be taken before a conclusion can be made that carp are present or absent in a waterway. Both lakes were ideal for these trials due to their large sizes and isolation. The low density of carp in a comparatively large water body is also a unique situation, and is good test of eDNA sensitivity. This technique could be applied to confirm the presence of carp and other species in suspected waters while populations are small, as well as being a complementary technique for confirming the eradication of species from waters.

The Clearer Waters Alliance unified call on strategic carp control

In January 2016, a coalition of industry and environment groups came together to call on State and Federal governments to take action against Australia's worst freshwater aquatic pest, the European carp. The coalition was made up of a unique alliance comprising the Australian Conservation Foundation, Australian Recreational Fishing Foundation, Invasive Species Council, National Farmers' Federation and the National Irrigator's Council. Together they called for clearer, healthier waterways and fish communities through the potential application of the carp herpesvirus. The alliance acknowledged that over half of our native fish species in the Murray-Darling Basin are now listed as vulnerable or threatened with extinction and that invasive pests including carp are a major cause in this decline. Their call to action was heard and this alliance played a significant role in the government allocating \$15 million in the May budget towards the rollout of a National Carp Control Plan over the next two years.

“...carp impact significantly on a number of the species that recreational fishers love to catch. Quite a modest investment in Australia's carp biocontrol program could deliver transformational change, environmentally and economically.”

Allan Hansard, Managing Director of the Australian Recreational Fishing Foundation – January 13th, 2016

COMMERCIALISATION AND UTILISATION HIGHLIGHTS



Ian Senior (Chief Finance and Operations Officer, ACTA), Ian Evans (On Farm Program Manager, AWI) Helen Cathles (Chair, IA CRC), and Greg Mifsud (National Wild Dog Facilitator, IA CRC/AWI) celebrate the launch of the first new predator toxin in more than 50 years at the National Wild Dog Action Plan Forum in Sydney 2016.

First new predator toxin in 50 years becomes available

Two new poison baits – Dogabait and Foxecute® – are now available for use in Australia. This major collaborative research and development investment between Animal Control Technologies Australia Pty Ltd (ACTA), Australian Wool Innovation (AWI) and the Australian government through the Invasive Animals CRC has resulted in the first new predator toxin in 50 years becoming available, since 1080 was released on the market. The new baits contain a chemical toxin called para-amino propiophenone (short name PAPP) which causes a targeted and quick death to wild dogs and foxes when consumed. Unlike other predator toxins, these new PAPP bait products have an antidote, which needs to be administered by a vet. It is the hope that these new baits will enable a more comprehensive regional management approach to wild dog and fox management within Australia.

“We are proud to see these new baits launched after more than 11 years of thorough scientific testing within Australia and overseas.”

Professor Linton Staples, Managing Director of ACTA – 14th June 2016

RHDV1 K5 approved for release by APVMA

The Australian Government announced on 29 April 2016 that the Australian Pesticides and Veterinary Medicines Authority (APVMA) approved the registration of the new Korean strain of RHDV1 (known as RHDV1 K5). Deputy Prime Minister and Minister for Agriculture and Water Resources, the Hon Barnaby Joyce MP, welcomed the approval of the new RHDV1 K5 strain, which will ensure its eventual roll out. RHDV1 K5 was carefully assessed by government and industry and the APVMA has formally approved the strain for registration in Australia as a restricted chemical product. This follows a comprehensive assessment process, including public consultation.

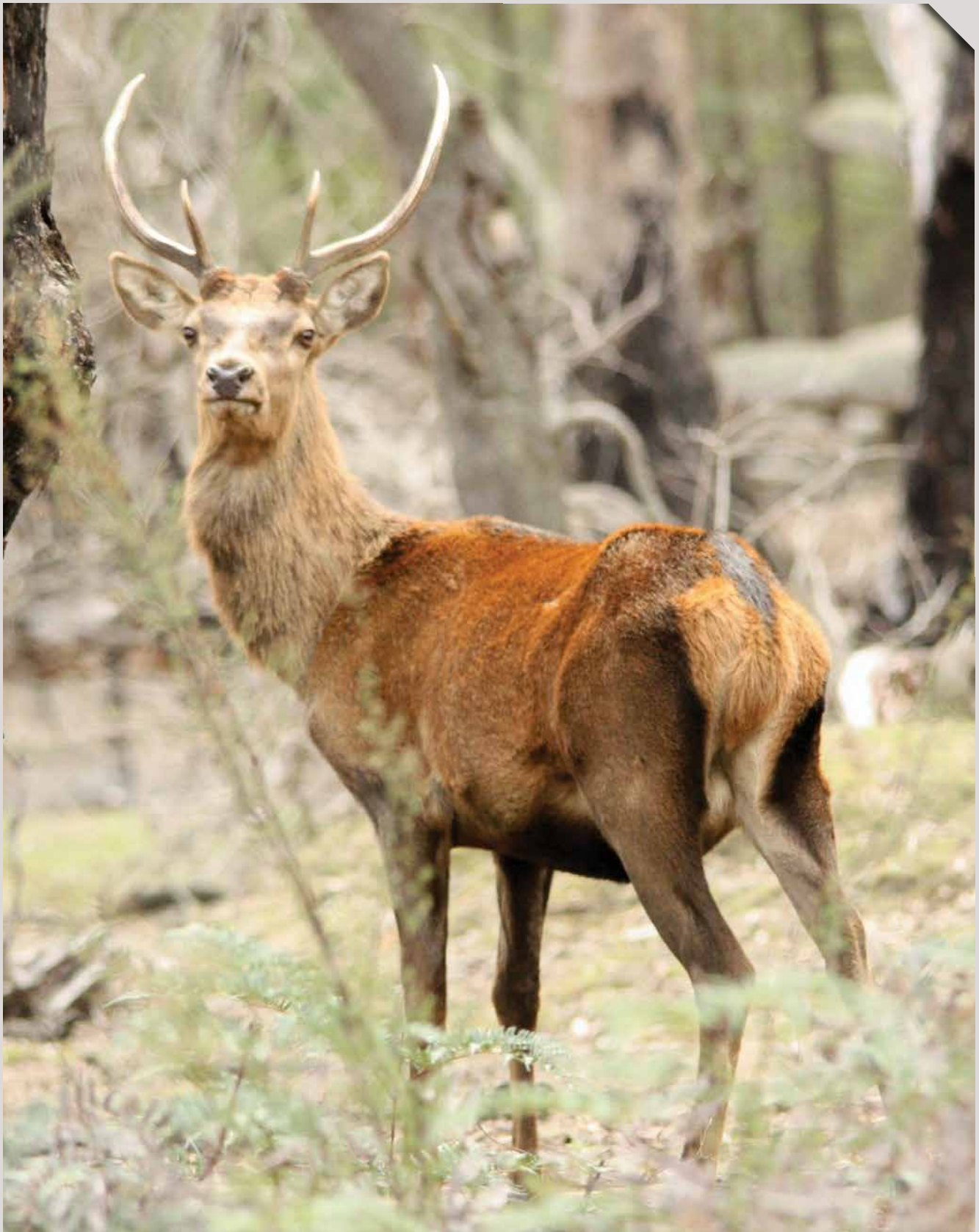
“Effective long-term management of rabbits is a national priority, and critical to improved productivity and increased farm gate profits.”

The Hon. Barnaby Joyce, Deputy Prime Minister and Minister for Agriculture and Water Resources – 29th April 2016

Funding boost through the Agriculture White Paper targeted grants program

The Agricultural Competitiveness White Paper is the Australian Government’s plan to grow agriculture. It is a multi-billion investment in our farmers. One of the priorities of the paper was focused around ‘farming smarter’ and included a \$50 million investment to give farmers better tools and control methods against established pest animals and weeds. Invasive Animals Limited and our partners successfully received \$766,000 in funding grants over the next two years for four projects:

1. further develop and research the next generation feral pig bait, HogGone;
2. undertake further formulation assessments of the Methylene Blue antidote for PAPP with the aim of having a farmer glovebox product available;
3. further assess carbon monoxide in warren fumigators for rabbit control and
4. develop a lethal trap device containing the PAPP toxin for feral predator control.



Feral deer numbers have increased over the past decade and are having detrimental impacts on ecosystems which are already suffering a number of threats (image taken by Daryl Panther)

EDUCATION AND TRAINING HIGHLIGHTS



NRM and pest animal facilitators from around the country attend the Community Engagement Masterclass in Perth, WA (image supplied by Tanya Howard)



VRAN members attend a rabbit leadership meeting at Ned's Corner on the border of NSW, Victoria and SA (image supplied by Michael Reid)

Leadership and Community Engagement Masterclass held in Perth

As part of our Community Engagement research, a series of online and face to face Masterclasses in Leadership and Community Engagement have been held. The second face to face Masterclass was held during May 2016 at the Muresk Institute in WA. The Masterclass was highly interactive and enabled participants with the opportunity to share their knowledge and experiences with each other and with specialists who can help them refine and reflect on their approach. The 32 participants each had a specific community engagement project to work on, to ensure an applied focus to the event and that tangible results can be delivered early.

“The Leadership and Community Engagement course really marked a turning point for me; it was the most powerful course I’ve ever done, hands down.”

Quote taken from a participant evaluation survey

Victorian Rabbit Action Network

The Victorian Rabbit Action Network (VRAN) was developed through a partnership between the Invasive Animals CRC and the Victorian Government and has started to change the way communities and the government work together to manage the unwanted architect of our landscape, the introduced European rabbit. The initiative is about finding collective responses to this national problem, through using a participatory, democratic systems strengthening approach. The focus is on building relationships of trust and respect between the various stakeholders for a co-ordinated response. The Victorian program has had some great success stories including facilitating a rabbit management course, convening the state’s first conference on rabbit management since 1958, developing a mentor and learning network and facilitating small community grants program. The next stage of this project is to document the process and to extend the work into other jurisdictions.



Writing! Writing! Writing! at the Balanced Researcher Program Annual Camp - L-R: Angelica Lopez (IAE), Elodie Modave (IA CRC), Dr Brian Cooke (mentor), Nadya Urakova (IA CRC), Papor Barua (Plant Biosecurity CRC), and Cat Campbell (IA CRC) (image supplied by Tony Buckmaster)

Balanced Researcher Program annual camp

The tenth Balanced Researcher program camp, spanning the two CRCs, was held in May 2016 at Kioloa on the NSW central coast. As the students have all progressed in their PhD studies, the camp this year focused on writing a manuscript based on their collected data that could either be added as a chapter to their traditional style thesis or as a submitted paper for a thesis by papers. As a result of this, many of the students will be submitting papers between August 2016 and February 2017. The annual camps are proving to be very popular with not only the 14 Invasive Animals CRC PhD candidates in attendance but a number of PhD candidates from other university institutes and CRCs, such as the Institute for Applied Ecology, Desert Ecology Research Group and Plant Biosecurity CRC. During the camp the students were also mentored by experts in the field.

AWARDS

“I’ve been lucky to be involved in some of the highest-quality wildlife research projects ever undertaken in Australia, and this award represents hard work from a great many people who continue to deliver solutions to Australia’s invasive species problems.”

Dr Ben Allen, 2015 IA CRC Dave Choquenot Science Prize recipient – 27th November 2015



IA CRC 2015 Award Recipients - L-R: Andreas Glanznig (IA CRC), Assoc. Prof Di Gleeson, (UC accepting award on behalf of Cat Campbell), Dr Ben Allen (USQ), Barry Kelly (GotaBug), Helen Cathles (IA CRC) and Dr John Tracey (NSW DPI accepting award on behalf of Dr Paul Meek)

This year four IA CRC awards were presented:

The IA CRC Dave Choquenot Science Prize

Dr Ben Allen, Vice-Chancellor's Research Fellow, Institute for Agriculture and the Environment, University of Southern Queensland

Ben was awarded this prize for his multidimensional research and high publication record in peer reviewed journals which covers the subject areas of wild dog control-induced trophic cascades, effects of wild dogs on sheep and beef cattle, and mitigation of human-wild dog conflicts in livestock and urban areas.

The Participant's Prize for outstanding contribution to invasive animal management

Barry Kelly, GotaBug Pest Control Specialist

Barry was awarded this prize for his extensive knowledge of feral pig control and conducting practical Feral Pig training workshops for government employees and landholders in SA and NSW.

The Chief Executive's prize for achievement as an IA CRC student

Catriona (Cat) Campbell, Institute for Applied Ecology, University of Canberra

Cat was awarded this prize due to her significant research and outreach (including national media and school talks) throughout her PhD project focusing on techniques to identify prey items from predator scats. She has also won multiple student grants during her candidature. Cat has already published two peer reviewed journal articles and is due to submit her PhD in early 2017 and we wish her luck.

The Golden Birkenstock Award – new award

Dr Paul Meek, Invasive Species Officer – Pest Animals, NSW DPI and Project Leader – Wild Dog Alert, Invasive Animal CRC

Paul was awarded this prize due to his passion for developing innovative methods that have practical benefits to on-ground research and management. In the last 5 years, Paul has focused his efforts on camera trapping and other sensor tools that can be used for monitoring wildlife populations, and developing new tactical tools for controlling invasive animals.

Other notable achievements by our researchers:



Member of the Governing Board, International Union for the Conservation of Nature (IUCN) Academy of Environmental Law

Professor Paul Martin, Director – Australian Centre for Agriculture and Law, University of New England and Leader, Program 4, IA CRC

Paul has been elected as the representative for the Oceania region to the Governing Board of the IUCN Academy of Environmental Law. The academy aims to build environmental law education capacity and promote the conceptual development of environmental law.



NSW Semi-Finalist, FameLab competition

Sally Hall – PhD Candidate, Invasive Animals CRC and University of Newcastle

Sally participated in the NSW semi-finals of the prestigious FameLab competition, one of the biggest science communication competitions in the world. As part of being in the semi-finals, Sally also got to attend a training session with some of Australia's best science communicators.

COMMUNICATIONS SUMMARY



83 Research and end-user publications

- 32 journal articles
- 31 new or revised PestSmart Toolkit publications
- 20 new multimedia products

"The full publications list is available in Appendix B."



Social media engagement

- Tweet reach – 580,000+ (▲ 100%)
- Facebook post views – 450,000+ (▲ 288%)
- YouTube clip plays – 75,000+ (▲ 12.5%)

"Carp was trending on Twitter as a result of Federal government budget announcement on May 1st which received major national and international media coverage."



PestSmart Connect website

- Page views – 378,116 (▲ 35%)
- Visitors – 159,903 (▲ 31%)
- Document downloads – 20,154 (▲ 200%)

"Two thirds of website viewers visit via their desktop, while the other third visit on a tablet or mobile phone."



Media splash

- 721 online mentions of the Invasive Animals CRC
- 80 feature articles published in major rural press outlets
- 27 online articles published via ABC Network
- 3 televised segments on ABC's Landline program

"The promo video for ABC Landline's wild dog segment has been viewed more than 1 million times and is the show's most popular clip to date."

Risks and impediments

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

Since last year, certainty around the regulatory and policy approval timetable for our next generation toxins and viral biocontrol agents has improved, but many risks remain. Australian Government regulatory approval through the Australian Pesticides and Veterinary Medicines Authority (APVMA) was obtained for the new wild dog and fox toxic PAPP baits on 21 January 2016. Developed through an IA CRC partnership with Australian Wool Innovation and Animal Control Technologies Australia (ACTA), these products also require State regulatory approval and as of October 2016 are still only legally available in three States. Based on current trends it is unlikely that these innovative new baits will be available in all mainland States before the end of 2016 – some 12 months after APVMA approval. The time lag from this two-step registration process has created considerable uncertainty for the product manufacturer – ACTA, and impedes timely use of this new product. This experience does not bode well for the timely registration of other IA CRC toxic baits and devices, such as our sodium nitrite based feral pig toxin and lethal trap device.

In April 2016, APVMA approval was obtained for the release of the new RHDV strain – RHDV1 K5 – selected through the RHD Boost project. It has also been assessed under Federal environmental legislation – the EPBC Act – and solid progress has been made with listing the new RHDV1 K5 strain under Commonwealth and relevant State Biological Control Acts. Additional State government approval to release the biocontrol agent remains pending in some State jurisdictions. As the lead government proponent, NSW is actively coordinating the regulatory and policy process, and this has recently been augmented by the establishment of a new Biocontrol Section within the Federal Department of Agriculture and Water Resources.

The implications of the 2015 biosecurity outbreak of RHDV2 for the proposed national release of RHDV1 K5 remains dynamic. RHDV2 has continued to spread westwards and is now found across the continent with the recent confirmation that it exists in Western Australia. The National RHDV Monitoring Program has been enhanced to take account of this situation, and has confirmed that rabbits are being killed by RHDV2. These findings are being regularly reviewed by a rabbit biocontrol scientific committee established through the IA CRC, who are advising the national government body overseeing the release – the Invasive Plants and Animals Committee.

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.

A significant positive change in 15-16 financial year was the announcement in May 2016 of the \$15 million National Carp Control Plan by the Australian Government to progress risk assessment and planning for the proposed release of Australia's first potential carp biocontrol agent. This has strengthened the path to adoption for this transformational technology.

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

Impacts

The IA CRC's projected 15 year economic impact has been revised downwards in 2016 to \$627.8 million from a 2012 baseline year. 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 management approaches, which artificially reduces the IA CRCs overall Benefit Cost Ratio (BCR).

The decrease in projected benefit value and BCR has been mostly driven by the delay in the national release of RHDV1 K5 to at least March/April 2017 and more conservative impact assumptions based on more detailed knowledge on expected RHDV1 K5 performance. As the 15 year CRC impact measurement period remains fixed (2012–27), the consequence of the loss of two years of economic benefit from the 2011 calculation of 15 year projected benefit is very significant. The 30 year expected benefit and BCR will remain high as it is less affected by this delay. This has been partially offset by the inclusion of the economic benefit of the use of a sodium nitrite based feral pig toxin in the USA by agricultural producers.

Table 2: 15 year projected benefits of IA CRC programs

Program	Expected benefits (\$)	Expected costs (\$)	Expected Benefit: Cost ratio	Comment
Land Pests	370,963,361	39,612,055	9.36	Most benefits from rabbit biocontrols (includes agricultural productivity as well as carbon biosequestration benefits). Decrease result of delayed RHDV1 K5 release.
Land Pests (Commercial Products)	341,321,790	25,472,717	13.40	Most benefit from more efficient feral management in USA from use of sodium nitrite based bait
Inland Water Pests	Not calculated	7,520,847	Not calculated	Economic benefits from more efficient detection tools, and MDB wide carp biocontrol not quantified. Latter may be quantified through National Carp Biocontrol Plan
Community Engagement	Not calculated	11,890,383	Not calculated	Economic benefit of accelerated adoption of CRC products and sustained community-led action not quantified
Overall	712,285,721	84,496,001	8.43	High BCR value driven by the cost effectiveness of rabbit biocontrol technologies



Wild dog within the landscape.

STRUCTURE AND GOVERNANCE

The Invasive Animals CRC is 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.

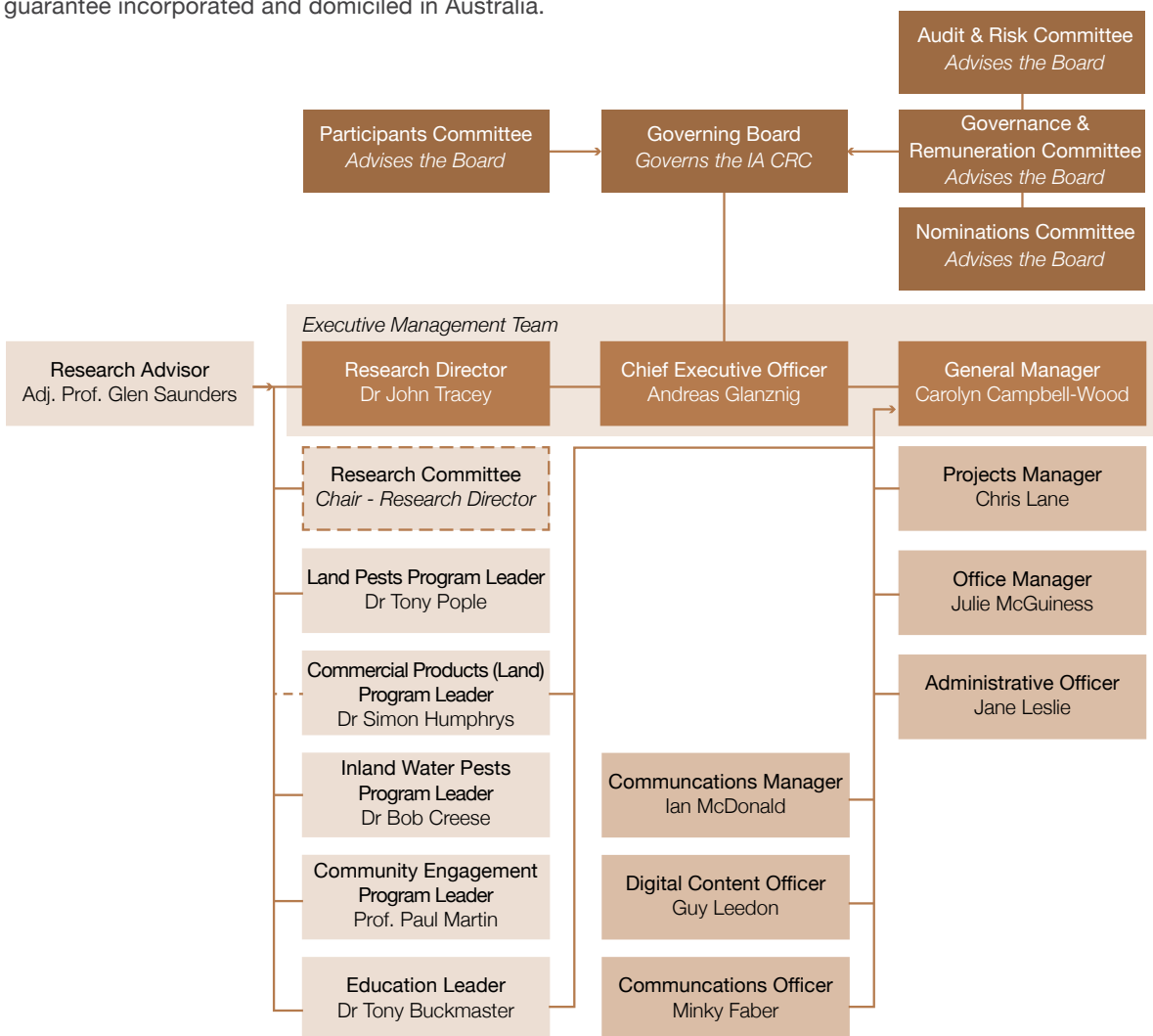


Figure 1: Invasive Animals CRC governance and management structure

BOARD



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

The structure and governance of the Invasive Animals CRC provides strong support to its operations. The CRC is led by a Board of skills-based Directors, the majority of whom are independent from the participants of the CRC. The Governing Board meets at least four times a year (in the 2015-16 year there were seven meetings) 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 is to drive the CRC strategy, to develop policies and monitor and review performance to ensure that the CRC achieves its research and adoption/utilisation goals. The Board also approves the CRC budget and ensures the Company complies with its contractual, statutory and other obligations.

The names and details of the directors in office during the financial year, and up to the date of this report, are listed in Table 3.

Farewell and thank you to Director, Dr Helen Scott-Orr



It is with heartfelt sadness that we bid farewell to Invasive Animals Limited Director Dr Helen Scott-Orr, who has been on the IAL Board of Directors since 2007. Helen leaves our board but isn't moving far from the sector as she takes on an exciting role as the inaugural Inspector-General of Biosecurity (IGB) under the new Biosecurity Act 2015 and will provide oversight of Australia's biosecurity system.

Deputy Prime Minister and Minister for Agriculture and Water Resources, Barnaby Joyce, said Dr Scott-Orr brought significant experience to the position, with her 40-year career improving animal health across three continents. Dr Scott-Orr's position is a three year term which began in July 2016 and the whole of the Invasive Animals community wishes her all the best in this role. During her time on the IAL Board, Dr Scott-Orr played an integral role in seeing stage 2 of the CRC receive funding and assisted in developing the strategic planning documents regarding the transition of the CRC into the Centre for Invasive Species Solutions.

Table 3: The names and details of the Directors in office during the 2015–16 financial year

Directors	Role	Key Skills	Independent/Organisation
Helen Cathles	Chair	Director since 2005. Corporate Governance, Primary Production, Pest Animal Control	Independent
Peter Noble	Director	Director appointed November 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 DPI
Dr Helen Scott-Orr	Director	Director since 2007. Primary Production, Pest Animal Control, R&D Management	Independent
Public Officers:			
Carolyn Campbell-Wood	Company Secretary	Appointed March 2014	

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.

Table 4: Audit and Risk Committee members in office during the 2015–16 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 DPI
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.

Table 5: Governance and Remuneration Committee members in office during the 2015–16 financial year

Name	Role	Key Skills	Independent/Organisation
Dr Helen Scott-Orr	Chair GRC	Director since 2007. Primary Production, Pest Animal Control, R&D Management	Independent
Helen Cathles	Board Chair	Director since 2005. Corporate Governance, Primary Production, Pest Animal Control	Independent
David Palmer	Director	Director since 2013. Governance, Management & Policy Development	Independent
Peter Noble	Director	Director appointed November 2015, Legal speciality, Governance & Risk Management	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.

Table 6: Nominations Committee members in office during the 2015–16 financial year

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 Geoff Hicks	Member	Participants Representative	Chief Scientist NZ Dept of Conservation
Helen Cathles	Chair IAL Board	Director since 2005. Corporate Governance, Primary Production, Pest Animal Control	Independent
Dr Helen Scott-Orr	Chair IAL GRC	Director since 2007. Primary Production, Pest Animal Control, R&D Management	Independent

Director's Meetings

Table 7: Meeting attendance by IAL Board of Directors

	Board Meetings		Audit and Risk Committee		Governance and Remuneration Committee		Nominations Committee	
	No. eligible to attend	2015–16	No. eligible to attend	2015–16	No. eligible to attend	2015–16	No. eligible to attend	2015–16
No. of meetings held for the year:		7		5		4		2
No. of meetings attended:								
Directors								
Helen Cathles (Chair)	7	7	1	1	4	3	2	2
Peter Noble	3	3	-	-	2	2	-	-
David Palmer	7	7	2	1*	3	3	-	-
Murray Rankin (Chair Audit & Risk Management Comm)	7	7	5	5	-	-	-	-
Dr Andrew Sanger	7	5	5	5	-	-	-	-
Dr Helen Scott-Orr (Chair Governance & Remuneration Comm)	7	6	-	-	4	4	2	2
Participants								
Dr Jim Thompson (Chair Nominations Comm)	-	-	-	-	-	-	2	2
Dr Geoff Hicks	-	-	-	-	-	-	2	2
*Mr Palmer was Acting Chair of the GRC at the time and unavailable to attend								

The Committee Chairs held their stated Chair position as at 30 June 2016.

Key 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.

Table 8: 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 DPI	Research Director	60%
Dr Tony Pople	Qld Agriculture and Fisheries	Program Leader, Land Pests	75%
Dr Simon Humphrys	Invasive Animals Ltd	Program Leader Land Pests (Commercial Products)	100%
Dr Dean Gilligan (July-December 2015) Dr Bob Creese (January-June 2016)	NSW DPI	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 DPI	Projects Manager	100%
Mr Guy Leedon	Invasive Animals Ltd	Digital Content Officer	60%
Ms Minky Faber	Invasive Animals Ltd	Communications Officer	100%
Dr Ian McDonald	Invasive Animals Ltd	Communications Manager	100%
Ms Julie McGuinness	Invasive Animals Ltd	Office Manager	100%
Ms Jane Leslie	Invasive Animals Ltd	Administration Assistant	100%

Staff Changes

During the period Mr Tim Blackman (Commercialisation and Marketing Director), Ms Kylee Carpenter (Communications Officer) and Ms Keryn Lapidge (Communications Officer) resigned. Dr Ian McDonald was appointed in September 2015, Ms Minky Faber in January 2016 and Mr Guy Leedon in June 2016.

Table 9: 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 Sustainable Development 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 is Department of Agriculture, Fisheries and Forestry; 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

Name	Type	ABN or ACN
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

Table 10: 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

Table 11: 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
Instituto 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 European rabbit within a very barren landscape, image taken by Kevin Solomon.

RESEARCH ACHIEVEMENTS



135 (77%)

Overall due Commonwealth milestones completed to date



38

IA CRC projects



32

Articles published in scholarly refereed journals in 2015-16



80

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



18

Doctoral students undertaking research through the IA CRC Education Program

Outcome 1: No new vertebrate pests established in Australia

Outcome 2: Improved prediction and control of emerging outbreaks

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

Outcome 4: Strengthened social networks and institutional 'architecture' around pest animal control

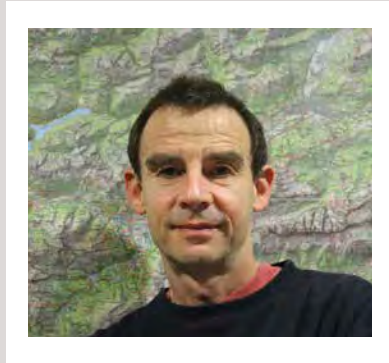
RESEARCH LEADERS



Dr John Tracey

Research Director

Our Phase 2 (2012-2017) research programs include 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 Pople

Land Pests

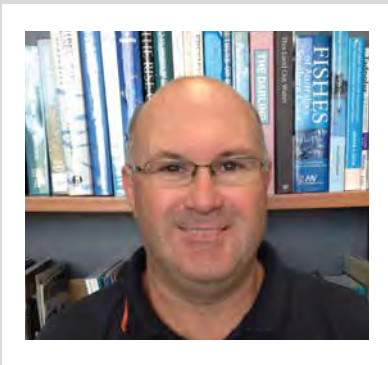
Products and strategies to manage land pests which impact on agriculture, urban areas and biodiversity.



Dr Simon Humphrys

Land Pests (Commercial Products)

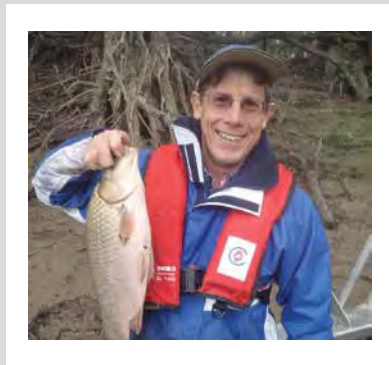
Research and development into new pest animal toxins and fertility control agents



Dr Dean Gilligan

Inland Water Pests

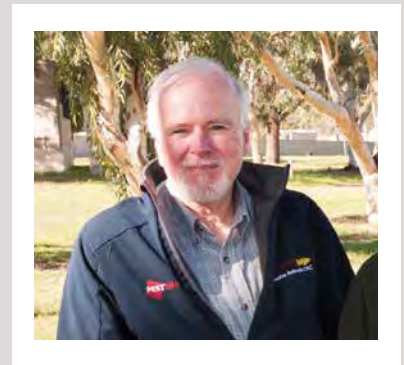
Products and strategies to detect, control and manage pest fish species



Dr Bob Creese

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 12. Full progress against project milestones is provided in Appendix A.

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.

2015-2016 highlights

- Completed the draft National Incursions Response Strategy which provides nationally agreed principles, goals and priorities aimed at facilitating Australia's ability to respond to incursions of potentially invasive animals.
- Developed toolkit elements that can be used by jurisdictions for incursion prevention and response, including debrief and evaluation material, trapping protocols, and risk assessment tools.
- Developed two surveillance data modelling approaches that have the potential to make very important contributions to avoiding or eliminating the deleterious effects of invasive species. Importantly, these span the 'invasion curve'.

CITIZEN SCIENCE MAPPING AND SURVEILLANCE:

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

2015-2016 highlights

- FeralScan has been significantly enhanced with the launch of FeralCatScan, improvements to WildDogScan and the FoxScan Southern Sydney regional page translated into five languages.

- FeralScan now has more than 50,000 sightings uploaded and they are now being shared with many regional managers and state governments across Australia. Alerts have also been setup to notify State Biosecurity Authorities for pest incursions.
- FeralScan has developed 70 new online landholder networks, 50+ new local mapping resources for Green Army service providers and 20 new regional partnerships with local authorities.

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.

2015-2016 highlights

- Research on the assessment of the probability of detecting a fox incursion in Tasmania using scat monitoring has been completed.
- Results of DNA scat survey reported to the Tasmanian Fox Technical Advisory Panel and participating Tasmanian landholders and partners.
- Risk assessment undertaken using published literature to assess the suitability of 1080, sodium cyanide and PAPP for use in the Tasmanian landscape.
- Cost-benefit analysis of different intensity management options under two different fox models completed.

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.

2015-2016 highlights

- New method for scheduling *Gambusia* eradication activities for high conservation value in Edgbaston Springs, QLD has been finalised, enabling scheduling of simultaneous management actions across many locations, as well as a new application of classification trees to simplify complex policies into usable rules of thumb that can be applied by managers.

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

2015-2016 highlights

- Field validations completed for three key invasive fish species (redfin perch, weatherloach, and European carp).
- The direct application of eDNA for the management of an invasive species, redfin perch, has been successfully implemented and findings published.
- A multispecies detection method has been developed for whole fish community analysis within a water system.
- Tilapia eDNA Pestsmart publication published online.

eDNA technology assisting river catchment management decisions

Redfin perch are a major threat to the Lachlan River catchment in NSW, they predate on vulnerable native fish such as the southern pygmy perch and compete with native fish for resources. Jonas Bylemans, Invasive Animals CRC PhD candidate based at the University of Canberra's Institute for Applied Ecology is undertaking research into the use of environmental DNA (eDNA) monitoring against conventional monitoring such as trapping. One of his recent studies determined the spread of the invasive redfin perch in the Lachlan River catchment. His study showed that eDNA monitoring was able to detect the presence of redfin perch in locations where the conventional monitoring was not. This project was done in collaboration with the fisheries section of NSW DPI, who assisted in collecting samples but also used the data to assist in making management decisions.

“The use of the eDNA monitoring gave us an ability to target containment measures in the catchment to ensure the spread of the pest fish is minimised.”

*Luke Pearce, NSW DPI Fisheries Manager
– July 12th 2016.*

RabbitScan – an essential part of the Rabbit Management Toolbox

Victoria's Bellarine region held a series of workshops, funding in part thanks to the Victorian Rabbit Action Network Grants Program. An aim of these workshops was to promote RabbitScan, the free online resource and mobile App used to determine rabbit numbers in your area which can help in monitoring the effectiveness of a management program. Landholders in the region have really taken to this resource, with one particular landholder mapping an area of council land and identifying up to 50 warrens. Due to this, the council took management action, realising the significance of the problem. A resource kit, incorporating a range of documents and factsheets on best practice rabbit management was given to all community members who attended the Bellarine community roadshows on rabbit management.



“RabbitScan has made this [mapping] process a whole lot easier, it is user friendly, accessible to everyone and most of all really helps us monitor the effectiveness of our programs - RabbitScan is a part of our management toolkit and is now a part of our rabbit management programs,”

Emma Camilleri, Landcare Facilitator for Bellarine region – March 22nd, 2016.

Dr Michelle Christy, National Incursions Facilitator

In just two short years we developed a national strategic framework for a consistent approach to the prevention, early detection and effective response to vertebrate pest incursions in Australia. The centre piece of the framework is the completion of the National incursion Prevention and Response (NIPR) Strategy. Once fully endorsed, the NIPR Strategy will provide a defined “road map” to facilitate and advance Australia’s response to invasive vertebrate incursions for the next five years. In addition to the NIPR Strategy, we have also completed the National Incursion Response Plan for Terrestrial Snakes. Since snake incursions have become quite frequent over the past few years, there has been a growing need to gather information and procedures into one document that can be used by all Australian states/territories to respond to these incursions in a timely fashion. Other noteworthy achievements include the creation and maintenance a fully functioning set of networks that allow operations and policy incursion practitioners to access information, knowledge and brainstorm ideas, and development of selected

toolkit elements that can be used by jurisdictions for incursion prevention and response. We are now in the process of developing a concept document that explores the possibility of creating a proactive, cost-effective and collaborative approach to incursion and surveillance planning adapted from the food industry’s Hazard Analysis and Critical Control Point (HACCP) planning paradigm. The plan is due for completion late 2016.



Dr Michelle Christy, the National Incursions Facilitator, in the field (image supplied)



Literally getting into his research - PhD candidate Jonas Bylemans collects a water sample from Blakney Creek in NSW, for eDNA analysis.

OUTPUTS AND COLLABORATIONS

Table 12: Outcome 1- No new vertebrate pests established in Australia

Output	Collaborations
1L1. National Incursions Response Facilitator	Department of Primary Industries, Parks, Water and Environment (DPIPWE), TAS Department of Primary Industries (DPI), NSW Department of Agriculture and Forestry (DAFWA), WA University of Adelaide Department of Primary Industries and Regions (PIRSA), SA Department of Economic Development, Jobs, Transport and Resources (DEDJTR), VIC Invasive Plant and Animal Committee (IPAC) Incursions Working Group (IWG) Commonwealth Department of Agriculture and Water Resources (DAWR) Commonwealth Department of the Environment (DoE) Department of Agriculture, Fisheries and Forestry (DAFF), QLD Landcare Research NZ Limited U.S. Geological Survey US Fish and Wildlife Service US Department of Defence (Navy)
1L2. Pest-Information Hub (Pest iHub)	University of Adelaide University of Queensland Arthur Rylah Institute Victoria DAFWA DEDJTR NSW DPI Landcare Research New Zealand Department of Conservation New Zealand National Wildlife Research Centre, USA
1L4. Exotic vertebrate risk analysis and complex invasion pathway framework	University of Adelaide Biosecurity South Australia Victoria Biosecurity DAFWA NSW DPI Landcare Research New Zealand
1L5. Mobile devices and web-mapping tools for pest species	NSW DPI NewtonGreen Technologies (web-service provider) University of Adelaide University of Western Sydney University of New England (via Paul Martin and Don Hine) 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

Output	Collaborations
1L5. Mobile devices and web-mapping tools for pest species continued	<p>Tenterfield Wild Dog Control Group</p> <p>Australian Government Dept. of Environment.</p> <p>CSIRO Agriculture Flagship</p> <p>Grains Research and Development Corporation</p> <p>Department of Agriculture Western Australia (WA)</p> <p>Goulburn Broken CMA</p> <p>ACT Government TAMS</p> <p>NSW National Parks and Wildlife Service</p> <p>Bush Heritage Australia</p> <p>Agriculture Kangaroo Island</p> <p>Dept of Environment, Water, Natural Resources SA</p> <p>Mallee Landcare Group</p> <p>Greater Mallee Landcare Area Group</p> <p>North-east Singleton Wild Dog Association</p> <p>Central West Farming Systems group</p> <p>Mallee CMA</p> <p>Central Tablelands LLS (NSW)</p> <p>Western LLS (NSW)</p> <p>North-west LLS (NSW)</p> <p>Northern Tablelands LLS (NSW)</p> <p>North Coast LLS (NSW)</p> <p>Hunter LLS (NSW)</p> <p>Victorian DEDJTR</p> <p>Parks Australia</p> <p>Tasmanian Government DPIPW (TAS)</p> <p>Sydney Coast Councils Group</p> <p>NSW Office of Environment and Heritage (OEH) (NSW)</p> <p>Foundation of National Parks and Wildlife (NSW)</p> <p>King Island NRM (Tasmania)</p> <p>Phillip Island Council (VIC)</p> <p>Rockdale City Council (NSW)</p> <p>Kanangra to Wyangala (K2W)</p> <p>Bellarine Landcare Group (VIC)</p> <p>South Australian Department of Environment, Water and Natural Resources</p> <p>Natural Resources South Australia Murray-Darling Basin (SA)</p> <p>Natural Resources Northern & Yorke (SA)</p> <p>Central Highlands Resource Planning Use Cooperative (CHRRUP) (Qld)</p> <p>Kangaroo Island Council</p> <p>Natural Resources Kangaroo Island (SA)</p> <p>Kangaroo Island Natural Resources Management Board</p> <p>Western Plains Regional Council</p> <p>Greater Sydney Local Land Services</p> <p>Central West Local Land Services</p> <p>ACT Waterwatch</p> <p>Conservation Volunteers Australia (Green Army)</p>

Output	Collaborations
1L11. Prioritising adaptation actions for managing invasive animals under climate change	CSIRO University of Queensland Department of Agriculture and Fisheries (DAF), QLD Terrain Natural Resource Management Far North Queensland Regional Organisation of Councils
1L21. Mechanised extraction and next generation sequencing for the analysis of trace DNA in predator scats	University of Canberra Department of Primary Industries, Parks, Water and Environment (DPIPWE), TAS Queen Victoria Museum Tasmanian Museum and Art Gallery Landcare Research NZ
1L22. Detection and monitoring for fox incursion in Tasmania	DPIPWE, TAS Landcare Research New Zealand
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 DPI University of Tasmania University of Canberra Landcare Research New Zealand
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 PIRSA Department of Industry, NSW NSW Department of Trade & Investment Cawthron Institute NZ University of Waikato, NZ The Nature Conservancy, USA

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 Table 13. 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.

2015-2016 highlights:

- Screen of US and Australian chemical databases for potential rodenticide agents, and Achilles Heel review completed.
- Seasonal surveys of mouse abundance completed using the project's 3-tier monitoring system across the major grain-growing regions.
- Significant progress made towards a working rabbit warren fumigator and lethal trap device prototype.
- A paste prototype has been tested and found to be sufficiently effective in the field in Australia and in pens in the USA. An application package for HOGGONE has been sent to the APVMA for assessment.
- Two manufactured PAPP bait products, Dogabait and Foxecute have been launched into the Australian market via Animal Control Technologies Australia (ACTA).

FERTILITY CONTROL

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.

2015-2016 highlights:

- Registration package for immunocontraceptive vaccine (GonaCon) being finalised for submission to the APVMA for assessment.
- A sperm protein vaccine formulation has shown to significantly decline sperm binding during mouse trials.
- A number of potential formulations that could induce infertility have been discovered and plan to be tested.

The BlueHealer (PAPP bait antidote) research continues

June 2016 saw the launch of two new baits for wild dog and fox control containing the PAPP toxin. One of the positive aspects of the PAPP toxin is that it has an effective antidote if a working or pet dog accidentally eats a bait. However, the only approved methylene blue antidote product needs to be injected intravenously by a registered veterinarian within at least 60 minutes from ingestion. Since 2007, the IA CRC Blue-Healer project has evaluated the safety and efficacy of different methylene blue formulations and routes of administration with the goal that owners could treat accidentally poisoned working or pet dogs. This is a very challenging task and no dog owner administered product is approved by the APVMA yet. However, despite the size of the challenge ahead, we are still working on delivering one and have received additional funding through the Australian Governments Agricultural White Paper initiative to assess alternative delivery mechanisms. The next step in the Blue Healer project will include testing an administration method that dog owners could use relatively safely and, if that testing proves successful, to submit a registration application to the APVMA for a new veterinary medicine that dog owners and vets can both use. Despite the challenges with this ongoing research, we hope the greater availability of the antidote will enhance the adoption of PAPP baits into best practice integrated wild dog and fox management programs.



Angus Kelly with his dog Mick, who was saved by methylene blue antidote after accidentally ingesting a fox PAPP bait being used for pest animal control in the region (image supplied).

HogGone Australia begins

The IA CRC, ACTA, and MLA have been developing formulations of sodium nitrite and a new bait (HOGGONE) for feral pig control so that additional tools are available in the future for the ever expanding number of feral pigs in Australia. Sister projects to this effort in Australia are the registration of HOGGONE in NZ (led by Connovation) and in the USA (led by the USDA National Wildlife Research Center, NWRC) for wild hog control. The US EPA has agreed to accept data from Australian field trials as part of the US product application so the field trials in QLD and NSW that we're undertaking to demonstrate HOGGONE's efficacy and non-target safety will be doubly important. Feral pigs have been trapped and fitted with a GPS collar to monitor movement. Weather permitting; the baiting trials will begin in October 2017. This will replicate work planned for the field in the US states of Texas and Alabama once the EPA approved the permit required for field work over there. Putting this information together will add considerable strength to our regulatory applications. To get a feel for the work required to set up a trial we invited Dr Nathan Snow (USDA, NWRC) over to Australia for the field trial preparation.



L:R - Dr Simon Humphrys (IA CRC), Darren Marshall (QMDC), Jason Wishart (IA CRC), Nathan Snow (USDA) and John Scriven (QMDC) on a recent field trip in St. George Queensland. The aim of the trip was to attach GPS collars to feral pigs so we can look at population knockdown when we field test HOGGONE at a later date (image supplied by Jason Wishart).

Cont-roo-ception! Dart-administered immunocontraceptive trialled in kangaroos

The ACT Government and CSIRO are currently trialling a dart delivery method to remotely administer the GonaCon Immunocontraceptive Vaccine to Eastern Grey Kangaroos. This project builds on research initially funded by the Invasive Animals Cooperative Research Centre, in which GonaCon was hand-injected to Tamar Wallabies and Eastern Grey Kangaroos. Those studies demonstrated very high efficacy in females of both species whereby no young were produced for at least three breeding seasons and greater than 90% of females produced no young for at least six breeding seasons. While it was concluded that GonaCon could

provide a viable method for controlling the abundance of small, captive kangaroo populations, because each animal had to be physically captured to inject the vaccine, a more practical method was needed. The current trial, led and funded by the ACT Government in collaboration with CSIRO, is testing the use of a remote dart delivery method, which should provide a more efficient way of administering the vaccine. A suitable dart has been selected, the humaneness of the method has been assessed and a temporary marking system has been trialled to prevent kangaroos being vaccinated more than once in a treatment period. The trial is currently in progress and will compare the efficacy of dart-delivered versus hand injected GonaCon, and investigate the overall effect of GonaCon treatment on the rate of increase of populations.



A collared kangaroo that has just been darted with GonaCon. After a few minutes the dart falls out and can be recovered (image by Lyn Hinds).

COLLABORATIONS

Table 13: Outcome 2 - improved prediction and control of emerging outbreaks

Output	Collaborations
2C1. Avicides	Meat and Livestock Australia Feed lot and 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 Landcare Research New Zealand
2C3. Surveillance and forecasts for mouse outbreaks in Australian cropping systems	CSIRO Grains Research and Development Corporation Department of Primary Industries (DPI), NSW Landcare Research New Zealand
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	NSW DPI 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 Queensland

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 and Dr Bob Creese, 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 14. 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.

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.

2015-2016 highlights:

Australia

- Registration of RHDV1 K5, a Korean strain of rabbit haemorrhagic disease virus, has been achieved and the national release is proposed for March 2017.
- Extensive rabbit management 'Roadshows' were undertaken across Australia reaching in excess of 1,000 landholders.
- A successful Expression of Interest (EOI) process was conducted encouraging landholders across Australia to

participate in the roll-out of RHDV1 K5. 755 EOIs were received, encompassing 977 possible release sites.

- Better understanding of the prevailing strains of RHD in the field that will inform which strain the Accelerator virus will likely have to outcompete.
- Analysis techniques set up to track the spread of RHDV2 around Australia.
- Economic Impact Assessment of Eimeria and RHDV2 undertaken.
- Produced the conservation related Decision Support System for the ACT Parks and Conservation Service which is 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).

Rabbit roadshow travels Australia

The RHD Boost project has undertaken an extensive rabbit roadshow which has spanned the states of Victoria, Queensland, NSW and Western Australia and reached more than 1,000 landholders. The roadshow was designed to encourage participation in the national rollout of RHDV1 K5 and advising land holders and land managers on what they can expect. The roadshows were conducted in collaboration with the relevant state departments and also strongly encouraged best practice and follow-up rabbit control to compliment the biocontrol release. They were always well received and assisted to leading in extensive awareness of the program, increased media attention on the topic and a larger number of users accessing information on our PestSmart website.



A Rabbit Roadshow held in Kilcunda, Victoria (L-R Dr Tarnya Cox, RHD Boost project leader; John Matthews, Victorian government Biosecurity Manager; Helen Henderson, PI Landcare; Derek Snowden, Bass Coast Landcare; Sophie Maddigan; Rob, Bass Coast Landcare; Anna Spiden, 3 Creeks LN) (image supplied by Rachael Miller)

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.

2015-2016 highlights:

- 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.
- 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.

A wild dog's diet in peri-urban Australia – not what you expect!

Our researchers were interested in the diet of peri-urban wild dogs to assess whether rubbish (i.e food scraps) might be favoured over native wildlife or small livestock. Diet analysis from scats collected in peri-urban areas of south east Queensland indicated that peri-urban wild dogs do not appear to be reliant upon human-sourced foods, and limiting access to these foods is unlikely to influence wild dog populations. However, the presence of iconic and threatened wildlife species (e.g. koalas) was recorded in these dietary studies and indicates strong potential for deleterious impacts in the peri-urban areas where many are already restricted to bushland fragments already 'under siege'.



A wild dog was snapped by this remote camera trap set up in a national park to monitor wildlife (image supplied)

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. The project also includes the submission of a registration package for approval by APVMA.

2015-2016 highlights

- 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.
- Development of the first model to inform a “release strategy” for viral biocontrol of a vertebrate, in this case the use of CyHV-3 to control common carp in the Lachlan River Catchment.
- Completed consultation with Government committees to pursue agreement for declaration of CyHV-3 and Common carp as agent organism and target species under the Biological Control Act 1984.
- Submission of application to import the carp herpesvirus under the Quarantine Act 1908.
- Commencement of consultation with key stakeholder groups in New South Wales, Victoria, and South Australia, with follow-up community meetings and presentations planned in these and other jurisdictions in preparedness of the CyHV-3 release if approval is granted.

Carpageddon! Australian Government’s \$15 million National Carp Control Plan

The Australian Government launched a nationally coordinated approach to eradicating Australia’s worst freshwater aquatic pest, the European carp, through a \$15 million National Carp Control Plan contained in the 2016 federal budget. The budget allocation includes developing a strategic plan for the staged release of the carp herpesvirus, and other complementary measures to create a long term solution to control carp in our waterways. The \$15 million plan is designed in conjunction with state and territory governments to maximise the impact of biological controls on carp populations while minimising disruption to industries, communities and the environment. The plan also includes work to ensure continued community awareness of the carp control program, monitoring the effects of the virus after release, opportunities to use harvested carp biomass and measures to protect infrastructure affected.

“The Invasive Animals Cooperative Research Centre and the CSIRO have made significant progress evaluating a viral biological control agent, we know that it works, we know it’s completely safe, now we need to plan the best way to roll it out.”

The Hon. Christopher Pyne, Federal Minister for Industry, Innovation and Science – May 8th, 2016



“The announcement of the National Carp Control Program led to an immense amount of national and international media attention, affectionately known as carpageddon.”

GREG MIFSUD, NATIONAL WILD DOG FACILITATOR

I have been working very closely with stakeholders in drought affected regions of Australia in order to assist with the delivery of effective wild dog management programs through the Australian government drought funding initiative. This work led to a commitment of a further \$10 million dollars of Australian government funding for cluster fencing programs in drought affected areas of Queensland. An additional \$3 million dollars was also provided by the Queensland government. I continue to support and mentor four industry funded coordinators as well as providing support to state government wild dog management staff throughout the country. I recently assisted Australian Wool Innovation (AWI) to oversee the appointment of a new industry funded wild dog coordinator, Meja Aldrich, within the Northern Agricultural region of WA. Meja's position is fully funded through AWI and we are grateful for the ongoing support of AWI to the wild dog facilitation program. I have continued to develop further extension material for inclusion on the Pestmart Connect website. These documents have included development and finalisation of the Glovebox Guide for Wild Dog and Fox Baiting, updating the FAQ Factsheet on PAPP and canid pest ejectors following their registration, and assisted in the development of booklets on the products are currently being distributed by Animal Control Technologies Australia. I am also working very closely to oversee the roll out of the National Wild Dog Action Plan (stage 2) as a member of the Implementation Steering Committee. Over the past 12 months we have seen awareness of the wild dog issue increase as well as start to work collaboratively between states and territories to ensure wild dog control is a national problem and not a state by state problem.



Greg Mifsud providing members of the National Wild Dog Action Plan stakeholder group with an update on progress of the regional wild dog facilitators program (image taken by Minky Faber).

Table 14: Outcome 3 - Recovery of key land and water regions from rabbits, wild dogs and carp

Outcome 3 - Recovery of key land and water regions from rabbits, wild dogs and carp	
3L1. RHD Boost: roll-out of new RHDV strains	Department of Primary Industries (DPI), NSW Department of Primary Industries and Regions (PIRSA), SA Department of Agriculture and Food (DAFWA), WA Department of Economic Development, Jobs, Transport and Resources (DEDJTR), VIC CSIRO Department of Agriculture and Fisheries (DAF), QLD Australian Wool Innovation Meat and Livestock Australia Environment and Planning Directorate (EPD), ACT Territory and Municipal Services (TAMS), ACT Department of Primary Industries and Fisheries (DPIF), NT Department of Primary Industries, Parks, Water and Environment (DPIPWE), TAS

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

3L2. Comprehensive RHD resistance model	<p>PIRSA CSIRO NSW DPI University of Adelaide Meat and Livestock Australia The University of Sydney Istituto Zooprofilattico Sperimentale, Brescia, Italy CIBIO, Universidade do Porto, Portugal</p>
3L3. Non-pathogenic rabbit caliciviruses	<p>CSIRO Landcare Research New Zealand University of Otago AgResearch</p>
3L4. RHD Accelerator	<p>CSIRO University of Canberra NSW DPI Australian Wool Innovation Meat and Livestock Australia Biosecurity SA University of Sydney University of NSW Istituto Zooprofilattico Sperimentale della Lombardia d dell'Emilia Romagna (IZS), Brescia, Italy Landcare Research New Zealand</p>
3L5. New potential rabbit biocontrol agent prospecting and assessment	<p>PIRSA University of Canberra Wildlife Health Australia CSIRO Istituto Zooprofilattico Sperimentale della Lombardia d dell'Emilia Romagna (IZS), Brescia, Italy</p>
3L6. Decision support systems for effective rabbit management	<p>NSW DPI QDAF DEDJTR, VIC TAMS, ACT Meat and Livestock Australia Landcare Research New Zealand</p>
3L11. Co-management solutions for wild dogs in agri-ecosystems: predators, prey, plants and the triple bottom line	<p>NSW DPI University of New England Local Land Services (LLS), NSW Australian Wool Innovation Meat and Livestock Australia Wild Dog Associations / Livestock Producers National Parks and Wildlife Service (NPWS), NSW National Wild Dog Management Advisory Group APHIS, USDA</p>

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

3L13. Limiting the source – peri-urban wild dog control	<p>QDAF NSW DPI 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, United States Department of Agriculture</p>
3L14. Facilitating strategic management of wild dogs throughout Australia	<p>Australian Wool Innovation Meat and Livestock Australia TAMS, ACT Australian Bureau of Agricultural and Resource Economics and Sciences QDAF NSW DPI DEDJTR, VIC Department of Environment and Primary Industries Victoria PIRSA DAFWA NSW LLS NSW Farmers 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</p>

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

3W1. Cyprinid herpesvirus-3
- CyHV-3: its potential as a
biological control agent for carp in
Australia

CSIRO
Department of Environment and Primary Industries Victoria
Department of Primary Industries (Fisheries NSW)
Murray-Darling Basin Authority
Department of Conservation, New Zealand

3W2. Cyprinid herpesvirus-3 -
CyHV-3: registration, release and
selected monitoring

DEDJTR, VIC
NSW DPI
MDBA
CSIRO – Australian Animal Health Laboratory
Commonwealth Environmental Water Office,
DAFWA
Commonwealth Department of the Environment,
Australian Pesticides & Veterinary Medicines Authority
Australian Quarantine & Inspection Service
Tasmanian Department of Primary Industries, Parks, Water and Environment - Inland
Fisheries Service
Primary Industries & Regions SA - South Australian Research and Development
Institute,
Victorian Department of Environment and Primary Industries,
QDAF
Western Australian Department of Fisheries,
TAMS, ACT
Australian Recreational Fishing Foundation
National Farmers Federation
National Irrigators Council
Australian Conservation Foundation
Invasive Species Council
Koi Society of Australia.

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 15. 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.

2015-2016 highlights:

- Online community engagement learning modules became available.
- Delivered the Community Engagement Masterclass in Western Australia involving 32 participants from across Australia, including many industry based regional facilitators.
- Delivered online learning modules related to auditing communication materials, and designing and evaluating behaviourally effective communications.
- Development of joint community/government committee, the Victorian Rabbit Action Network, responsible for overseeing the program.
- Facilitated the Rabbit Leadership Program; a 2.5 day capacity building course in conjunction with the Victorian Government and industry experts.
- An accredited course "Apply stakeholder engagement techniques" was piloted in Western Australia and Queensland. The course brings together best practice regarding "triggers for effective pest animal control and sustaining community lead pest-animal control action".
- Continued to support regional groups and agencies across Australia to help increase their capacity so coordinated and well planned activities can be implemented to reduce impacts from pest animals.



Landholders in the Goldfield region of WA planning their coordinated baiting program.

Michael Reid, National Rabbit Facilitator

The National Rabbit Project has been implementing a series of initiatives in collaboration with the key partners over the past 12 months. The Victorian Rabbit Action Network convened the first rabbit conference in Melbourne since 1958, attracting over 160 participants and showcasing local knowledge and know-how for rabbit management. This event was building on the increasing network of practitioners who participated in 3 day Rabbit Boot Camp and the development of a state-wide learning network, developing the next generation of leaders working with their communities for managing rabbits. Communities have also leaped at the opportunity of our Small Grants Program, focused on supporting local innovation for coordinated action, and we have some great success stories here. Communication activities have been building around the release of RHDV1 K5, which included a pivotal story on ABC Landline, promoting integrated rabbit control and showcasing sustained community action in rabbit management. The future focus of the project is to document the systems process piloted in Victoria as to make available to other jurisdictions, and other pest species.



Michael Reid (red cap, middle), with a group of land managers at the 3 day Rabbit Bootcamp held at Ned's Corner on the border of Victoria, NSW and SA, earlier in 2016 (image supplied).

Jason Wishart, Acting National Natural Resources Management Facilitator

From August 2015 until April 2016, I acted in the position of National Natural Resource Management Facilitator while Jessica Marsh was on maternity leave. While this position was not a pure research position, it was closely related to what I had been doing for most of my time at the organisation. I enjoyed the fact that I went from being part of the team that develops products and strategies to enhance pest animal management, to being part of the team that helps land managers apply these products and strategies to real-life pest management situations. It was a highly beneficial and rewarding experience. I was lucky enough to meet a variety of stakeholders from around Australia at various conferences, field days, workshops and forums. I also managed the 2015 Feral Photos competition which was again full of some amazing images. The competition is a great initiative as it helps to visually demonstrate the impacts caused by pest animals to agriculture and the environment, and we all know "a picture tells a thousand words". I also enjoyed publishing several issues of NRM Notes, mainly because I got to hear about numerous community driven pest management projects going on around the place and it helped me keep up-to-date with other pest related news stories. NRM notes was also a great way to put people in touch with others dealing with similar pest problems, essentially reducing the need to reinvent the wheel.



Jason Wishart talking to a delegate at the Australasian Wildlife Management Society Conference in Perth (November 2016).

Table 15: Outcome 4 - Strengthened social networks and institutions around pest animal control

Outcome 4 - Strengthened social networks and institutions around pest animal control	
4E1. Facilitate collective action	<p>University of New England Meat and Livestock Australia Australian Wool Innovation Queensland Murray-Darling Committee (QMDC) Department of Primary Industries, Parks, Water and Environment (DPIPWE), TAS Department of Agriculture and Food (DAFWA), WA Department of Primary Industries (DPI), NSW Department of Economic Development, Jobs, Transport, and Resources (DEDJTR), VIC School of Veterinary and Life Sciences, Murdoch University Penn State University, USA Cornell University, USA Sam Houston State University, USA</p>
4E2. Triggers for effective action	<p>University of New England DPIPWE, TAS NSW DPI Department of Agriculture, Fisheries and Forestry (DAF), QLD City of Gold Coast Council DAFWA Queensland Murray-Darling Committee South West NRM (QLD) IA CRC Communications Team Griffith University</p>
4E3. Reduction of legal and institutional impediments	<p>University of New England Meat and Livestock Australia Limited NSW DPI DPIPWE, TAS Griffith University Rabbit research theme, IACRC Wild dog research theme, IACRC QMDC</p>
4E4. Action driven coordination	<p>University of New England Meat and Livestock Australia Limited Australian Wool Innovations Griffith University Rabbits program, IACRC Wild Dogs program, IACRC Queensland Murray Darling Committee NSW DPI DAFWA DPIPWE, TAS QDAF Gold Coast City Council</p>

Outcome 4 - Strengthened social networks and institutions around pest animal control

4E6. Facilitating community led rabbit management in Australia

Department of Environment and Primary Industries Victoria
 University of New England
 DEDJTR, VIC
 QDAF
 Rabbit Free Australia
 Meat and Livestock Australia
 Australian Wool Innovation
 Victorian Catchment Management Authorities
 Victorian Landcare Networks and Groups
 Parks Victoria
 Victorian Farmers Federation
 Penn State University, USA

4E11. VET Training packages on strategic pest management

NSW DPI
 NSW DPI Tocal College
 Penn State University, USA

4E12. National NRM Facilitator

NSW DPI
 South Coast NRM WA
 Northern Territory NRM
 Adelaide and Mt Lofty Ranges NRM
 QMDC
 Border Rivers Gwydir CMA
 NSW LLS
 Office of Environment and Heritage (OEH), NSW
 DEDJTR, VIC
 West Gippsland CMA
 Agforce Queensland
 Victoria Department of Primary Industries
 Braysher Consulting
 Western Catchment management Authority
 Northern and Yorke NRM
 South West NRM
 North East (NSW) Pest Animal Steering Group
 Riverina LLS
 Central Tablelands LLS
 Western LLS
 Pennsylvania State University
 Landcare Research New Zealand

4E21. Balanced Researcher Program

Plant Biosecurity CRC
 Institute for Applied Ecology, University of Canberra



A native sparrowhawk takes down an Indian myna (image taken by Catherine Begley).

EDUCATION AND TRAINING



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.

Table 16: Doctoral students categorised by research theme

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 students 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. Students 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 students' ability to produce exceptional-quality research theses, the IA CRC fully funds an eight-semester scholarship.

The IA CRC has 18 doctoral research students enrolled in partner universities and actively engaged in IA CRC projects, including 4 professional doctorate students and 14 traditional PhD students (Table 16).

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



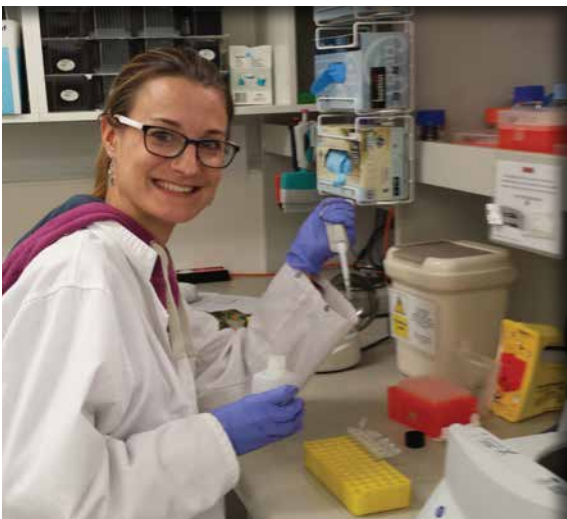
Andreas Glanznig chatting with Elise Dewar (DPIPWE, Tasmania), Elodie Modave (PhD Candidate, UC/IA CRC) and Liara Weaver (Lab Manager, UC) as part of an ABC Landline segment on invasive animals research.

Student progress

All IA CRC traditional PhD students are enrolled in the Balanced Researcher Program, which started in 2013. Four camps have now been held during the program and 11 out of the 14 PhD students have already participated in their industry placements as part of the program. Students have had placements locally with the Australian Museum, Biosecurity South Australia and the NSW National Parks and Wildlife Service. Students have also been placed internationally with South African National Parks, the Smithsonian Institute in Washington DC, Yellowstone National Park and the Centre for Agriculture and Bioscience International (CABI) in Malaysia. We are still on track to have many of our PhD students submit their thesis by early 2017.

Tiger bones, rhino horns, and DNA forensic analysis with the Australian Museum

Elodie Modave is undertaking her PhD studies on the DNA analysis of predator scats (in collaboration with our eDNA projects). As part of her Balanced Research Program industry placement she undertook a five week program at the Australian Museum Research Institute in Sydney; working in their Australian Centre for Wildlife Genomics under the supervision of Dr Rebecca Johnson and Dr Greta Frankham. She worked on two projects focusing on Tiger's and Rhino's, related to the illegal wildlife trade using forensics DNA identification of rhino horns and providing tools for agencies to recognise tiger bones when they are seized.



“Not only has this placement made me see an industry-like type of environment focusing on forensics, it also allowed me to enhance my network and see what the post-PhD life would look like.” (image supplied by Elodie Modave)

The interactions between plants and animals – from Armidale to Yellowstone!

Helen Morgan is researching trophic cascades and the effect of wild dogs on vegetation. As part of her Balanced Researcher Program industry placement Helen recently travelled to Yellowstone National Park in Wyoming and Montana, USA, which is recognised as the ‘home’ of trophic cascades due to wolf extirpation and reintroduction and the subsequent extensive literature covering wolf–elk–willow–beaver interactions. Helen spent an exciting month in Yellowstone, studying the way animals and plants interact and the influence of the climate and landscape on them. This is an ecosystem totally different to Australia. Our unpredictable climate, flat dry land and nutrient-poor soils have created a completely different native biota and system functionality. However, an insider’s view of Yellowstone clarified many aspects of what is required for trophic cascades to occur, and this is currently being incorporated into Helen’s PhD research. Helen’s scientific papers on the topic will be available soon – so watch this space!



“Yellowstone has had a tumultuous glacial and volcanic history and the legacy of this is a network of active geyser basins providing constant water flow throughout the year and warm refuge in the freezing winters allowing some bison and elk to remain at high elevation.” (image supplied by Helen Morgan)

Table 17: Current IA CRC doctoral students

Name	Draft thesis title	IA CRC Research Project	Theme	Commonw. agreement output	Partner University	Commencement date
Pablo Garcia-Diaz	Exotic vertebrate risk analysis and invasion pathway analysis	1.L.4	Theme 1	1.1	University of Adelaide	February 2013
Rheyda Hinlo	Parameterisation of eDNA detection probabilities for the identification of aquatic invasive species	1.W.2	Theme 1	3.1	University of Canberra	January 2013
Jonas Bylemans	Monitoring freshwater fish communities using eDNA metabarcoding	1.W.2	Theme 1	3.1	University of Canberra	December 2013
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
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	January 2013
Aleona Swegen	Identification of targets for immunocontraceptive fertility control in horses	2.C.13	Theme 3	2.4	University of Newcastle	February 2013
Sally Hall	Phage peptides fertility control for the non-surgical sterilisation of feral horses	2.C.13	Theme 3	2.4	University of Newcastle	February 2013
Amy Iannella	Rabbit genetic resistance to RHDV variants in Australia	3.L.2	Theme 4	1.3	University of Adelaide	February 2013
Nadya Urakova	Identifying molecular virulence factors of RHDV	3.L.4	Theme 4	1.4	University of Canberra	February 2013
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	August 2013
Michał Śmielak	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
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
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	February 2013
Bernadette York	Wild dog aware	4.E.2	Theme 7	4.2	University of New England	February 2013
Roxane Blackley	mApps for rangeland decision makers	4.E.2	Theme 7	4.2	University of New England	July 2013
Lynette McLeod	Improving the behavioural effectiveness of cat management programs	4.E.2	Theme 7	4.2	University of New England	February 2013
Vivek Nemane	Reducing legal and institutional impediments	4.E.3	Theme 7	4.2	University of New England	March 2015
Lisa Yorkton	Social media: achieving active engagement	4.E.2	Theme 7	4.2	University of New England	February 2014

Themes:

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

PAST PHD STUDENTS OF THE INVASIVE ANIMALS CRC – WHERE ARE THEY NOW?

As part of the Balanced Researcher Program, a longitudinal study was undertaken through UNSW ADFA, to assess the transition of our previous PhD candidates into the work place. The program is proving to be the unique link for our students obtaining successful careers, with many entering into Australian or international research organisations, and several obtaining academic-based positions.

29 PhD candidates funded through the Balanced Researcher Program (2005-2012)

93% submitted & conferred (33% above national average)

68% currently hold research positions

45% currently work in the invasive species sector

24% classified as working for an academic institution



Dr Peter Elsworth

Experimentalist for Biosecurity Queensland

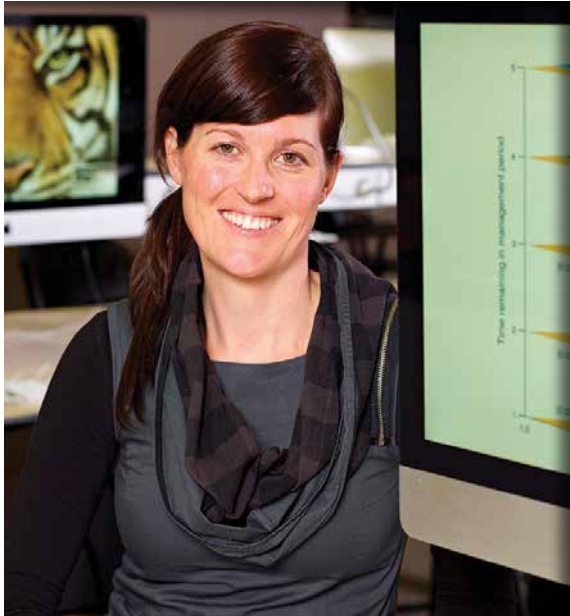
Peter's PhD studies investigated rabbit resistance to RHDV and were undertaken while he was employed by the Queensland Department of Agriculture and Fisheries (QDAF) as a technician in pest animal research. The IA CRC Balanced Researcher Program gave Peter exposure to other researchers in the field. This made him greatly appreciate that biological control is only one tool in the management of rabbits and is not a complete solution. Since having his PhD conferred in 2013, Peter has continued doing research on the ecology and agricultural impacts of rabbits in Queensland to help landholders understand the importance of rabbit control and the management tools that will best suit individual circumstances. He is still employed by QDAF working at Robert Wicks Pest Animal Research Centre and is involved in the roll out of RHDV1 K5.



Dr Melissa Snape

Conservation Researcher for the ACT Government

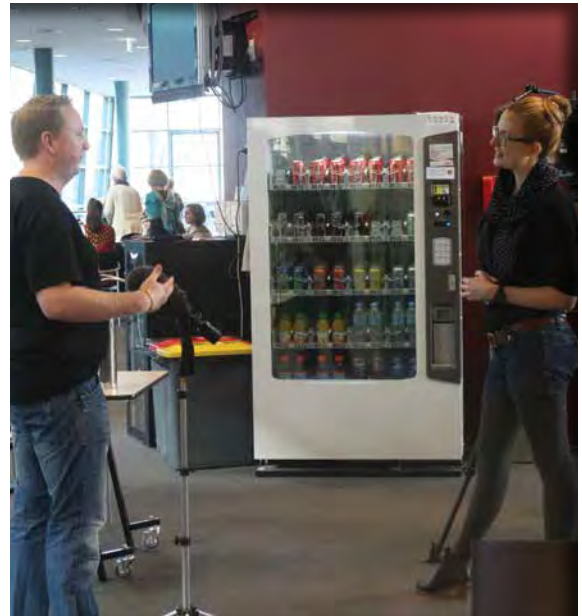
Mel was awarded her PhD in 2013 for work in the field of wildlife contraception. Despite the majority of her research being conducted in an 'outdoor laboratory' setting using captive macropods, she developed a broader appreciation of the need for practical land management tools through IA CRC sponsored placements with the Department of Food and Agriculture in the UK and working on predator-prey dynamics in Nevada, USA. She now works within the Conservation Research unit of ACT Government (an IA CRC partner) assessing relationships between kangaroos, grassy habitats and biodiversity; and continues to contribute to the development of a remote delivery mechanism for the kangaroo contraceptive vaccine trialled during her PhD.



Dr Eve McDonald-Madden

Conservation Decision Scientist at the University of Queensland

Eve is a Chief Investigator on the ARC Centre of Excellence for Environmental Decisions and an Australian Research Council Early Career Research Fellow with the School of Geography, Planning and Environmental Management, at The University of Queensland. Eve had her PhD conferred in 2009, going on to research roles both in academia and CSIRO. She used her IA CRC Balanced Researcher Program resources to expand her network around the globe and to enhance her potential global impact by learning Spanish. The foundation of Eve's work is the application of applied mathematics and artificial intelligence techniques to conservation problems. More commonly associated with the science of robotics, web-search, and spacecraft control, she has demonstrated how these techniques can be a powerful way to find novel solutions to the complex challenges of managing natural systems.



Dr Ian McDonald

Communications Manager for the Invasive Animals CRC

Ian undertook his PhD in the field of animal reproductive immunology. His studies focused around developing new fertility control agents but he noted a need for further awareness and understanding of the topic. He used the resources allocated through the IA CRC Balanced Researcher Program to receive further training in the field of science communication. Since being conferred with his PhD in early 2013, Ian has specialised in the science communication field and held various communication roles with research organisations' within Australia, including the not-for-profit sector. He is also finishing his Master of Science Communication through the Australian National University (due for completion in 2017). He is currently working with the Invasive Animals CRC as the Communications Manager, helping Australians become aware of the invasive animal problem and the innovative solutions to solving the problem.



Dr Kate Grarock

Sanctuary Ecologist for the Mulligans Flat Woodland Sanctuary

Kate's PhD research was undertaken at the Fenner School of Environment, ANU and supported by the Invasive Animals CRC, focusing on the effective management of an invasive species in an urban environment. She was awarded her PhD in 2013. Kate is currently working as the Ecologist for Mulligans Flat Woodland Sanctuary. In this role she focuses on the research and restoration of critically endangered box-gum grassy woodlands. A key element to this restoration is the reintroduction of species lost from this ecosystem due to habitat clearing and introduced pest species. In this role Kate also works to inspire the next generation of nature lovers through the "ambassador bettong" school outreach program.



Dr Scott Van Barneveld

Ecologist at Kimberly Land Council

Scott received his PhD in 2011 for research into the ecological factors driving the geographic distributions of invasive species compared to rare species. Following from this Scott worked as an ecological consultant providing advice on threatened species and invasive species management, which often go together. Scott then moved to the Kimberley region in north-west Australia and over the last three years has established Australia's largest threatened animal program with WWF-Australia and Kimberley Land Council. The skills and support offered by the Invasive Animal CRC have put Scott in good stead to help manage invasive animals across the remote Kimberley and to build the capacity of Indigenous Ranger groups who protect last stronghold of threatened native animals such as bilbies and golden bandicoots that are extinct elsewhere.

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

In addition a national “Vertebrate Pest Management Planning Skill Set” has been defined - grouping five essential Units of Competency around planning pest management programs.



Participants from the Cairns Pilot Workshop using their creative skills to develop promotional material that appeals to communities core values and emotions (image supplied by Birgitte Verbeek)



Feral cats impact heavily on Australia's unique native wildlife through predation, and also spread diseases that affect humans and livestock. In July 2015, FeralCatScan, a new project by the Invasive Animals CRC and Australian Government Department of the Environment, was launched to help improve knowledge about feral cats and protect Australia's threatened wildlife. In just over a year more than 3,000 records of feral cats have been entered by members of the public, helping land managers tailor control in their regions (image taken by Joe Scanlan).



Ian Evans, On-Farm Program Manager with AWI showcasing the new PAPP products for wild dogs and fox control.

RESULTS

2015-2016 has seen significant progress made with many of our projects. Many of our major national projects are ticking off major deliverables.

- Registration and approval to release RHDV1 K5
- Launch of two new predator baits containing the new PAPP toxin
- Further funding for additional research into new pest animal tools such as a feral pig bait, a rabbit fumigator and a lethal trap device.
- Played a pivotal role in securing additional funding for a National Carp Control Program which will endeavour to seek approval to release the carp herpesvirus by the end of 2018.

“We hear constant stories of the severe emotional stress wild dog predation can cause, impacting on family life and rural communities. This is why we are very supportive of seeing additional new control tools become available in the market to fight this serious problem.”

Ian Evans, On-Farm Program Manager, AWI – June 12th, 2016.

COMMERCIALISATION AND UTILISATION

The commercialisation and utilisation strategy adopted by IAL focuses on IAL's brokering role to secure co-investment and partnerships in both commercially focused applied R&D projects and public good projects. These projects are captured in the CRC program of work. The IA CRC's two small-to-medium enterprise (SME) Participants, ACTA and Connovation, take a lead role in commercialising opportunities and are also heavily involved in the R&D phase (for more information on the commercialisation and utilisation strategy, please refer to the Commercialisation and Utilisation Plan, available from IAL head office).

This strategy diversifies key risks involved in innovation in this field, such as:

- research and technical failure
- overcoming market failure to develop products that meet end-user needs
- product development to meet market needs in terms of effectiveness, ease of use, animal welfare and human health concerns.

This brokering and co-investment approach improves end-user, CRC Participant and SME engagement, and builds trust and credibility in research outputs and products to market. The HOGGONE® project highlighted above is an example of this strategy in action.

Other initiatives of note are:

- Development of a lethal trap device to reduce animal welfare concerns over leg-hold trapping of wild dogs, foxes and feral cats. Status: Field-toxic prototypes will be tested in late 2015.
- Development of a new bait containing a new toxin (PAPP), and an antidote for these products in case of accidental consumption, for the humane management of wild dogs and foxes. Status: The baits and toxin packages are in the final stages of assessment by the APVMA. The outcome of this process is expected to be announced soon.
- Development of a new rabbit virus delivery mechanism: freeze-dried RHDV. 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 was secured in 2015.
- Research into new rodenticides that can be safely used by land managers and producers. Status: Research is ongoing and in its early stages.

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 improve the adoption of the project outputs.

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.

Licensed IP that generates royalties from the sale of products developed through the IA CRC (2005–12) is reinvested into the current extension IA CRC. IP that is novated and/or managed by IAL in this extension is related to the commercialisation of:

- PIGOUT®, 2015–16 financial year royalty of \$2,658.31, distributed to Pest Animal Control CRC Participants
- HOGHOPPER, 2015–16 financial year royalty of \$3,150.05, retained by IAL
- RODEMISE®, 2015–16 financial year royalty of \$699.40, retained by IAL
- PAPP, 2015–16 financial year royalty of \$21.27.

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 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 as follows:

- Co-investors (Participants) in a project will be allowed to legally and beneficially co-own project IP.
- Specified Project IP is classified as Specified Project IP rather than Centre IP.
- Specified Project IP ownership is determined by a process that is agreed to by the Participants directly involved in the project.
- All investors in a Specified Project IP project have a say in developing the terms under which project IP will be commercialised, where possible.

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.

Tables 18 and 19 provide a summary of currently held commercial IP and option agreements. For more information, please refer to the 2015 Commercialisation and Utilisation Plan.

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
- International Published Patent Application (WO/2008/104028) targeting Canada — Nitrite Salts as Poisons in Baits for Omnivores. This patent application was submitted in 2008 and has not yet been granted.

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)
- FeralScan (field monitoring app)
- Community engagement tools.

The 'Internet of Everything' has been embraced by IAL and is seen as a core enabler of present and future best-practice pest animal management. In 2015, PestSmart Connect (our knowledge hub) and FeralScan (our mobile monitoring app) will be enhanced as we execute our digital strategy, and provide end users with improved community features and better ways to connect.

SMALL-TO-MEDIUM ENTERPRISE AGREEMENT

End-user and SME engagement is important to the work of the IA CRC, and is reflected in our business, research and communications strategies. End users for the IA CRC include farmers, land managers (nongovernment organisations and government) and land management groups (natural resource management councils, catchment management authorities). Two SMEs are Participants of the IA CRC — Animal Control Technologies Australia Ltd and Connovation (New Zealand). SME engagement has included:

- 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 Participants
- support for promotion of best-practice products from SMEs for invasive animals management. In 2015–16, the IA CRC will be promoting the launch of various products as they become available, such as the new canid toxin PAPP.



Feral pigs attracted by the sheep grain being supplied during drought period, image taken by Nick Perkins.

Table 18: 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 pending patent applications (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
FarmStart Trademark	2015	100% IAL	N/A
LandSmart Trademark	2015	100% IAL	N/A
AVPC Trademark	2015	100% IAL	N/A
Centre for Invasive Species Solutions registered trademark	2015	100% IAL	Not applicable

Table 19: 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 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 are also gearing up for major communication campaigns associated with the roll out of new wild dog, rabbit and carp control products. The aim is to have a collaborative approach to managing these community engagement and outreach campaigns in partnership with our participant organisations.

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.

This year, our PestSmart Toolkit grew with new publications relating to wild dog baiting, the release of RHDV1 K5, and information about the carp herpesvirus. The complete wild dog suite of resources was updated, made available on our website and printed for distribution

at various field days around the country – thanks to funding through the National Wild Dog Action Plan. Since the toolkit was developed in 2011, it now totals more than 200 publications which are all available online via PestSmart Connect. In the 2015/16 financial year our PDF toolkit documents were downloaded more than 20,000 times.

PestSmart Connect

The new [PestSmart Connect](#) website went live in March 2015, replacing the [feral.org.au](#) site, which had been a key digital platform for the IA CRC since 2004. 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 significantly increased with visitations up by 31% from the previous year and the number of downloads tripling since 2014/15.

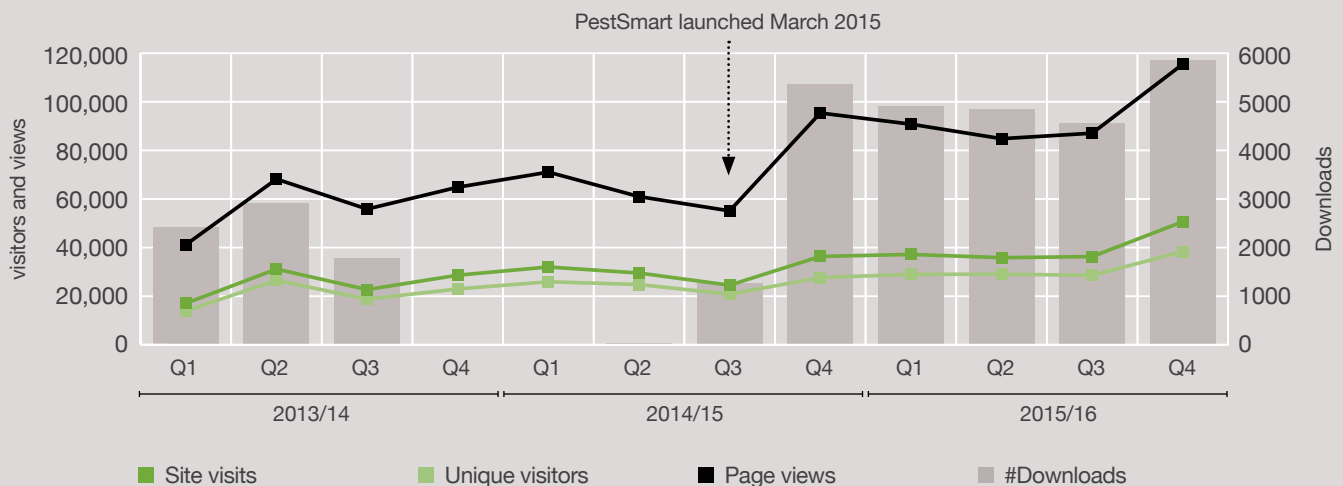


Figure 2: PestSmart Connect website statistics by quarter 2013–2016

Table 20: The websites most popular pages and documents 2015/16

Most visited species webpages	Most downloaded PDF documents
• European rabbit	• Methods of euthanasia SOP
• Wild dog	• Feral Cat Workshop Proceedings
• Feral cat	• RHDV1 K5 Information Guide
• European fox	• National Wild Dog Action Plan
• Feral pig	• Get Involved in RHDV1 K5 Monitoring and Release

The National Wild Dog Action Plan portal - www.nationalwilddogactionplan.org.au - sits within the PestSmart Connect website, recognising that our innovative wild dog research and wild dog information materials have a good fit with this first ever national action plan for wild dogs.

Invasive Animals CRC Corporate Website

Our corporate website received more than 28,000 visitors over the course of the financial year and 67,301 page views. This website is used to highlight our research projects and houses our corporate documents. However, where possible, we drive end users to PestSmart Connect for toolkit information and the latest research information.

FeralScan website and Apps

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. The FeralScan app has over 14,000 registered users and more than 50,000 pest animal sightings has been added to the national monitoring map which is growing daily.

e-newsletters

Feral Flyer is the IA CRC's 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 2,186 subscribers as of end of June 2015, a net increase of 20% from the previous year.

As part of our major campaigns, e-newsletters were also created to focus on the release of RHDV1 K5, this list currently has more than 1,000 subscribers including all those who expressed interest to be involved in the release. The Invasive Animals CRC also assists with creating and distributing the Communique 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

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 2015 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 an important part of our communications strategy to continue to develop our profile, and generate awareness and support among our key audiences.

During the 2015/16 financial year we have focused on building strong relationships with key journalists who can reach our stakeholders. This has resulted in quality media engagement through 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.

During 2015–16, 721 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). Our communications team also had more than 85 requests for interviews during the 2015/16 financial year and issued a total of 17 media releases:

- [National search for photos of ferals - 1 July 2015](#)
- [New feral cat app to protect wildlife - 16 July 2015](#)
- [Last days to expose feral animals - 14 September 15](#)
- [Priorities for effective feral cat management released - 7 October 2015](#)
- [Help boost Australia's rabbit biocontrol action - 5 November 2015](#)
- [Feral Photos winners focus on impact - 11 November 2015](#)
- [New national plan stays hop, skip & jump ahead of rabbits - 26 November 2015](#)
- [Wild dog managers and experts meet in Sydney - 2 December 2015](#)
- [Stop new pest invasions this holiday season - 17 December 2015](#)
- [Spring 2016 or Autumn 2017 release proposed for new rabbit virus - 12 January 2016](#)
- [Wildlife research highlights need for long-term rabbit biocontrol strategy - 17 February 2016](#)
- [Science and Innovation vital for Australian farmers - 1 March 2016](#)
- [NSW Commission supports successor of Invasive Animals CRC - 31 March 2016](#)
- [The truth about feral cat and wild dog 'selfies' - 15 April 2016](#)
- [Discussion paper proposes new invasive species plan - 10 May 2016](#)
- [First new predator toxin in 50 years becomes available - 16 June 2016](#)
- [Lights, camera, action on ferals - 22 June 2016](#)



Table 21: Top ten outlets mentioning IA CRC and our research

outlet	Coverage	ITEMS
ABC	National	27
Get Farming	National	20
QLD Country Life	QLD	18
The Land	NSW	13
Stock and Land	VIC	13
Stock Journal	SA	12
Sheep & Beef Central	National	12
Farm Weekly	WA	9
Weekly Times	VIC/SA/TAS	8
North QLD Register	QLD	7

Media highlights

- Sydney Morning Herald article on wild dogs (feat. Greg Mifsud, National Wild Dog Facilitator) syndicated nationally to major metro and regional papers – September 2015
- Clearer Waters Alliance media release resulted in a front page article on The Australian and widespread national coverage about the carp herpesvirus – January 2016
- Three ABC Landline invasive animal feature segments ran nationally and proved very popular - May/June 2016
- Launch of PAPP products featured in all major rural press outlets, coverage was ongoing – June 2016
- Centre for Invasive Species Solutions (CISS) mentioned 21 times in online media articles, particularly prior to and during election campaign

Figure 3: IA CRC online media mentions per quarter



“Through our tailored PestSmart campaigns and strong communication networks, media mentions of pest animals such as Rabbits and Carp nearly tripled compared to the 2014/15 FY.” (image: Matt Barwick being interviewed by Prue Adams from ABC Landline)



Chief Executive Officer Andreas Glanznig being interviewed by ABC Landline.

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 the IA CRC and directing traffic to the PestSmart Connect website.



A screenshot capture of an ABC Landline post promoting involvement in the release of RHDV1 K5 to their 70,000 Facebook followers. This and other targeted promotion through our partners resulted in close to 1,000 expression of interests received from around Australia.

Twitter, Facebook and LinkedIn

A total of 959 tweets and 818 Facebook posts were sent out during the financial year to our social media audience of over 4,000 users. This resulted in approximately 24,000 clicks on links to find out more information. Followers on Facebook and Twitter increased by 84% and 35% respectively, with our posts reaching over 1,000,000 accounts. The Invasive Animals CRC also started a LinkedIn page which is receiving a steady number of followers.

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. Now in its fifth year, more than 300 photos were entered from all over Australia. Winners were chosen based on how well the image told a story of 'impact' along with quality, clarity and difficulty in obtaining the image. The winning photos included an image of a wild dog lunging on a bearded dragon, a native collared sparrowhawk taking down an Indian Myna, a fox running at full speed across a farmers crop and two wild boars fighting it out in a rough and tumble boxing match. These images are featured throughout the report.

“All the winning images tell a story about pest animal management, whether that be environmental or agricultural damage, or interactions between invasive animals and other species,”

Jason Wishart, acting National NRM Facilitator – 11th November 2015

PestSmart campaigns

Two PestSmart campaign sites were set up during the financial year.

- The Healthier Landscapes campaign site www.healthierlandscapes.org.au has all the information regarding the national RHDV monitoring program and release of RHDV1 K5.
- The Clearer Waters campaign site www.clearerwaters.org.au has information regarding our carp herpesvirus research and its potential as Australia's first carp biocontrol agent.

Ferals take over ABC Landline

We are extremely grateful to ABC Landline, which featured three different segments during the months of May and June 2016 on invasive animal issues. This included a feature on the proposed release of RHDV1 K5 to boost rabbit biocontrol, the proposed release of a carp herpesvirus and what it might mean for our waterways and the launch of two new predator baits for wild dog and fox control. These segments were worked up in consultation with our rabbit, carp and wild dog research teams and received much positive coverage from the Landline viewership.



Professor Linton Staples (ACTA) and Ian Evans (AWI) being filmed as part of an ABC Landline segment about the wild dog scourge in Australia.



Buffalo photographed at the Arafura Swamp in Arnhem Land, Northern Territory. There is currently estimated to be over 20,000 buffalo in this region causing massive amounts of damage! They are changing the waterways, polluting the water and creating wallows, image taken by Elizabeth McCrudden.

The carp herpesvirus goes viral!

The Australian government's announcement of a \$15 million National Carp Control Program (May 1, 2016), attracted the interest of many Australians. To put this into perspective, the same amount of online media articles were monitored in the week of the carp announcement (May 1-8, 2016) as were monitored during the entire 2014/15 financial year. There was also coverage on high ranking global news outlets such as CNN, BBC News and the Wall Street Journal, along with many satirical media sites such as New Matilda and Mashable. All this media attention resulted in European carp being the second most searched species on PestSmart Connect during the month of May, highlighting that people wanted to learn more about this topic and were coming to our website for this information.

Rabbiting on about rabbits

In mid-March 2016, some of our key rabbit researchers and community spokespeople came together to undertake media training with DeBlas Communications and Mossman Media. The two day training session was excellently tailored and prepared for our purposes. The training had both aspects of theory and practice and the trainers gave extremely useful insights to the media industry, coming from both urban and rural media backgrounds. All the participants thoroughly enjoyed the interactive and practical training session and now feel much more comfortable in talking to the media. This media training was undertaken thanks to funding provided by the RHD Boost project, with travel support also provided by AWI.



Participants of the rabbit media training (Back L-R: Alexandra DeBlas (trainer), Nic Newland (RFA), Emma Sawyers and Tarnya Cox (NSW DPI), David Lord (AWI rabbit representative), Susan Campbell (DAFWA) Front L-R: David Harvey (Landholder), Mike Reid (National Rabbit Facilitator), Simon Mossman (trainer) and Ian McDonald (IA CRC).



Feral pigs in full fight, image entered into our 2015 Feral Photos competition by Thomas Garrett.

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.

IAL's short term objective is to govern and manage the Invasive Animals Cooperative Research Centre (IA CRC), in accordance with the Commonwealth Agreement and Participants Agreement.

IAL's long term objective, also in accordance with those Agreements, is to establish an enduring service provider. The establishment of the Centre for Invasive Species Solutions (CISS), a service provider facilitating the efficient design, promotion, investment, brokering and management of large-scale collaborative invasive species RD&E programs to deliver new pest animal management tools and approaches, is well advanced.

The Invasive Animals CRC, a 27 member collaboration, is now in its final year with the expected wind up of the IA CRC in June 2017. IAL has a demonstrated commitment to continual development, strong fiscal stewardship and robust, effective financial management which underpins the broader strategic objectives of the IA CRC.

For the 2016 financial year there was a continued review of internal control systems, policies and procedures, in particular Work, Health and Safety and Risk Management, 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%.

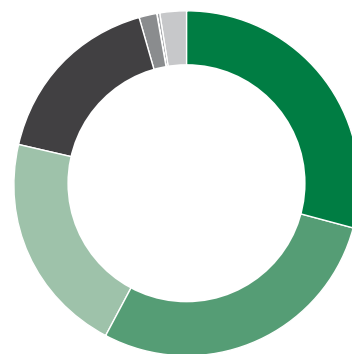
The total revenue for the 2016 year was \$8,213,937 with \$2,411,000 being provided by the Commonwealth Department of Industry, \$2,338,135 being invested by the Participants, \$1,388,829 being provided by the

Commonwealth Department of Agriculture and Water Resources 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 \$1,721,863.

With the inclusion of \$9,975,000 for the 2016 year In-kind contributions, provided by the Participants in support of IA CRC, the total combined resources available were \$18,188,937.

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

Figure 4: FY16 Revenue (Consolidated)

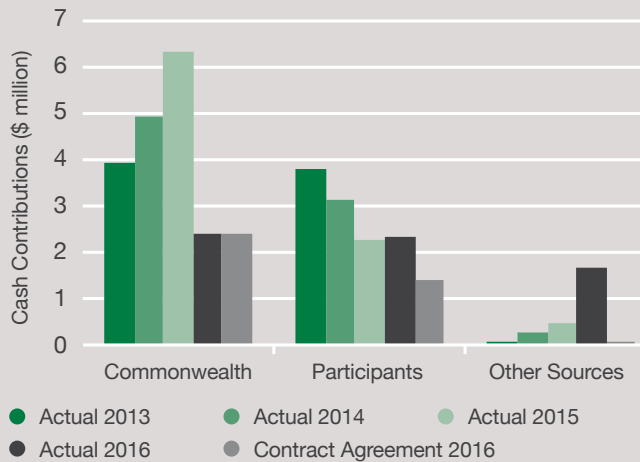


	\$000s
● C'wealth Dept of Industry	2,411
● Participants Contribution	2,338
● IAL contracts	1,721
● C'wealth Dept of Agriculture & Water Resources	1,388
● Interest	142
● Third Party Grants	5
● Royalties	6
● Other Income	200
● Combined resources	18,188

ACHIEVEMENT AGAINST COMMONWEALTH CONTRACT BUDGET

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

Figure 5: Commonwealth Agreement Cash Contributions 2012–16



For the 2015-16 Financial Year our target for contributions of personnel time was 23.0 full time equivalents (FTE). The actual level of contributions obtained was 30.1 FTE, again reflecting the commitment of the Participants.

The target of \$616,000 for non-personnel In-kind contributions in 2015-16 was again exceeded, with \$2,367,000 of contributions confirmed by participants.

Figure 6: Commonwealth Agreement In-kind Contributions to 2012–16 (Staff FTE)

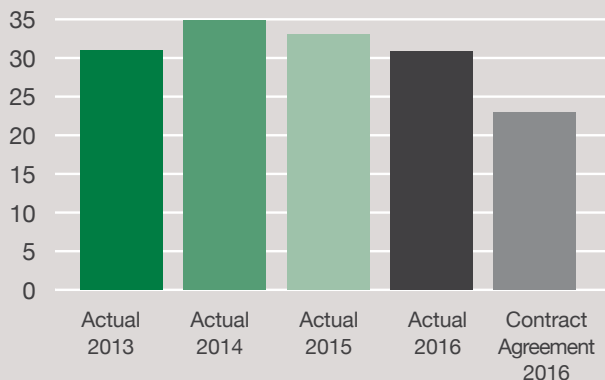
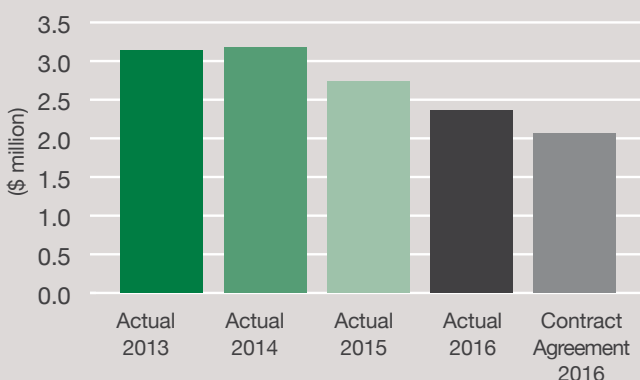


Figure 7: Commonwealth Agreement In-kind Contributions to 2012–16 (Non-Staff FTE)



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.

The positive financial position with consolidated cash position, at June 2016 of \$7,359,279 represents sufficient cash flow to meet both entities combined liabilities of \$6,594,638. The current asset ratio (a measure of liquidity) was 1.19.

Figure 8: CRC Resources Available 2015–2016 (\$16.427M)

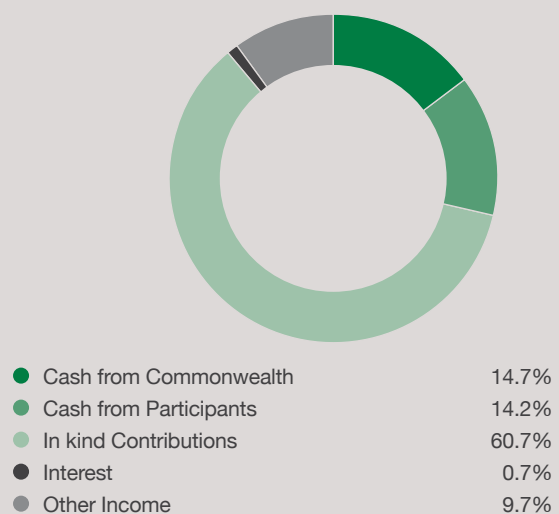


Figure 9: CRC Resources Applied 2015–2016 (\$16.427M)

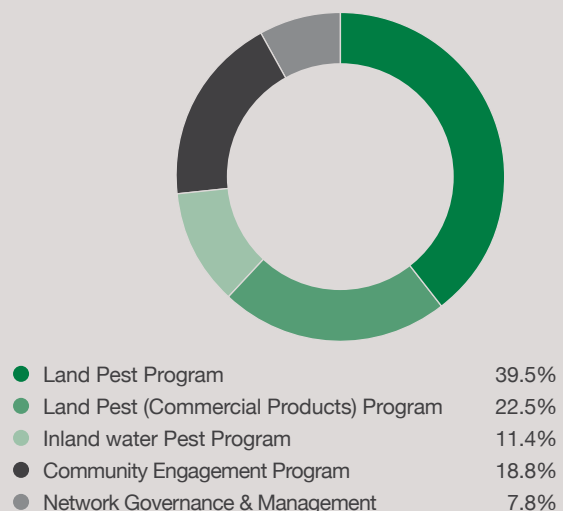
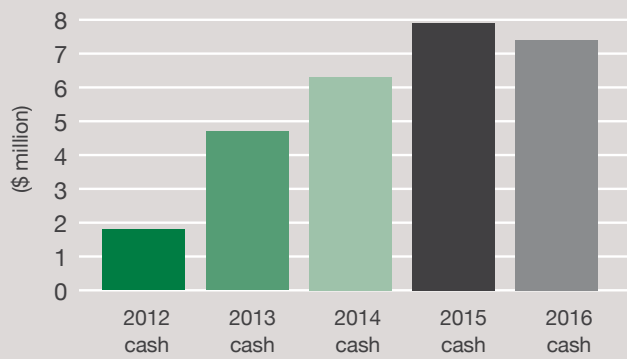
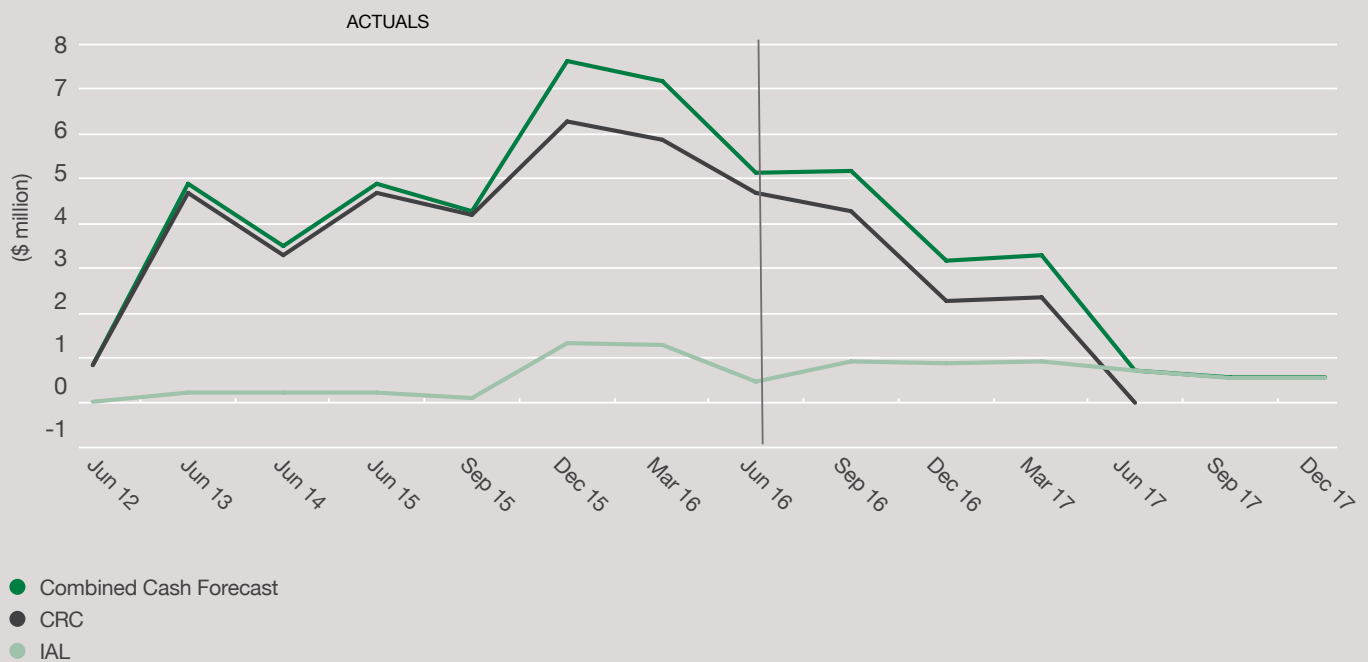


Figure 10: IAL and IACRC Cash at Bank



The Cash Flow forecast graph represents the cumulative net position of both entities, as estimated, at a point in time. This represents past financial year results as well as estimates of future period income and expenses. While Cash Reserves (including Bank accounts and Term Deposits) or 'cash on hand' is a highly liquid asset, by themselves they are only a very broad measure of liquidity. The 5 year Cash Flow graph below demonstrates the decline in funding in 2015-16 year from the 2014-15 peak funding period for the IACRC and the following year will see the remaining funding invested in CRC resources in the duration of the Commonwealth Agreement.

Figure 11: IAL and IACRC 5 year Cash Flow Projections



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



Innovation in pest animal management – the ‘Wild Dog Alert’ research initiative is being delivered through the Invasive Animals CRC, with major financial and in kind resources provided by the Australian and NSW governments, University of New England, Meat and Livestock Australia and Australian Wool Innovation. The project has the potential to provide an unprecedented opportunity to monitor wild dog activity and efficiently inform the development and review of strategic regional wild dog management plans.

OTHER ACTIVITIES AND GRANTS

Invasive Animals Limited (IAL) agreed to undertake the following new research services contracts, funded by the Commonwealth Department of Agriculture and Water Resources to augment existing Commonwealth Agreement CRC projects.

1. RHD Boost Plus

The purpose of this agreement is to augment the roll out of the RHDV K5 strain, enable landscape scale community led monitoring of its spread and effectiveness, develop a pipeline for creating superior virus strains for successive future releases and develop a serology test for the RHDV2 Strain.

2. Wild Dog Alert

The purpose of the project is to develop, promote and deploy the Wild Dog Alert system.

3. Three grants (through the Department's Agricultural Competitiveness White Paper initiative) were received to augment and facilitate the IA CRC (2005 – 2012) tactical tools and management projects.

- Carbon monoxide rabbit warren fumigator
- Hoggone Australia – next generation feral pig bait
- PAPP based lethal trap device

GRANT SOURCES

IAL also received the following new grants during the reporting period:

The Wild Dog Management Project Stage 2 funded by the Department of Agriculture and Water Resources. Its purpose is to support the implementation of the National Wild Dog Action Plan, with a focus on activities in the national interest such as National leadership and Coordination, Extension and training, Community Action to support ground control and Monitoring and evaluation.

The Blue-healer Glovebox antidote project funded by the Department of Agriculture and Water Resources. Its purpose is to build on prior CRC research to develop an antidote product for animals that have been accidentally poisoned by para-aminopropiophenone (PAPP) that can be safely administered by dog owners and vets.

PERFORMANCE REVIEW

All Cooperative Research Centres are required to undergo one or more performance reviews during their funding term in accordance with the CRC Programme guidelines and the CRC's Commonwealth Agreement. The major mid-term performance review of the Invasive Animals CRC under its current Commonwealth Agreement was undertaken by an independent review panel at the University of Canberra during June 2015.

The Invasive Animals CRC received an extremely positive performance review, which recognised the strengths of its leadership team, participant support and engagement, the quality of its R&D program and likelihood for impact, and the quality of its communications and extension program.

The panel made eight recommendations of which seven have been implemented and progress is ongoing.

Table 22: Third year panel review recommendations to be actioned

Panel recommendation	Plan of action to address recommendation	Implemented
The CRC should encourage the commencement of inter-departmental discussions on streamlining the engagement with, and the obtaining of approvals from, the Australian Pesticide and Veterinary Medicines Authority (APVMA), including investigating whether risk based, simplified and speedier approaches used in New Zealand are worth consideration; and more generally in reducing red tape.	The IA CRC will engage the APVMA on the benefits of stronger harmonisation of regulatory assessment in the field of invasive species management product development.	<p>Yes and on-going.</p> <p>The IA CRC plan of action has been revised given the panel's recommendation is being considered through the Productivity Commission Inquiry on the Regulation of Australian Agriculture.</p> <p>The IA CRC has provided a submission to this Productivity Commission Inquiry.</p> <p>The IA CRC strongly supported the Inquiry draft report recommendation 6.2 to make greater use of international evidence including greater reliance on assessments made by trusted comparable international regulators, and recommendation 6.3 for the implementation of a national control-of-use regime for agricultural and veterinary chemicals by the end of 2018.</p> <p>The final Inquiry Report has yet to be tabled and the Australian Government response will follow.</p>



European rabbit along fence line (image taken by Rick Nash).



Fox amongst the birds at Reedy Swamp, Shepparton, image entered into our 2015 Feral Photos competition by Barney Enders.

APPENDIX A

Milestone Report - Progress against
Commonwealth agreement schedule
1 milestones

Project No.	Output/milestone number	Description	Contracted achievement date	Achieved	Reason/details	Strategies to achieve unmet milestone
1L1	R1.1.6	One pilot incursion response plan for identified priority species produced	30 June 2014	Yes	Achieved - Incursion Response Plan for Terrestrial Snakes produced and endorsed by IPAC in August 2016.	
1L1	R1.1.7	Incursion response strategy reviewed and nationally endorsed by Vertebrate Pests Committee	30 June 2014	In progress	Delays caused by extended review process. Draft Strategy tabled at Invasive Plants and Animals Committee (Meeting 6) in August 2016. Final review pending the completion of the Australian Pest Animal Strategy public consultation process.	In progress and on track to deliver by 31 January 2017.
1L1	R1.1.8	Incursion response training program developed	30 June 2014	In progress	Extensive review process associated with the National Incursions Prevention and Response Strategy (R1.1.7) still occurring.	In progress and on track to deliver early 2017.
1L1	R1.1.10	Two further incursion response plans developed	30 June 2015	In progress	Pending completion of review process (See R1.1.7) Completion will be dependent on reviewers speed and acceptance of the document	In progress and on track to deliver early 2017
1L1	R1.1.11	Training programs aligned with activities and functions of the incursion response strategies developed	30 June 2015	In progress	With delays experienced for milestone R1.1.7 and R1.1.8, training cannot be formally developed or progress. However, the program has been conceptualised	In progress and on track to deliver early 2017
1L1	U1.1.1	One incursion response plan and one case study adopted by Vertebrate Pests Committee	30 June 2015	In progress at 30 June 2016	Achieved – Invasive Plants and Animals Committee (Meeting 6) endorsed the National Incursions Response Plan for Terrestrial Snakes on 1 August 2016.	
1L23	U1.2.1	Risk assessment report considered and alternative fox control strategies endorsed by Tasmanian Government	30 June 2015	In progress	Delayed until December 2016 - Due to the ongoing changes to DIPIWE structure, the formal endorsement of the Tasmanian 'Vertebrate Pest Incursion Response Plan' will be delayed.	Delayed until December 2016.
1L2	R1.1.14	Findings and procedures from surveillance data modelling case studies trialled by end users.	30 June 2016	Yes	Four case studies have been developed: 1. Modelling of high-risk areas for starling settlement in WA (DAFWA), 2. Explanatory and forecast modelling of mice in Australia (GRDC), 3. Analysis and manuscript on Incursions of Indian ringed-neck parakeets, and 4. Fox-scat detection modelling (Invasive Species Branch, Department of Primary Industries).	

Project No.	Output/ milestone number	Description	Contracted achievement date	Achieved	Reason/details	Strategies to achieve unmet milestone
1L1	R1.1.15	Incursion response plans reviewed and nationally endorsed by Vertebrate Pests Committee.	30 June 2016	In progress	Delays caused by extended reviewing process because of government staff turnover. Final review pending the completion of the revised Australian Pest Animal Strategy public consultation process.	In progress and on track to deliver by 30 September 2016.
1L5	R1.1.16	Training programs for incursion response strategies and mobile devices implemented.	30 June 2016	Yes	Training programs for mobile devices implemented include: <ul style="list-style-type: none"> • 54 extensive training and adoption workshops/ field days/conferences across Queensland, NSW, ACT, Victoria, and South Australia. • 70 new online landholder networks, including 40 new wild dog control groups using FeralScan/ WildDogScan. This brings members of their working groups together online to record and map pest and control efforts collaboratively. We will connect these local scale groups with regional programs where possible. • 20 new regional partnerships formed with regional NRM and local government organisations, such as South Australia Murray-Darling NRM group. 	
1L1	U1.1.2	Two incursion response plans and two case studies utilised by Vertebrate Pests Committee.	30 June 2016	In progress	Awaiting IPAC to complete the review of the first plan for adoption (See U1.1.1).	Will be pursued once IPAC complete the review of the first plan for adoption (See U1.1.1).
1L1	U1.1.3	Incursion response training program adopted by Vertebrate Pests Committee members.	30 June 2016	In progress	With delays experienced for milestone R1.1.7 and R1.1.8, training cannot be formally developed or progress. However, the program has been conceptualised	Will progress once R1.1.7 and R1.1.8 completed.
1L5	U1.1.4	Uniform web mapping procedures for monitoring pest animals endorsed by Vertebrate Pests Committee.	30 June 2016	Yes	The National Data Standard for Invasive Plants and Animals was presented to IPAC (Invasive Plants and Animals Committee) in June and endorsed in August 2015 for national adoption. This culminated from extensive consultation with state/territory agencies through the IPAC national data standards working group.	

Project No.	Output/ milestone number	Description	Contracted achievement date	Achieved	Reason/details	Strategies to achieve unmet milestone
1L22	R1.2.12	Detection experiments completed.	30 June 2016	Yes	Detection trials to estimate the probability of scat detection in 1-km monitoring cells by two-person search teams has been completed for 10 monitoring units. The sample size is sufficient for analysis.	
1L21	R1.2.13	Results of DNA scat survey reported to the Tasmanian Fox Technical Advisory Panel.	30 June 2016	Yes	Achieved	
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.	A completed draft will be circulated for comment to participants and collaborators. The milestone will be achieved in early 2017.
1L24	R1.2.15	Long term response strategy implementation process developed.	30 June 2016	In progress	The implementation process will be developed after the successful completion of R1.2.14.	The implementation process will be developed after the successful completion of R1.2.14.
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	In progress	Registration of RHDV1 K5 has been achieved. Release, in accordance with the national release strategy, is now expected to be in 2017.	Release in accordance with the national release strategy, is now expected to be in 2017.
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	In progress	Registration of RHDV1 K5 has been achieved. Release, in accordance with the national release strategy, is now expected to be in 2017.	Release in accordance with the national release strategy, is now expected to be in 2017.
3L2	R1.3.8	Genetic basis of RHD resistance determined and a RHD resistance mechanistic model produced.	30 June 2016	In progress	Modelling is being conducted by University of Adelaide.	The milestone will be delivered in early 2017.
3L4	R1.4.7	Virulence of selected RHDV strains in naïve rabbits assessed	30 June 2015	Yes	The trials have been completed and the most recent Accelerator passage virus (P23) has been tested and proven to be highly virulent in domestic rabbits.	
3L4	U1.4.1	Recommendations for long term biocontrol strategic approach submitted to Vertebrate Pests Committee	30 June 2015	Yes	Report has been submitted to IPAC and noted (IPAC 4 Nov. 2015 and IPAC 6 Aug. 2016)	

Project No.	Output/milestone number	Description	Contracted achievement date	Achieved	Reason/details	Strategies to achieve unmet milestone
3L4	R1.4.8	Proof of concept established, if RHDV variants can be experimentally selected in vivo or in vitro.	30 June 2016	Yes	Proof of concept was shown, and has been widely communicated at internal and external workshops and conferences. A journal publication for submission is at the final draft stage.	
3L4	U1.4.2	Proof of concept and potential applications for accelerated RHDV evolution widely communicated.	30 June 2016	Yes	Proof of concept was shown, and has been widely communicated at internal and external workshops and conferences. A journal publication for submission is at the final draft stage.	
3L4	U1.4.3	RHDV cell culture systems/strategies published and used by other researchers.	30 June 2016	Yes	Two peer reviewed journal articles have been published describing properties of RHDV proteins in cell culture, and in vitro, with a particular focus on the viral polymerase.	
3L11	R1.5.9	Data from year 3 collated, and preliminary analyses completed and reviewed by advisory committee.	30 June 2016	Yes	Data collated, preliminary analyses completed and the information and results have been presented to and reviewed by the advisory committee.	
3L11	R1.5.10	Five peer reviewed journal papers submitted.	30 June 2016	Yes	In excess of five journal papers have been submitted to peer review journals.	
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	In progress	Delayed appointment of two PhD students means some of the data collection is incomplete at this point.	Effectiveness of a primary control strategy (annual aerial baiting) for wild dogs and foxes and its non-effect on spotted tailed quolls has been completed and reported. Evidence about fencing and ground baiting, trapping and shooting as tools in an integrated management strategy in almost complete. Recommendations from that work have been drafted knowing that, some of the seasonal data-collection is unfinished. Milestone will be delivered by mid-2017.
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	In progress	Preliminary analyses have been conducted on LLS data and a survey conducted. UNE is collecting more detailed information on the institutional barriers to effective management, and providing specialist advice on the final survey design.	The survey will be piloted in July/August 2016 and the milestone is on track to complete the data collection and collation by March 2017.

Project No.	Output/ milestone number	Description	Contracted achievement date	Achieved	Reason/details	Strategies to achieve unmet milestone
3L14	U1.5.5	4th annual update provided to stakeholders.	30 June 2016	Yes	Annual update provided.	
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	In progress	Advice has been provided on aerial bait rates for wild dogs and foxes to AWI, LLS, NSW DPI and APVMA, and these outcomes were discussed and considered at the National Feral Cat Workshop.	Preliminary analyses of data from various sources (e.g. GPS, camera traps, LLS livestock and dog management records) will be formalised to provide strategic recommendations in early 2017.
2C1	R2.1.4	Pilot scale field trials completed if pen efficacy results warrant further investigation.	30 June 2016	Cancelled	The active assessed failed efficacy testing.	Further development of the project was therefore abandoned.
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.	The manuscript will be submitted to a suitable journal such as Applied Animal Behaviour Science or Physiology & Behaviour about end November 2016.
2C2	R2.2.2	Proof-of-concept studies completed with existing options, including microencapsulated sodium nitrite	30 June 2014	Yes	A report on the preliminary evaluation of sodium nitrite as a rodenticide has been completed and accepted. Two aligned projects assessing the same active ingredient showed poor uptake and zero percent lethality in rats consuming sodium nitrite formulations.	
2C2	R2.2.3	Preferred rodenticide actives formulated and free-choice pen efficacy trials completed	30 June 2015	In progress	This milestone is dependent on new actives identified in the conventional screen of chemicals (USDA, BASF, Nufarm databases) and in the genetic screen of mice receptors passing the review of an expert toxicologist and regulatory consultant. This review has been completed and a short-list of 6 actives selected.	These actives will be tested prior to March 2017.
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	This milestone is dependent on study outputs and strategy for protecting any IP that could be commercialised. Results of Achilles heel review of house mouse physiology have been communicated to GRDC/ACTA/USDA as key stakeholders but will not be publically disclosed until closer to the registration of a new rodenticide product.	Results will remain commercial in confidence until approval from GRDC is received to publish the research outputs. Milestone will be achieved by 31 December 2016.

Project No.	Output/milestone number	Description	Contracted achievement date	Achieved	Reason/details	Strategies to achieve unmet milestone
2C2	R2.2.4	Domestic registration and field/pen trials started for the most promising rodenticides.	30 June 2016	In progress	This milestone will be delayed by approximately 12 months and is dependent on the results from the initial screening pen studies indicating one of the 6 short-listed chemicals satisfies efficacy and humaneness criteria.	This milestone will be delayed by approximately 12 months and is dependent on the results from the initial screening pen studies.
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	Results from pen and large enclosure studies but not field studies will be available by March 30 2017.	These results will be communicated to stakeholders and potential investors so that larger scale field studies can be undertaken in Australia and the USA.
2C4	R2.3.1	Non-toxic field trials of feral pig baits in the USA completed	30 June 2013	Yes	Project report on non-toxic field trials of feral pig baits in the USA completed and received. Manuscript published - Bait Preference of Free-Ranging Feral Swine for Delivery of a Novel Toxicant.	
2C4	R2.3.3	Toxic field trials of feral pig baits in the USA started	30 June 2015	In progress	Milestone dependent on the USDA EPA approving an experimental use permit (EUP) prior to field trials commencing. The delay was due to a change in the manufacturing process.	The toxicology, chemistry and physical tests are complete. This data along with the field trial protocol was incorporated into the EUP application and submitted to the EPA on 30th June 2016. The assessment process can take up to 16 months.
2C4	U2.3.1	HOGGONE® and a nitrite concentrate registration package submitted to APVMA in Australia	30 June 2013	In progress	The APVMA application is complete except Part 7 Efficacy and Safety. This requires field trial data that demonstrates the efficacy of the product used per label instructions and relatively safety for end users and non-target species. These field trials were delayed due to a change in manufacturing process.	New prototype product was tested in March 2016 in western NSW. 3-4 additional field trials will be completed between June and September 2016 (weather dependant).
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 will be achieved by 30 June 2017.
2C4	R2.3.4	Toxic field trials of feral pig baits in the USA completed.	30 June 2016	In progress	This milestone delay is due to the need for USDA EPA approving the EUP prior to field trials commencing.	The EUP application was submitted on June 30 2016. The assessment process can take 16 months.

Project No.	Output/ milestone number	Description	Contracted achievement date	Achieved	Reason/details	Strategies to achieve unmet milestone
2C4	U2.3.4	Results of field studies published, and presented and promoted to end-users and stakeholders.	30 June 2016	In progress	Presentation of selected results from the project were delivered during the: American Vertebrate Pest Conference, California, USA (March 2016), and International Wild Pig Conference, South Carolina, USA (April 2016).	<p>After completion of planned AUS field studies (July to Sep 2016) with the paste product, a project report will be finalised by end of October 2016.</p> <p>Using successful extension, awareness and participation, and well-established communication channels the project team will communicate project activities highlighting key events and scientific breakthroughs to stakeholders and the general public. This will occur in consultation with the Australian Government. Future presentation of select results will occur at the Australasian Vertebrate Pest Conference (May 2017, Canberra).</p>
2C11	U2.4.1	GonaCon™ registration package prepared and submitted to APVMA	30 June 2013	In progress	The USDA owns the EPA registration dossier for Gonacon use in white tail deer and horses and have licenced both to a not for profit company based in Oklahoma USA - SpayFirst for commercialisation purposes. IAL has negotiated access to both dossiers from SpayFirst for the purposes of registering Gonacon in Australia (if possible). The EPA dossiers are currently being used to prepare an APVMA application for a new veterinary medicine in Australia that will be available for vets or wildlife management staff to use on free-ranging wildlife only eg cervids, brumbies and macropods.	The toxicology data package is complete and the Chemistry and Manufacturing data package is 85% complete and efficacy and Safety data package is 50% complete. The APVMA application will be submitted prior to September 30 2016.
2C12	U2.4.2	Once approved by APVMA, GonaCon™ launched in Australia	30 June 2015	In progress	Requires APVMA registration submission (see U2.4.1) .	Expected to occur once Milestone U2.4.1 is achieved and APVMA considers registration.

Project No.	Output/milestone number	Description	Contracted achievement date	Achieved	Reason/details	Strategies to achieve unmet milestone
2C12	U2.4.3	GonaCon™ applied by the ACT government as an effective kangaroo fertility control	30 June 2015	Yes	The ACT government has an APVMA approved permit for a field trial to assess the effectiveness of Gonacon as a fertility control product for eastern grey kangaroos. Gonacon is being administered to kangaroos via hand injection or darting currently and these animals' fertility will be monitored until 2020.	
2C13	R2.4.5	Field/enclosure trials of any successful anti-fertility formulations conducted.	30 June 2016	In Progress	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. The approach of using modified sperm/sperm proteins produced some interesting results, including significantly reduced binding of sperm to eggs, but these are unlikely to sterilise an animals at this point. Additional targeting-cytotoxic conjugate reagents that have proven cytotoxic effects are being prepared for assessment in mares late this year or in the first quarter of calendar year 2017.	
1W2	R3.1.8	Evaluation of two eDNA detection methods completed	30 June 2015	Yes	Evaluation of two methods has been complete. The choice of eDNA capture, storage, extraction method and filtration materials can significantly affect DNA yield.	
1W2	R3.1.10	Development of high throughput detection system completed.	30 June 2016	Yes	The evaluation of eDNA metabarcoding has been completed.	
1W2	R3.1.11	Practical evaluation of detection system started.	30 June 2016	Yes	Practical evaluation is now underway through custom primer development and field sampling.	
3W1	R3.2.3	KHV susceptibility trials completed	30 June 2014	Yes	All susceptibility trials are now completed. The manuscript has been drafted and it is in review.	
3W2	R3.2.4	National KHV release, monitoring and evaluation plan prepared (including plans for post release carp clean-up)	30 June 2015	In progress	Plan completion awaiting the Epidemiological Modelling being undertaken for the post-release carp clean-up plan.	This milestone is expected to be completed by December 2016.

Project No.	Output/ milestone number	Description	Contracted achievement date	Achieved	Reason/details	Strategies to achieve unmet milestone
3W1	R3.2.5	Scientific evaluation of KHV concluded	30 June 2015	Yes	Research has concluded. Technical report and manuscripts are in review.	
3W2	U3.2.2	KHV registration package submitted to government regulators	30 June 2015	In progress	IA CRC has had a preliminary meeting with the APVMA. Further information has been requested by the APVMA to add to the registration package before formal submission.	Milestone will now be achieved by 30 December 2016.
3W2	R3.2.6	Pre-KHV release benchmark monitoring at selected sites started.	30 June 2016	Yes	Methods for collection of data on ecosystem health established and sites selected. Collection of pre-release benchmarking data for fish, macroinvertebrate, macrophyte, and water quality is now complete for season 1. Laboratory sorting is now underway and will be complete prior to commencement of spring sampling.	
4E1	U4.1.1	Research findings incorporated by end-users, including IA CRC participants, in design and delivery of regional pest animal control programs	30 June 2015	Yes	Online toolkit deployed, VET modules and training package developed, Online Community of Practice (CoP) capacity building module completed. More tools and research findings will continue to be disseminated throughout the projects life.	
4E1	R4.1.7	International forum on best practice support and engagement in community-based management of invasive pests held.	30 June 2016	In progress	Planning for an international forum is underway, to be held in February 2017.	International forum planned for February 2017.
4E1	U4.1.2	Research findings incorporated by end-users, including IA CRC participants, in design and delivery of regional pest animal control programs.	30 June 2016	Yes	Research findings have been incorporated by end users into front line projects and programs.	
4E2	U4.2.1	Preliminary research findings incorporated by end-users, particularly IA CRC participants involved in project, in new extension materials and programs	30 June 2015	Yes	The IA CRC has incorporated a wide range of research findings into end-user projects, extension material and on-ground programs. Examples include (and limited by) the following -2015 National Feral Management Workshop Proceedings and recommendations to Australian Government, integrated management models used by Kingsborough and Glamorgan Spring Bay Councils, and the Community Based Social Marketing approaches being adopted by communities affected by wild dog and feral deer populations.	

Project No.	Output/milestone number	Description	Contracted achievement date	Achieved	Reason/details	Strategies to achieve unmet milestone
4E2	R4.2.5	Workshop on behavioural change held	30 June 2015	Yes	Online workshop of online communications audit tool with partners in Victoria and Queensland, and IA CRC communications staff, was held May 2015. From this, training material was developed for group capacity building, allowing behavioural change and capacity building workshops to be conducted with Queensland and Tasmanian stakeholders in the latter half of 2015.	
4E2	R4.2.7	One peer-reviewed journal paper submitted.	30 June 2016	Yes	One journal article has been published, another submitted in May 2016 and three additional articles are approaching submission in the latter half of 2016.	
4E2	R4.2.8	Report on behavioural strategies to achieve effective community action published.	30 June 2016	In progress	Report as a journal publication: 'Encouraging participation in invasive animal management: A review of behavioural intervention frameworks' is drafted due for submission by 31 August 2016.	A report is due for submission by 31 August 2016.
4E2	U4.2.2	Expert and practitioner workshop or conference held on the use of behavioural science to improve invasive animal control programs.	30 June 2016	Yes	This was delivered via Masterclass, VET community engagement and online communication workshops held during 2015 and 2016.	
4E3	R4.3.4	Technical report on how relevant stakeholders perceive and respond to invasive animal control institutional arrangements published	30 June 2014	Yes	An institutional technical report that identifies key stakeholders, relevant instruments, and policies was published in early 2016.	
4E3	R4.3.6	Workshop report on challenges and strategies for the improvement of invasive animal control institutions completed	30 June 2015	Yes	Contained in Martin P. and Low Choy D. (2016). Recommendations for the reform of invasive species management institutions. PestSmart Toolkit Publication, Invasive Animals Cooperative Research Centre: Canberra, and Martin P, Low Choy D, Le Gal E and Lingard K. (2016). Effective Citizen Action on Invasive Species: The Institutional Challenge. Invasive Animals Cooperative Research Centre: Canberra Further publications are planned on the Workshops and Delphi Survey.	

Project No.	Output/ milestone number	Description	Contracted achievement date	Achieved	Reason/details	Strategies to achieve unmet milestone
4E3	R4.3.7	Working paper or technical report evaluating the impact of institutional reform strategies completed.	30 June 2016	Yes	Contained in Martin P. and Low Choy D. (2016). Recommendations for the reform of invasive species management institutions. PestSmart Toolkit Publication, Invasive Animals Cooperative Research Centre: Canberra, and Martin P, Low Choy D, Le Gal E and Lingard K. (2016). Effective Citizen Action on Invasive Species: The Institutional Challenge. Invasive Animals Cooperative Research Centre: Canberra Further publications are planned on the Workshops and Delphi Survey.	
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	In progress at 30 June 2016	In progress at 30 June 2016. Invasive Plants and Animals Committee (Meeting 6) endorsed the research finding on 1 August 2016.	Now Achieved. Invasive Plants and Animals Committee (Meeting 6) endorsed the research finding on 1 August 2016.
4E11	U4.5.2	Complementary market analyses of training needs and likely utilisation undertaken in NSW Department of Primary Industries in conjunction with Tocal College, and other state pest management agencies	30 June 2013	Yes	Achieved – see R4.5.4.	
4E11	U4.5.3	Revised national competencies for Certificate and Diploma level training in pest animal management endorsed by Vertebrate Pests Committee and accredited nationally	30 June 2015	Yes	Final contribution has been made to the review of the Pest Management components of the Agriculture, Horticulture and Conservation and Land Management Training Package (CLM Training Package) as developed by AgriFood Skills Australia. AgriFood Skills has now submitted the revised competencies to the National Skills Standards Council, Standards for Training Packages for endorsement by State and Federal Government.	
4E11	R4.5.4	VET Certificate and Diploma units packaged into courses for pest managers completed	30 June 2015	Yes	The revised new units of competency and existing units of competency have been packaged into Certificate III in Pest Management, Certificate IV in Pest Management and Diploma of Pest Management qualifications. Two new Units of Competency have been added to the scope of the CLM Training package at Certificate and Diploma levels that expand and strengthen the units available to provide skills in addressing the human dimension of pest management.	

Project No.	Output/milestone number	Description	Contracted achievement date	Achieved	Reason/details	Strategies to achieve unmet milestone
4E11	R4.5.5	Preparation of training materials completed for delivery in face-to-face and online formats.	30 June 2016	Yes	Two units of competency have been included in training relating to the human dimensions of pest animal management for the VET Sector.	
4E11	U4.5.4	Delivery and market courses to state agencies and RTOs completed.	30 June 2016	Yes	Pilot courses have been completed in Western Australia and Queensland, including attendees representing industry, state and local government invasive species professionals.	
2C5	O1.3	Operational performance of rabbit warren fumigator determined under field-simulated conditions	30 June 2013	In progress	Delayed due to protracted legal negotiations with WG&B Manufacturing. However a memorandum of understanding has been negotiated and signed off that sets out the responsibilities for each party in achieving the commercialisation of warren fumigators globally. This MOU will form the basis for a future Commercialisation agreement (manufacturing and distribution) between WG&B and IAL.	All parties have agreed to the form of the commercialisation agreement now. A completed Product Development Agreement will be signed off by the 22nd of August 2016. Fumigators are currently being made and will be delivered to the project by 1 October 2016. Field trials are planned to be completed before the calendar year ends and a registration application as soon as practical after the field trial data is incorporated into the Part 8 Efficacy and Safety dossier (data warranting).
2C5	O1.4	National APVMA registration package for rabbit warren fumigator submitted	30 June 2013	In progress	In progress - milestone delay as is contingent on achievement of milestone O1.3	Field trials are planned to be completed before the calendar year ends and a registration application as soon as practical after the field trial data is incorporated into the Part 8 Efficacy and Safety dossier (data warranting).
	T1.5	Final Transition plan reviewed and submitted to Commonwealth.	30 June 2016	Yes		



The Australian community is engaged by the idea that our rivers could run clear again (image supplied by Dean Norbiato).

APPENDIX B

Publications

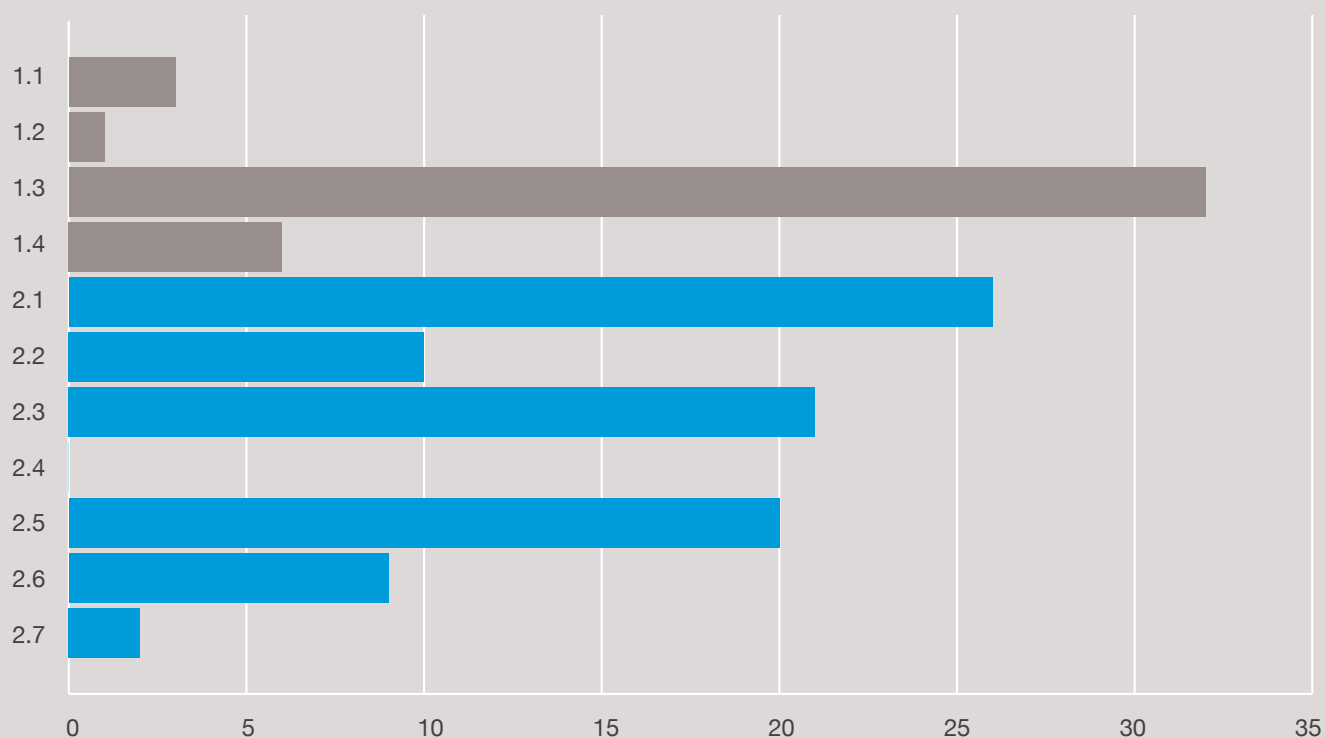
Table 23: IA CRC Project Publication List 2015-16

Code		Total number
Formal Publications		
1.1	Book	3
1.2	Book chapter/s	1
1.3	Articles in scholarly refereed journals	32 [^]
1.4	Full written conference paper – refereed proceedings	6
Publications and reports for end-users		
2.1	Conference abstract in a non-refereed proceedings publication	26
2.2	PestSmart Technical Report	10
2.3	PestSmart Glovebox Guide, Factsheet or webpage	21
2.4	PestSmart Case Study	-
2.5	PestSmart DVD/Multimedia product	20
2.6	Invasive Animals CRC newsletter, including e-Newsletter	9
2.7	Other IA CRC or agency related factsheet or report	2

* not all publication types listed in appendix

[^] 38 articles submitted or under peer review in scholarly refereed journals

Figure 12: IA CRC Project Publication List 2015-16



OUTCOME 1: NO NEW VERTEBRATE PESTS ESTABLISHED IN AUSTRALIA

1.3 Article in scholarly-refereed journal

Jul 2015	Dingoes are a major causal factor for the distribution of sheep in Australia	Australian Veterinary Journal 93(4): 90-92	Allen, B.L., & West, P.	1L5
Aug 2015	Priority threat management of invasive animals to protect biodiversity under climate change	Global Change Biology 21: 3917-3930	Firn, J., Maggini, R., Chadès, I., Nicol, S., Walters, B., Reeson, A., Martin, T.G., Possingham, H.P., Pichancourt, J.B., Ponce-Reyes, R. & Carwardine, J.	1L11
Aug 2015	Species assignment from trace DNA sequences: an in silico assessment of the test used to survey for foxes in Tasmania.	Journal of Applied Ecology 52(6) 1649-1655	MacDonald, A.J. & Sarre, S.D.	1L21
Dec 2015	Saving the Lake Eyre Basin's biodiversity	Australian Veterinary Journal 93(12): N22	Firn, J. & Carwardine, J.	1L11
Jan 2016	A framework for estimating sensitivity of eDNA detection.	Molecular Ecology Resources 16: 641-654	Furlan, E., Gleeson, D., Hardy, C., & Duncan, R.	1W2
Mar 2016	Environmental DNA detection of redfin perch, <i>Perca fluviatilis</i>	Conservation Genetics Resources	Furlan, E., & Gleeson, D.	1W2
Mar 2016	Alien species as a driver of recent extinctions.	Biology letters	Bellard, C., Cassey, P., & Blackburn, T.M.,	1L4
Apr 2016	Improving reliability in environmental DNA detection surveys through enhanced quality control.	Marine and Freshwater Research	Furlan, E., & Gleeson, D.	1W2
May 2016	Assessment of non-target risks from sodium fluoroacetate (1080), para-aminopropiophenone (PAPP) and sodium cyanide (NaCN) for fox-incursion response in Tasmania.	Wildlife Research 43, 140-152.	Mallick, S., Pauza, M., Eason, C., Mooney, N., Gaffney, R., & Harris, S.	1L23
Jun 2016	The illegal wildlife trade is a credible source of alien species.	Conservation Letters	García-Díaz, P., Ross, J.V., Woolnough, A.P., & Cassey, P.	1L4
Jun 2016	Physical attractiveness, constraints to the trade and handling requirements drive the variation in species availability in the Australian cagebird trade.	Ecological Economics	Vall-Ilosera, M., & Cassey, P.	1L4
Jun 2016	Blackburn, T.M. (2016) Biological invasions and natural colonisations are different – the need for invasion science.	NeoBiota	Wilson J.R.U., García-Díaz, P., Cassey, P., Richardson, D.M., Pyšek, P., & Blackburn, T.M.	1L4
Jun 2016	Improving the containment of a freshwater invader using Environmental DNA (eDNA) based monitoring.	Biological Invasions	Bylemans, J., Furlan, E.M., Pearce, L., Daly, T., & Gleeson, D.M.	1W2

2.1 Conference paper – non-refereed proceedings

Jul 2015	FeralScan community mapping of Australia's worst pest animals.	Citizen Science Association Conference, Canberra, ACT.	West, P., Marsh, J., & Tracey, J.	1L5
Jul 2015	Combining traditional and environmental DNA (eDNA) based monitoring to improve the management of native and invasive fish species.	Genetics Society of Australasia Annual Conference, Adelaide, SA.	Bylemans, J., Furlan, E.M., Daly T., Pearce, L., & Gleeson D.M.	1W2
Jul 2015	Estimating the sensitivity of eDNA detection	Genetics Society of Australasia Annual Conference, Adelaide, SA.	Furlan, E., Gleeson, D., Hardy, C., & Duncan, R.	1W2
Oct 2015	Combining traditional and environmental DNA (eDNA) based monitoring to improve the management of native and invasive fish species.	Proceedings of the Australian Society of Fish Biology Annual Conference, Sydney, NSW.	Bylemans, J., Pearce, L., Furlan, E.M., Daly, T., & Gleeson, D.M.	1W2

OUTCOME 1: NO NEW VERTEBRATE PESTS ESTABLISHED IN AUSTRALIA

Nov 2015	Environmental DNA detection: Applications for wildlife management.	28th Australasian Wildlife Management Society Annual Conference, Perth, WA.	Furlan, E.M., Duncan, R., Bylemans, J., Hinlo R., & Gleeson, D.M.	1W2
Nov 2015	Improving national biosecurity: The potential to adapt the HACCP Model to manage invasive species in Australia	28th Australasian Wildlife Management Society Annual Conference, Perth, WA.	Christy, M.	1L1
Nov 2015	Community mapping of Australia's worst pest animals with FeralScan.	28th Australasian Wildlife Management Society Annual Conference, Perth, WA.	West, P., Tracey J., & Fleming, P.	1L5
May 2016	An environmental DNA based method for monitoring spawning activity: a case study using the endangered Macquarie perch (<i>Macquaria australasica</i>).	Society for Freshwater Science Annual Conference, Sacramento, USA	Bylemans J., Furlan, E.M., Hardy C.M., Lintermans, M., & Gleeson, D.M.	1W2
2.2 PestSmart Technical Report				
Aug 2015	Surveillance and Forecasts for Mouse Outbreaks in Australian Cropping Systems.	Technical report. http://www.pestsmart.org.au/surveillance-and-forecasts-for-mouse-outbreaks-in-australian-cropping-systems/	Pech, R., Brown, P., Cruz, J., Henry, S., Hinds, L., Byrom, A., West, P., & Farrell, J.	1L5
Nov 2015	The utility of eDNA as a tilapia surveillance tool	Technical report http://www.pestsmart.org.au/edna-as-a-tilapia-surveillance-tool/	Noble, T.H., Robson, H.L.A., Saunders, R.J. & Jerry, D.R.	1W2
Jun 2016	Finding cost-effective future monitoring strategies for foxes in Tasmania	Technical Report (unpublished)	Rout, T.M., Barclay, C., McDonald-Madden, E., Caley, P., & Ramsey D.S.L.	1L24
2.3 PestSmart Glovebox guide, Factsheet or webpage				
Dec 2015	Incursions	Webpages http://www.pestsmart.org.au/incursions/		1L1
2.5 PestSmart DVD / multimedia				
Aug 2015	MouseAlert - mouse monitoring app	YouTube video https://youtu.be/Fg5lQZw4udE	West, P.	1L5
2.7 Other IA CRC related publications & reports				
Aug 2015	Priority threat management of invasive animals to protect biodiversity in the Lake Eyre Basin	CSIRO Publications http://www.csiro.au/en/Research/LWF/Areas/Ecosystems-biodiversity/Monitoring-biodiversity/Conservation-decisions/Lake-eyre-threat-management	Firn, J., Maggini, R., Chadès, I., Nicol, S., Walters, B., Reeson, A., Martin, T.G., Possingham, H.P., Pichancourt, J.-B., Ponce-Reyes, R. & Carwardine, J.	1L11

OUTCOME 2: IMPROVED PREDICTION AND CONTROL OF EMERGING OUTBREAKS

1.3 Article in scholarly-refereed journal

Jan 2016	Bait Preference of Free Ranging Feral Swine for Delivery of a Novel Toxicant	PLoS ONE	Snow, P.N., Halseth, J.M., Lavelle, M.J., Hanson, T.E., Blass, C.R. Foster, J.A., Humphrys, S.T., Staples, L.D., Hewitt, D.G., & VerCauteren, K.C.	2C4
Apr 2016	Aldehyde Dehydrogenase Plays a Pivotal Role in the Maintenance of Stallion Sperm Motility	Biology of Reproduction	Gibb, Z., Lambourne, S.R., Curry, B.J., Hall, S.E., & Aitken, R.J.	2C13

2.1 Conference abstract in a non-refereed proceedings publication

Mar 2016	Electrophilic aldehydes increase free radical production and modify surface proteins in horse spermatozoa	International Congress of Animal Reproduction	Hall S.E., Gibb, Z., Nixon, B., Smith, N., & Aitken, R.J.	2C13
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2.3 PestSmart Guide, Fact Sheet or webpage

Aug 2015 (updated Jul 2016)	IA CRC Product Status Update	Webpage http://www.pestsmart.org.au/iacrc-product-status-update	Humphrys, S.	
Jun 2016 (updated)	Frequently asked questions: PAPP for wild dog and fox control	Factsheet http://www.pestsmart.org.au/PAPP	Staples, L., Humphries S and Mifsud G (reviewed)	2C5

2.5 PestSmart DVD or multimedia product

Jul 2015	Mallee Recovery	YouTube video https://youtu.be/gHX7cVRacCY	Wishart, J.	2C11e
Aug 2015	New feral pig toxin: a collaboration between the US and Australia	YouTube video https://youtu.be/MkGhw78I3es	Vercauteren, K.	2C4
Aug 2015	Mouse monitoring, modelling and MouseAlert	YouTube video https://youtu.be/ursQyUaGmJc	Henry, S.	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

Sep 2015	Comparative Phylodynamics of Rabbit Hemorrhagic Disease Virus in Australia and New Zealand.	Journal of Virology	Eden, J.S., Kovaliski, J., Duckworth, J.A., Swain, G., Mahar, J.E., Strive T. & Holmes, E.C.	3L4
Oct 2015	Expression and partial characterisation of rabbit haemorrhagic disease virus non-structural proteins	Virology	Urakova, N., Frese, M., Hall, R.N., Liu, J., Matthaei, M., & Strive, T.	3L4
Dec 2015	Resolving the Origin of Rabbit Hemorrhagic Disease Virus: Insights from an Investigation of the Viral Stocks Released in Australia	Journal of Virology	Eden, J.S., Read, A. J., Duckworth, J.A., Strive T. & Holmes, E.C.	3L4
Dec 2015	Resolving the origin of rabbit haemorrhagic disease virus (RHDV): insights from an investigation of the viral stocks released in Australia.	Journal of Virology	Eden, J.S., Read, A.J., Duckworth, J.A., Strive, T. & Holmes, E.C.	3L3
Dec 2015	Emerging Rabbit Hemorrhagic Disease Virus 2 (RHDVb), Australia	Emerging Infectious Diseases	Hall, R.N., Mahar, J.E., Haboury, S., Stevens, V., Holmes, E.C. & Strive T.	3L4
Mar 2016	Environmental effects and individual body condition drive seasonal fecundity of rabbits: identifying acute and lagged processes.	Oecologia	Wells, K., O'Hara, R.B., Cooke, B.D., Mutze, G.J., Prowse, T.A.A., & Fordham, D.A.	3L2
Apr 2016	Purification and Biochemical Characterisation of Rabbit Calicivirus RNA-Dependent RNA Polymerases and Identification of Non-Nucleoside Inhibitors	Viruses Basel	Urakova, N., Netzler, N., Kelly, A.G., Frese, M., White, P.A. & Strive, T.	3L4
May 2016	Targeting season and age for optimizing control of invasive rabbits	The Journal of Wildlife Management	Wells, K., Cassey, P., Sinclair, R. G., Mutze, G.J., Peacock, D. E., Lacy, R. C., Cooke, B. D., O'Hara, R. B., Brook, B. W. & Fordham, D. A.	3L5

2.1 Conference abstract in a non-refereed proceedings publication

Aug 2015	The search for new rabbit biocontrols: potential of Eimeria intestinalis and E. flavescens from south-west Western Australia and RHDV2	Victorian Rabbit Control Conference	Peacock D. & Mutze G.	3L5
Aug 2015	Seeking additional biological control agents to augment rabbit haemorrhagic disease virus (RHDV) and myxomatosis: Managing Australia's recovering rabbit population	Victorian Rabbit Control Conference	Peacock D. & Mutze G.	3L5
Sep 2015	Rabbit haemorrhagic disease and myxomatosis epidemiology in an ongoing 19 year study of the Australian Turretfield rabbit population	10th European Vertebrate Pest Management conference	Peacock, D., Sinclair, R., Kovaliski J. & Schwensow, N.	3L5
Sep 2015	RHD and the Turretfield rabbit population	First European / Australian RHDV Workshop: Vairão, Portugal	Sinclair, R., Peacock, D., Kovaliski, J. & Capucci, L.	3L5

2.2 PestSmart Technical Report

Nov 2015	Business case to advance the selection of new rabbit biocontrol agents	Technical Report	Agtrans Research Peacock, D. (compiler)	3L5
Jun 2016	Recommendations for a long-term rabbit biocontrol plan	Technical Report (prepared for IPAC)	Strive, T.	3L4

2.3 PestSmart Glovebox Guide, Fact Sheet or webpage

Aug 2015	The arrival of RHDV-2 in Australia and implications for current rabbit biocontrol initiatives	Factsheet http://www.pestsmart.org.au/the-arrival-of-rhdv2-in-australia-and-implications-for-current-rabbit-biocontrol-initiatives/	Rabbit Biocontrol Scientific Committee	
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OUTCOME 3: RECOVERY OF KEY LAND AND WATER REGIONS AFTER HUMANE CONTROL OF RABBITS, WILD DOGS AND CARP

Aug 2015	RHDV1 K5: Frequently asked questions	Webpage http://www.pestsmart.org.au/rhdv-k5-frequently-asked-questions/	Rabbit Biocontrol Scientific Committee	3L1
Oct 2015	RHDV1 K5: What about my pet rabbit	Webpage http://www.pestsmart.org.au/rhdv-k5-what-about-my-pet-rabbit/	Rabbit Biocontrol Scientific Committee	3L1
Nov 2015	Rabbit biocontrol in Australia: key facts	Factsheet http://www.pestsmart.org.au/rabbit-biocontrol-in-australia-key-facts/	McDonald, I.	3L1
Nov 2015	Boosting rabbit biocontrol: RHDV5 national release - how you can get involved	Factsheet http://www.pestsmart.org.au/get-involved-as-a-monitoring-site/	McDonald, I., West P. & Cox. T.	3L1
Jan 2016	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
2.5 PestSmart DVD or multimedia product				
Aug 2015	Genetic resistance, immunity and transmission of rabbit biocontrol	YouTube video https://youtu.be/qsCbf8li43k	Strive, T.	3L4
Dec 2015	Importance of rabbit biological control to livestock producers	YouTube video https://youtu.be/UOIXUYj4CWY	Allen, C.	3L1
Mar 2016	Rabbit haemorrhagic disease (RHD) boost project	YouTube video https://youtu.be/xmjNabtcvS0	Cox, T.	3L1
Wild Dog				
1.3 Article in scholarly-refereed journal				
Nov 2015	Resolving the value of the dingo in ecological restoration.	Restoration Ecology	Newsome, T.M., Ballard, G.-A., Crowther, M.S., Dellinger, J.A., Fleming, P.J.S., Glen, A.S., Greenville, A.C., Johnson, C.N., Letnic, M., Moseby, K.E., Nimmo, D.G., Nelson, M.P., Read, J.L., Ripple, W.J., Ritchie, E.G., Shores, C.R., Wallach, A.D., Wirsing, A.J., & Dickman, C.R.	3L11
Dec 2015	Death by sex in an Australian icon: A continent-wide survey reveals extensive hybridization between dingoes and domestic dogs.	Molecular Ecology	Stephens, D., Wilton, A.N., Fleming, P.J.S., & Berry, O.,	3L11
Mar 2016	Diet of dingoes and other wild dogs in peri-urban areas of north-eastern Australia.	Scientific Reports 6, 1-8.	Allen, B.L., Carmelito, E., Amos, M., Goulet, M.S., Allen, L.R., Speed J., Gentle, M. & Leung, L.K.P.	3L13
2.1 Conference abstract in a non-refereed proceedings publication				
Jul 2015	Deriving contact rates of dingoes and domestic dogs from camera traps.	61st Australian Mammal Society, Alice Springs, N.T.	Sparkes, J., Ballard, G., Fleming, P.J.S. & Körtner, G.	3L11
Nov 2015	Yellowstone National Park two decades after the wolf reintroduction: did they deliver the environmental benefits predicted and what are the lessons for predator and wildlife management here in Australia	28th Australasian Wildlife Management Society, Perth, WA.	Mifsud, G.	3L14

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

Nov 2015	Interactions between wild and domestic dogs: implications for rabies spread in Australia.	28th Australasian Wildlife Management Society, Perth, WA.	Sparkes, J., Allen, B., Körtner, G., Ballard, G., Fleming, P & Meek, P.	3L11
Dec 2015	Culling canids increases mesic macropods while reducing livestock losses.	Ecological Society of Australia Annual Conference, Fremantle, WA.	Fleming, P., Thompson, J. & Ballard, G.	3L11
Feb 2016	A preliminary bio-economic analysis of wild dog management in northern NSW livestock industries	56th Annual Australian Agricultural Economics Society Conference	Khairo, S., Cacho, O., Hadley, D., Fleming, P. & Hean, R.	3L11

2.3 PestSmart Glovebox guide, Fact Sheet or webpage

Apr 2016 (updated)	Wild dog risks to threatened wildlife	Factsheet http://www.pestsmart.org.au/wild-dog-risks-to-threatened-wildlife/	Allen, B (reviewed)	3L11
				3L13
Apr 2016 (updated)	FAQ - Wild dog home ranges and movements	Factsheet http://www.pestsmart.org.au/faq-wild-dog-home-ranges-and-movements/	Newsome, T (reviewed)	3L11
				3L13
Apr 2016 (updated)	Have you got wild dogs?	Factsheet http://www.pestsmart.org.au/have-you-got-wild-dogs/	Allen, B (reviewed)	3L11
				3L13
Apr 2016 (updated)	Working Plan to Manage Wild Dogs	Glovebox Guide http://www.pestsmart.org.au/working-plan-to-manage-wild-dogs/	Allen B and Fleming P. (reviewed)	3L11
Apr 2016 (updated)	Frequently Asked Questions – Wild dog impacts	Factsheet http://www.pestsmart.org.au/pestsmart-wild-dog-impacts-faq/	Allen, B (reviewed)	3L11
				3L13
May 2016 (updated)	Working dog safety and first aid	Factsheet http://www.pestsmart.org.au/working-dog-safety-first-aid/	Fleming, P (reviewed)	
May 2016 (updated)	FAQ - Wild dogs and poison baiting	Factsheet http://www.pestsmart.org.au/faq-wild-dogs-and-poison-baiting/	Mifsud, G., Fleming, B., and Allen, B. (reviewed by Mifsud, G)	3L14
Jun 2016 (updated)	Glovebox Guide for Managing Wild Dogs	Glovebox Guide http://www.pestsmart.org.au/pestsmart-glovebox-guide-for-managing-wild-dogs/	Allen, B.	3L14
Jun 2016 (updated)	Guidelines for Preparing a Working Plan to Manage Wild Dogs	Glovebox Guide www.pestsmart.org.au/guidelines-for-preparing-a-working-plan-to-manage-wild-dogs/	Allen, B., Ballard, G., and Fleming P.	3L11
			(reviewed by Allen, B)	3L13

2.5 PestSmart DVD or multimedia product

Aug 2015	The wild dog problem in Australia	YouTube video https://youtu.be/bhePCuT5ue8	Fleming, P.	3L11
Aug 2015	Wild dogs - trophic cascade and mesopredator release hypothesis	YouTube video https://youtu.be/noMfF2ZQOHc	Fleming, P.	3L11
Aug 2015	Wild dog management - how does community engagement fit in?	YouTube video https://youtu.be/e0Qx93TeB0s	Fleming, P.	3L14

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

Dec 2015	The impacts of wild dogs and investment in management	YouTube video https://youtu.be/MaBEnpmi4Jc	Evans, I.	3L14
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European Carp

2.1 Conference abstract in a-refereed proceedings publication

Oct 2015	Cyprinid herpesvirus 3: a potential biological control agent for carp in Australia	Australian Society of Fish Biology, Sydney, NSW.	McColl, K.A., Sunarto, A., Barwick, M. & Gilligan D.	3W1
Oct 2015	The Countdown to Carp Control: progress with implementation of a biological control program for Common carp in Australia	Australian Society of Fish Biology, Sydney, NSW.	Barwick, M. & Gilligan, D.	3W2
Nov 2015	Cyprinid herpesvirus 3: a potential biological control agent for carp in Australia	New Zealand Freshwater Sciences Society and Australian Society for Limnology	A McColl, K.A., Sunarto, A., Fulton, W., Crane, M., Gilligan D.	3W1

2.3 PestSmart Glovebox Guide, Fact Sheet or webpage

Mar 2016	Carp herpesvirus as a biological control method for carp	Factsheet http://www.pestsmart.org.au/pestsmart-factsheet-carp-herpesvirus/	McColl., K.A	3W1
May 2016	Carp herpesvirus: Frequently Asked Questions	Webpage http://www.pestsmart.org.au/carp-herpes-faq/	McColl., K.A., Barwick., M. & Creese, B.	3W1 3W2

2.5 PestSmart DVD or multimedia product

Aug 2015	Biocontrol for carp – potential benefits and stakeholder engagement	YouTube video https://youtu.be/ssOZo0dFxbQ	Barwick, M.	3W2
Aug 2015	Biocontrol for carp – carp herpesvirus (CyHV-3)	YouTube video https://youtu.be/mq6hDajYVHU	Gilligan, D.	3W2
Aug 2015	Carp biocontrol (carp herpesvirus) & non-target species testing	YouTube video https://youtu.be/p5zfpQWh_zU	McColl, K.A.	3W1

2.7 Other IA CRC or agency related factsheet or report

Jun 2016	Clearer Waters: Australia's Carp Biocontrol program	Factsheet	Barwick., M.	3W2
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Other

1.3 Article in scholarly-refereed journal

Feb 2016	Feral cat home-range size varies predictably with landscape productivity and population density.	Journal of Zoology	Bengsen, AJ, Algar, D, Ballard, G, Buckmaster, T, Comer, S, Fleming, PJS, Friend, JA, Johnston, M, McGregor, H, Moseby, K and Zewe, F.	3L11
Sep 2015	Homo sapiens is the apex animal: Anthropocentrism as a Dionysian sword.	Australian Zoologist	Fleming, P.J.S, Ballard, G.	3L11
May 2016	Are we getting the full picture? Animal responses to camera traps and implications for predator studies.	Journal	Meek, P, Ballard, G., Fleming, P, Falzon, G.	3L11
Feb 2016	Can recreational hunting contribute to pest mammal control on public land in Australia?	Mammal Review	Bengsen, A J and Sparkes, J	3L20

1.4 Full written conference paper – refereed proceedings

Jun 2016	Can recreational hunting control pests on public lands?	Conservation through Sustainable Use of Wildlife	Bengsen, A J, Sparkes, J and McLeod, S R	3L20
Sep 2015	National Feral Cat Management Workshop Proceedings	Conference Workshop Proceedings	J Tracey, C Lane, P Fleming, C Dickman, J Quinn, T Buckmaster & S McMahon (Eds)	3L35e

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

2.1 Conference abstract in a non-refereed proceedings publication				
Oct 2015	Spot the difference: Camera trap methodology for detecting and individually identifying spotted-tailed quolls (<i>Dasyurus maculatus</i>).	Australian Mammal Society 61st annual Conference, Hobart, Tasmania	Forge, T., Körtner, G., Ballard, G., Vernes, K. & Fleming, P.	3L11
Nov 2015	Predicting feral cat home range from environmental productivity or population density.	28th Australasian Wildlife Management Society, Perth, WA	Bengsen, A.J., Algar, D., Ballard, G., Buckmaster, T., Comer, S., Fleming, P.J.S., Friend, J.A., Johnston, M., McGregor, H., Moseby, K. & Zewe, F.	3L11
Nov 2015	Managing Australian placental predators: interactions and ecological roles.	28th Australasian Wildlife Management Society, Perth, WA	Forge, T., Körtner, G., Ballard, G. & Fleming, P.	3L11
Nov 2015	Smile or “run away”! You are on not-at-all candid camera.	28th Australasian Wildlife Management Society, Perth, WA	Meek, P., Ballard, G., Fleming, P. & Falzon, G.	3L30f
Nov 2015	What have we learnt from a year of intensive feral cat monitoring?	28th Australasian Wildlife Management Society, Perth, WA	Zewe, F., Ballard, G., Fleming, P., Körtner, G., Vernes, K., van der Eyk, J. & Śmielak, M.	3L11
2.3 PestSmart Glovebox Guide, Factsheet or webpage				
Jul 2015 (updated)	Feral cat (<i>Felis catus</i>)	Factsheet http://www.pestsmart.org.au/feral-cat/	Halliday D.	
2.5 PestSmart DVD or multimedia product				
Aug 2015	Part 1 - New computer assisted technologies for pest animal management	YouTube video https://youtu.be/Fpnm84wH8LM	Meek, P.	3L30f
Aug 2015	Part 2 - New computer assisted technologies for pest animal management	YouTube video https://youtu.be/HUeFmQaYkvo	Meek, P.	3L30f

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

1.1. Book				
May 2016	Reclaiming the rabbit problem with Australia’s communities	Book	Reid, M.	4E6
1.3 Article in scholarly-refereed journal				
Apr 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 56: 100-111.	Marshall, G.R., Coleman, M. J., Sindel, B.M., Reeve I.J. & Berney, P.J.	4E1
Nov 2015	‘Born to roam? Drivers and barriers related to cat containment’	Preventative Veterinary Medicine 122(3): 339-344.	McLeod, L., Hine, D.W. & Bengsen, A.	4E2
2.1 Conference abstract in a non-refereed proceedings publication				
Mar 2016	‘Making time for tea: conservation agencies as learning organisations’	14th Annual Savanna Science Network Meeting, Kruger National Park, South African National Parks, South Africa	Dickson, K.	4E1
Aug 2015	Connecting knowledge and know-how for effective community action on rabbits	Victorian Rabbit Management Conference	Victorian Rabbit Action Network	4E6

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

Oct 2015	Invasive animals in Australia: reframing the problem.	Australian and New Zealand Society for Ecological Economics Biennial Conference, Armidale, NSW	Howard, T., Please, P. & Thompson, L.J.	4E1
Oct 2015	'Natural resource management agencies as learning organisations'	Australian and New Zealand Society for Ecological Economics Biennial Conference, Armidale, NSW	Dickson, K.	4E1
Nov 2015	How to use behavioural science to increase participation in wild dog management in peri-urban and rural landscapes	Australasian Wildlife Management Conference, Perth, WA	Please, P., Hine, D., Skoien, P. & Phillips, K.	4E2
Nov 2015	Managing the managers: Applying behavioural science for more effective management outcomes	Australasian Wildlife Management Conference, Perth, WA	McLeod, L., Hine, D. & Bengsen, A.	4E2
Dec 2015	"Opening Pandora's box": Talking to communities and individuals about wild dog management in Australia.	Australasian Wildlife Management Society Conference. Perth, Australia.	Howard, T. & Skoien, P	4E1
2.2 PestSmart Technical Report				
Dec 2015	Leadership and Community engagement for Invasive Animals Management in Australia: scoping study	Technical report (unpublished)	Thomson, L. & Alter, T.	4E1
Jan 2016	Transforming Regional Biosecurity Response Research Collaboration - Department of Agriculture and Food WA and Invasive Animals CRC Report 1: Findings and recommendations from DAFWA staff interviews	Technical report (unpublished)	Howard, T.	4E4a
Feb 2016	Transforming Regional Biosecurity Response Research Collaboration - Department of Agriculture and Food WA and Invasive Animals CRC Report 2: Insights and intervention points from key informant interviews	Technical report (unpublished)	Howard, T.	4E4a
May 2016	Recommendations for the reform of invasive species management institutions	Technical Report http://www.pestsmart.org.au/recommendations-for-the-reform-of-invasive-species-management-institutions/	Martin, P. & Low Choy, D.	4E3
May 2016	Discussion paper: effective citizen action on invasive species	Technical Report http://www.pestsmart.org.au/effective-citizen-action-on-invasive-species-the-institutional-challenge/	Martin, P., Low Choy, D., Le Gal, E. & Lingard, K.	4E2
2.5 PestSmart DVD or multimedia product				
Jul 2015	Rabbit management and challenges – a farmer's perspective	YouTube video https://youtu.be/EzRjGwxxPXw	Campbell, S.	4E6
Aug 2015	Community led integrated rabbit management - Michael Reid, National Rabbit Management Facilitator	YouTube video https://youtu.be/3X70tpDQWVs	Reid, M.	4E6
Dec 2015	Historical and current impacts of rabbits - a farmers perspective	YouTube video https://youtu.be/3sUSswfxDVI	Lord, D.	4E6
Jan 2016	Principles of best practice pest animal management	YouTube video https://youtu.be/JJEMr2pM4U0	West, P.	

ACRONYMS AND ABBREVIATIONS

ACTA Animal Control Technologies Australia

APVMA Australian Pesticides and Veterinary Medicines Authority

AWI Australian Wool Innovation

CISS Centre for Invasive Species Solutions CRC cooperative research centre

CSIRO Commonwealth Scientific and Industrial Research Organisation

CyHV-3 cyprinid herpesvirus 3

DAFWA Western Australian Department of Agriculture and Food

DEDJTR Victorian Department of Economic Development, Jobs, Transport, and Resources

DPIPWE Tasmanian Department of Primary Industries, Parks, Water and Environment

eDNA environmental DNA

IA CRC Invasive Animals Cooperative Research Centre

IAL Invasive Animals Limited IP intellectual property

MLA Meat and Livestock Australia

NSW DPI New South Wales Department of Primary Industries

NSW LLS New South Wales Local Land Services

PAPP para-aminopropiophenone

PIRSA Primary Industries and Regions South Australia

QDAF Queensland Department of Agriculture and Fisheries

QMDC Queensland Murray-Darling Committee

R&D research and development

RD&E research, development and extension

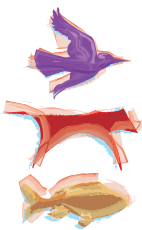
RHD rabbit haemorrhagic disease

RHDV rabbit haemorrhagic disease virus

SME small-to-medium enterprise

TOGETHER, CREATE AND APPLY SOLUTIONS

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