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THE CAMPAIGN TO CREATE CHANGE

Hidden Vale Project

RESEARCH IMPACT REPORT 2020



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Hidden Vale Research Manager Introduction

The Hidden Vale Wildlife Centre was officially opened three years ago, which means our first PhD student is nearing completion. This signifies that the first full 'research cycle' is almost complete, making it an opportune time to take stock of the achievements of the Hidden Vale Project so far, and refine our directions moving forward.

On a daily basis, my role entails unique exposure to, and awareness of, the research outcomes and growing impact of the Hidden Vale Project. The goal of this report is to share this by documenting the research themes; demonstrating how Turner Family Foundation research funding is being applied; and present the research achievements so far, as well as those underway.

As just one example illustrating research impact, the Hidden Vale team have presented over 30 conference papers globally since the inception of the Project. This shows evidence of the spread of the Hidden Vale Project story, building our collective reputation, while fostering crucial collaborations and partnerships.

The wider impact of the Project was never more obvious than in the wake of the recent devastating bushfires, when our expertise was sought by leading wildlife conservation groups across the country. We were asked to provide advice on the best methods of wildlife reintroductions incorporating unique technology developed through research within the Hidden Vale Project. For an entity still in its infancy, this speaks volumes about the positive impact and reputation we are cultivating already.

The Hidden Vale Project is a remarkable element of the Turner Family legacy, and the research outcomes and impact would simply not be possible without the Turners' vision, generosity, and trust in the team working at the coalface. However, this legacy is becoming even more powerful as the Project grows, such that it is now part of the legacy of each of the individuals involved. As the first Hidden Vale Research Manager, I am fortunate to have been involved with establishing some foundational building blocks and am immensely proud that this Project



is a chapter of my own legacy. The research students and staff who contribute to the growth and success of the Project every day are also lucky to call it part of their legacy. As these students and researchers go out into the world to further their careers, they take with them the Hidden Vale principles of a strong and positive research culture, and the vision we all share for a better planet.

We will never be able to accurately measure the impact of the Hidden Vale Project as the flow-on effects are already extending well beyond the perimeter of the Wildlife Centre and the Turner properties. However, it is abundantly clear that this collective legacy is infinitely powerful, and is launching enduring positive change in conservation globally for generations to come.

Dr Julia Hoy

Research Manager
Hidden Vale Wildlife Centre

Background to the Hidden Vale Project

The Hidden Vale Project is a collaborative conservation initiative between the Turner Family Foundation (TFF) and The University of Queensland (UQ).

TFF's long-term vision is: *to support resilient functioning ecosystems across our network of properties and the broader region, where key species and processes are restored, land use is sustainable and people are connected with nature.*

UQ's vision for this Project is: *to develop innovative and globally significant solutions for wildlife management and conservation, using the Hidden Vale Wildlife Centre and surrounding ecosystems as a model.*

To align these compatible visions, the Hidden Vale Wildlife Centre (HVWC) was officially opened in March 2017. The HVWC is owned and managed by the TFF, which grants UQ a long term license to utilise it. The HVWC boasts state of the art facilities that support a wide range of research, teaching and engagement activities, and it serves as a base for conservation activities.

Forming the backbone of The Hidden Vale Project (HVP) are three large private properties that are managed by the Turner Family Foundation: Old Hidden Vale, Spicers Peak Station and Mount Mistake. These properties currently form a total area of 8,367 ha, with 4,500 ha having perpetual Nature Refuge status. These properties support a diversity of wildlife, regional ecosystems, habitat types and land uses, and are a veritable science laboratory for undergraduates, postgraduates and the broader research community, where innovative solutions can be developed for real world problems. Current land uses on the properties include cattle grazing, mountain biking and other ecotourism activities.

The vision on these properties is central to the overall project vision, where conservation and human land use are managed in balance to ensure the protection and enhancement of ecosystem condition in perpetuity.

Hidden Vale Project Mission

Through research, ecological restoration and education the Hidden Vale Project seeks to build an enduring legacy to:

- Maximise captive wildlife management to improve *in situ* conservation;
- Have a scientific underpinning to captive management, restoration and land management;
- Connect people with conservation; and
- Develop innovative and globally significant solutions for wildlife conservation and restoration using the Hidden Vale Project resources as a model.

Unique circumstances that enable the Hidden Vale Project vision

A set of unique resources and circumstances combine to allow this vision.

These include:

- The facilities of the Hidden Vale Wildlife Centre;
- Large private land areas that are regionally significant in size, with multiple land uses and large tracts of remnant vegetation;
- The easy proximity of both of these to the greater Brisbane metropolitan area; and
- An enduring, unprecedented partnership between the Turner Family Foundation and The University of Queensland for funding and access to land, as well as other teaching, research and restoration partnerships.

Research Themes

Hidden Vale Project research is broadly grouped into two areas:

Captive research streams

Using the Hidden Vale Wildlife Centre:

- Next-generation husbandry and captive management;
- Technological advances in conservation;
- Wildlife pre-release strategies.

Ecology/ecosystem research streams

Using the Hidden Vale property and other Turner Family Foundation properties:

- Pest and threat management;
- Habitat condition and restoration;
- Sustainable land uses (e.g. agriculture and ecotourism);
- Ecosystem and trophic dynamics.

Overarching Project Goal

To develop *innovative and globally significant solutions* for wildlife management and conservation, using the Hidden Vale Wildlife Centre and surrounding ecosystems as a *model*

Ex situ conservation sub-goal

Maximise captive wildlife management to improve *in situ* conservation

Captive research streams

Next-generation husbandry and captive management

Technological advances in conservation

Wildlife pre-release strategies

In situ conservation sub-goal

To address threats to the conservation of threatened and keystone species, for restoring ecosystem integrity

Ecology/ecosystem research streams

Pest and threat management

Habitat condition and restoration

Sustainable land uses (e.g. agriculture)

Ecosystem and trophic dynamics

The Hidden Vale difference: Research Support Program

The research support funding provided to the Hidden Vale Project by the Turner Family Foundation is designed to have **greatest impact, for the greatest number of students** and includes:

- 1) Top-up scholarships of \$7,000 per year for three years for a total of six PhD students at any one time.
- 2) Access to 8,367 hectares of real-world research-focused land and land uses, with research support of vegetation mapping, land use data, LiDAR data, fieldwork tablets, and long-term research sites.
- 3) Access to a purpose-built state of the art captive wildlife research facility, with a range of camera-equipped enclosures, research rooms, laboratories and a fully equipped veterinary clinic.
- 4) Desk space and office equipment within the postgraduate room at the Wildlife Centre.
- 7) Access to one-on-one statistical advice and training with a highly experienced statistician on site at the Wildlife Centre one day per month.
- 8) Social support program—every second month all HV research students are hosted a morning tea at Spicers retreat where they share the trials and tribulations of the research experience.

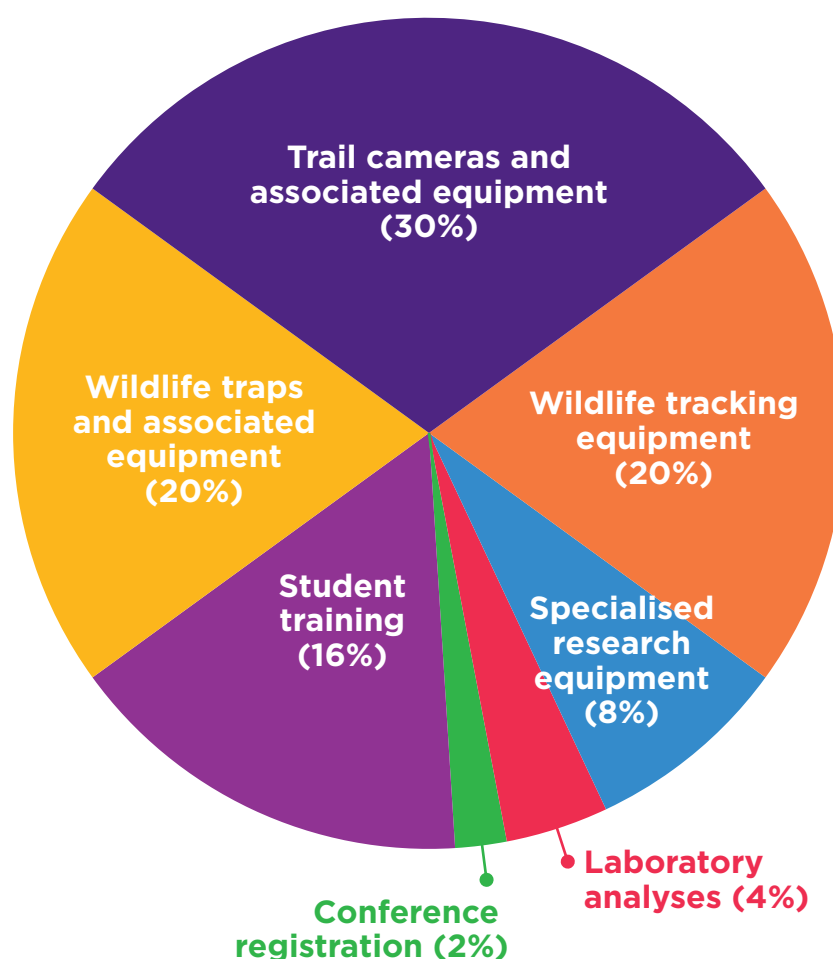


- 5) Access to a wide range of research equipment including cameras, traps, and vehicles.
- 6) Eligibility to apply for quarterly research funding via an online application form. There is up to \$12,000 in total available each round (\$48,000 per year) to be split between a range of research projects as determined by the HVP Research Committee.
- 9) Research training program—on the alternate month to the morning tea, research training sessions are held on topics ranging from scientific writing, to public speaking, Endnote, research ethics, graduate school procedures etc with guest speakers when suitable. Topics for these sessions are flexible and are guided by current student needs and requests.
- 10) Access to one-on-one general research support and advice from a TFF-funded, UQ Research Manager based on site at the Wildlife Centre.

Expenditure of TFF research support funding

Discretionary research funding is comprised of two components:

- 1) \$48,000 per annum split across quarterly research student and staff internal funding rounds.
Scope: Students and staff apply via online application form for funding to support their research. Categories include: research equipment (remains property of the HVWC); fieldwork expenses; laboratory analysis; conference registration; and specialist research training.
- 2) \$20,000 per annum discretionary research funding.
Scope: Equipment and support for the benefit of a wide range of research students and staff. Includes research and field equipment, and execution of the research training program (including specialist statistical support and guest speakers).



Examples of Turner Family Foundation funding increasing research capacity and impact



Trail cameras and associated equipment

Trail cameras are the most commonly utilised research equipment within the Hidden Vale Project and are deployed in field-based and captive studies. Whilst access to a small number of cameras is possible through students' enrolling Schools, there are often restrictions on the number of cameras available, and duration of their use. It has been demonstrated that the value of research outcomes improves greatly by increasing the number of trail cameras deployed. TFF research funding has facilitated the purchase of more than 60 trail cameras with associated equipment for the exclusive use of Hidden Vale students and staff. This directly translates to more robust and reliable research outcomes and remain a valuable resource for future members of the Hidden Vale team.



Wildlife traps and associated equipment

Wildlife traps are an essential tool for ecological and captive research. As with the trail cameras, some Schools do have wildlife traps, but the restrictions on the number of traps, and duration of their use often impacts research possibilities. TFF research funding has facilitated the purchase of quality cage traps in various sizes, small mammal traps and associated trapping equipment. This means Hidden Vale students have easy access to a large quantity of traps, such that their research is not restricted by the availability of equipment. These traps are stored at the Wildlife Centre and will remain an asset of the Project for future use.



Wildlife tracking equipment

Historically, one of the biggest downfalls in traditional wildlife release research is a paucity of post-release data. This is primarily due to the high expense of wildlife tracking equipment. TFF research funding has facilitated the purchase of a range of VHF and GPS tracking equipment which allows Hidden Vale students to gather the most reliable results and contribute to an important area of wildlife science. Understanding where wildlife go, and how they interact within their ecosystem is critical to increasing their chance of survival. This is where post-release monitoring with wildlife tracking equipment is of the utmost importance.



Student training

In addition to the wide range of training available to all UQ students, Hidden Vale students can apply for TFF funding for specialised training, are provided with one-on-one statistical advice on site at the Wildlife Centre on a monthly basis, and attend presentations by guest speakers. These valuable opportunities allow Hidden Vale students to further develop and enhance a wide range of skills to achieve greater research impact.



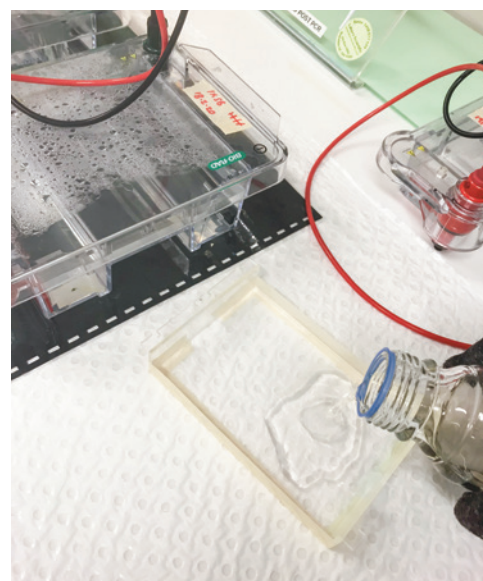
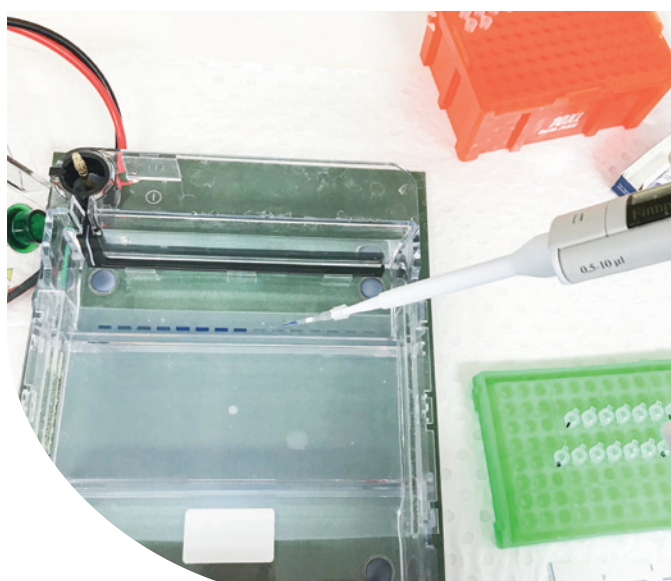
Specialised research equipment

Hidden Vale students are encouraged to be innovative and bold when designing their research methodology. Often this involves a need for highly specialised research equipment. Without the availability of TFF research funding, access to such equipment would not be possible, thus limiting how much impact the research can have. As with all equipment purchased with TFF funding, this equipment remains the property of the Hidden Vale Project, becoming valuable assets for use by current and future students and staff.



Laboratory analyses

Undertaking laboratory analyses is often expensive, but yields highly valuable research outcomes. In some research studies, analysis of wildlife samples can be cost-prohibitive, but with the ability to apply for TFF funding, Hidden Vale students are fortunate to have the opportunity to be able to fund this important laboratory work.



Conference attendance

Effective science communication and collaboration are important aspects of the research student journey. Hidden Vale students are supported to attend and present at conferences using TFF funding. Not only is this an important part of the individual students' development, it increases the profile of the Hidden Vale Project, and leads to highly valuable partnerships.



Social support program

Hidden Vale students come together on a monthly basis to share the trials and tribulations of the research journey. Every second month involves a morning tea at Spicers Retreat, alternating with a more structured training session in the Wildlife Centre. This program allows students to discuss the progress of their research, while increasing their awareness and involvement in the wider Hidden Vale Project. Wildlife research is often challenging, and with long hours of fieldwork can also be isolating, so this program encourages vital connections, and provides support to individuals which translates to stronger research outcomes across the board.



Hidden Vale Conservation Top Up Scholarships

Turner Family Foundation research support funding encompasses top up scholarships of \$7,000 per year for three years for PhD students. This generous support makes PhD positions within the Hidden Vale Project highly sought-after, and directly contributes to an increase in research impact by reducing financial pressure, and intensifying focus on achieving research milestones. The quotes below from the first top up scholarship recipients directly illustrate how valuable this support is.

“Funding provided by the Turner Family Foundation has had an immense personal and professional impact on me. Personally, it has lifted the economic stress of full time research, especially as my experiments often occur at odd hours and would not allow much other work. Professionally, it has supported the critically important conservation work being undertaken at Hidden Vale, and ensured the crucial attention it so deeply deserves.”

Meg Edwards

Hidden Vale Conservation
Top Up Scholarship recipient 2018



“The generous top up scholarship provided to me from the Turner Family Foundation has relieved an enormous amount of pressure and stress relating to living expenses. This has enabled me to fully focus on my PhD and will ultimately lead to me producing better research outcomes.”

Charlotte Tinsley

Hidden Vale Conservation
Top Up Scholarship recipient 2018



“The generosity of the Turner Family Foundation has provided not only financial support and access to study areas, but beyond this, an excellent research facility at Hidden Vale that offers collaborative research opportunities and a supportive environment to undertake ecological research. For me personally, this support has meant that I can undertake threatened species’ research, which I believe in so profoundly, while supporting my small family, something I wouldn’t have been able to do otherwise.”

Kellie Goodhew

Hidden Vale Conservation
Top Up Scholarship recipient 2019

Examples of Hidden Vale Project research underway



Australian mammals' naivety towards predators: innovative solutions

Research level: PhD

Student: Megan Edwards
(Hidden Vale Conservation Top Up Scholarship recipient)

Advisors: Associate Professor Peter Murray,
Dr Julia Hoy, Dr Sean FitzGibbon



Background

Native wildlife in Australia have faced devastating effects from introduced predators, as our fauna has not evolved concurrently with eutherian predators. Following the introduction of cats, foxes and other exotic predators, Australia now has the world's worst mammal extinction record that has been the motivation behind many wildlife reintroduction programs. However, ongoing predation by these introduced predators remains the downfall of most of these programs.

One method of combatting these high extinction rates and failed reintroduction programs includes training native animals to avoid introduced predators. Research within the Hidden Vale Project is leading the way globally by combining predator avoidance training with microchip-automated devices to provide released (microchipped) animals with areas of refuge inaccessible by predators.

Expected outcomes

This research will improve outcomes of wildlife reintroduction or translocation programs, by providing innovative solutions for predator control. The use of microchip-automated devices has shown great potential, particularly for hollow dependent species such as phascogales and possums, and predator avoidance could aid in survival after release.

Read more

<http://bit.ly/predator-avoidance-technology>

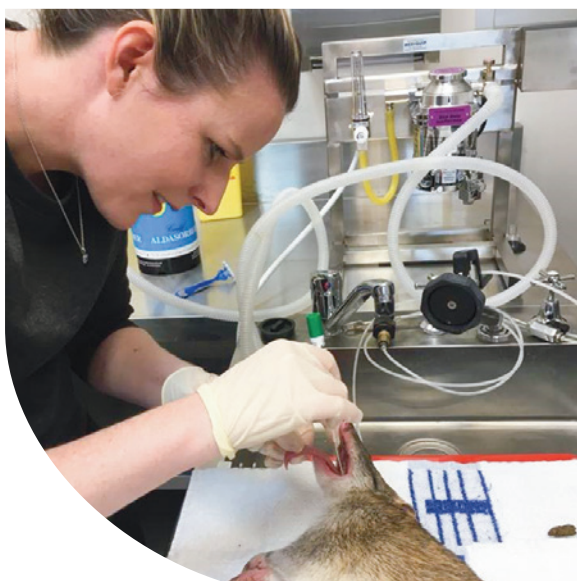


The impact of human landscapes on wildlife-pathogen dynamics

Research level: PhD

Student: Charlotte Tinsley
(Hidden Vale Conservation Top Up
Scholarship recipient)

Advisors: Associate Professor Peter Murray,
Dr Julia Hoy, Dr Steven Kopp



Background

Clearing of native forests for the expansion of urban and agricultural areas results in substantial alterations to native ecosystem structures and processes. Exposure to certain pathogens may be higher in wildlife inhabiting heavily modified, anthropogenic landscapes. Reduction in habitat size combined with behavioural modifications such as seeking anthropogenic food sources can lead to increased interaction between humans, domestic animals and wildlife species.

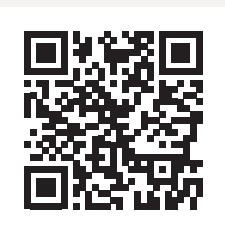
As urban and agricultural areas continue to expand, research in this area is not only important to safeguard wildlife health but also human and domestic animal health.

Expected outcomes

This research will contribute to knowledge of the epidemiology of certain pathogens in South East Queensland. It will provide a greater understanding of how human land-use impacts the health of wildlife. An improved understanding of the wildlife-pathogen dynamics in these landscapes may also aid in limiting the risk of human and domestic animal exposure to disease.

Read more

<http://bit.ly/landscape-wildlife-pathogens>



Spotted-tailed quoll spatial ecology in South East Queensland

Research level: PhD

Student: Kellie Goodhew
(Hidden Vale Conservation Top Up
Scholarship recipient)

Advisors: Associate Professor Diana Fisher,
Dr Megan Brady, Dr Scott Burnett,
Dr April Reside



Background

The endangered South East mainland spotted-tailed quoll *Dasyurus maculatus maculatus* is the largest marsupial carnivore remaining on the mainland. It was once widely distributed and occupied a variety of habitat types. However, it is thought to have declined severely in Victoria and NSW in the last decade so that it survives in only a few strongholds such as the Snowy Mountains and the northern tablelands of NSW. It is possible that locations in South East Queensland are crucial last mainland strongholds for this threatened species, but we do not have current information on the distribution and abundance of spotted-tailed quolls in South East Queensland. Previous estimates suggest that South East Queensland populations may have undergone a range contraction in excess of 30%. The main causes of spotted-tailed quoll decline are likely habitat loss, fragmentation and modification, although introduced species such as red foxes and cane toads are also implicated. This project aims to determine if specific habitats and topographical features are associated with spotted-tailed quoll persistence versus disappearance in South East Queensland, or whether other threatening processes play a more important role.

Expected outcomes

This research will determine habitat factors essential for persistence that can be protected or restored to ensure the conservation of endangered Spotted-tailed quolls in South East Queensland. The identification of threatening processes that act at local and landscape scales is an essential part of this research and will be vital for managing landscapes and mitigating risks to populations across their current range in South East Queensland.

Read more

<http://bit.ly/quoll-spatial-ecology>



Drivers of intra- and interspecies variation in predator avoidance training success

Research level: PhD

Student: Caitlin Ford

Advisors: Associate Professor Peter Murray,
Dr Julia Hoy, Dr Megan Brady,
Megan Edwards



Background

Introduced predators in Australia contribute to the continuing decline of native wildlife, predominantly caused by the lack of fear prey species have when encountering these predators. This 'prey naivety' is thought to have caused the extinction of 30 native mammal species. Additionally 80% of failed reintroduction programmes can be attributed to introduced predators.

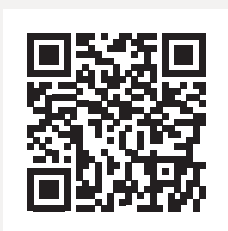
Predator avoidance training aims to improve the response of native prey to these introduced predators. This training reduces prey naivety, and has already been successful in an array of taxa. By presenting an introduced predator and an adverse event simultaneously across multiple training sessions. This technique teaches animals to recognise and respond fearfully towards these predators, and in this research animals will also be trained to use microchip-automated nest boxes to evade predators. Little research has assessed the efficacy of different methods and the influence animal temperament may have on these methods.

Expected outcomes

Using the yellow-footed antechinus and the eastern chestnut mouse as model species, it is expected that after training they will display predator avoidance behaviours, while using microchip automated nest boxes as a refuge. It is expected that these newly learned behaviours will be beneficial to their post-release survival, and therefore trained animals will have increased survival compared to untrained animals. It is likely that animals with different temperaments will respond to training differently, and this difference will also influence their post-release survival.

Read more

<http://bit.ly/temperament-predators>



Development of the Mata Hari Judas canid

Research level: PhD

Student: Natalie Fraser

Advisors: Associate Professor Peter Murray,
Dr Julia Hoy



Background

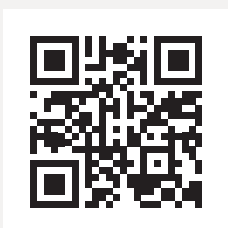
Control of feral canids, such as wild dogs and foxes, is important to protect native wildlife in Australia. Current control methods such as trapping, baiting, and shooting typically fail to eliminate the entire feral population, allowing feral animals to persist and their populations to recover. The Mata Hari Judas (MHJ) canid is a novel approach to feral canid management, and has been successfully used to eradicate other feral animals such as goats. A MHJ animal is a female that has been hormonally treated to display persistent oestrus; the MHJ female can be released to find conspecifics and subsequently tracked to find remnant animals in a population.

Expected outcomes

This research will determine the hormonal treatment that is both safe and effective for inducing persistent oestrus and that the MHJ canid can be used to identify and eradicate animals in remnant feral populations.

Read more

<http://bit.ly/MHJ-canids>



Koala behavioural ecology and implications for their conservation

Research level: PhD

Student: Alex Jiang

Advisors: Associate Professor Peter Murray,
Dr Andrew Tribe



Background

Koala populations are declining and in Queensland their conservation status was downgraded to 'vulnerable to extinction' in 2012. In order to reverse this decline, conservation based on rigorous scientific research on their ecology and mitigation of threats to their survival, are urgently needed. This project is studying aspects of their ecology including population survey methodology, reproductive behaviour and the possible threat from cattle.

Expected outcomes

This research will greatly enhance the reliability of koala scat surveys to determine their distribution, critical for effective conservation.

Understanding the relationship between koalas bellowing and associated breeding behaviour will improve the effectiveness of future conservation strategies.

Evidence of cattle-associated koala deaths/injuries will require development of conservation/farm management strategies to minimise the risk to koalas cohabiting with cattle.

Read more

<http://bit.ly/koala-conservation>



***In situ* animal classification on embedded devices for biodiversity surveys**

Research level: Masters

Student: Nic Heaney

Advisors: Associate Professor Peter Murray,
Dr Phil Valencia, Dr Julia Hoy



Background

Ecological wildlife surveys are often inaccurate due to the inherent bias in current techniques used (e.g. limited trapping time, the effect of weather, welfare concerns), forcing environmental scientists to explore new methods to conduct surveys. As many wildlife conservation decisions are based on such surveys, it is important that more accurate, methods be developed.

Image recognition and machine learning (ML) techniques offer promising approaches to improve survey methodology. ML research focuses on algorithms, patterns and models to generate outputs based on previously observed inputs (training data). Recent advances in the ML field suggest that algorithms could be run on embedded (low power) battery operated devices, with the potential to apply image classification on a low power embedded device. Classifications of animals could then be reported, from remote locations, providing a new continuous ecological survey method without the spatial and temporal biases of current survey techniques.

Expected outcomes

This research aims to design and evaluate a continuous vision-based biodiversity survey system using embedded machine learning. To overcome the inherent bias of traditional trapping methods, this approach will attempt to provide finer spatial and temporal resolution while factoring labour and system costs.

Read more

<http://bit.ly/insitu-classification>



Using seed-based restoration to restore a degraded system

Research level: Masters

Student: Fernanda Caro Beveridge

Advisors: Professor Steve Adkins,
Dr Megan Brady, Dr Alwyn Williams,
Dr Robyn Cave



Background

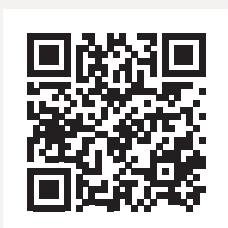
The forests of eastern Australia are considered a world biodiversity hotspot, making their restoration of crucial importance. Seed-based restoration involves sowing a seed mix of different plant species to re-establish cleared plant communities and is often used in areas where site factors such as access or other constraints preclude revegetation. When using seeds for restoration, it is important to study the biology and ecology of the selected species to understand the different approaches needed to achieve effective germination, and what biotic and abiotic cues are required to trigger this event. Besides overcoming seed germination issues, it is critical to create a favourable micro-environment for seed germination and seedling establishment, if seedling recruitment is to be maximised. This would help reduce seed losses by overcoming seed germination constraints and ensuring maximum efficient use of resources, which are often limiting in large-scale restoration projects.

Expected outcomes

This research was expected to identify site preparation and seed application treatments that could improve the initial phases of seed-based restoration. While glasshouse trials yielded some promising results, overall in field trials extremely low native seedling emergence and soil cover were experienced and various treatments failed to improve seedling emergence. One native species was however identified that performed satisfactorily in field conditions and further work should be done on identifying other native species that could perform similarly. These results demonstrate the realistic challenges presented when trying to restore degraded landscapes.

Read more

<http://bit.ly/seed-based-restoration>



The *in situ* use of microchip-automated devices for wildlife

Research level: Honours

Student: Shania Watson

Advisors: Associate Professor Peter Murray,
Dr Julia Hoy, Megan Edwards



Background

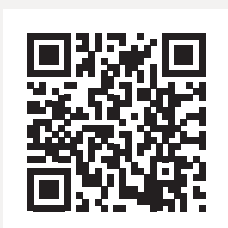
Microchip-automated technology has the potential to assist with reducing predation, mitigation of habitat loss and competition for resources. By controlling access of individual animals to resources, microchip-automated technology facilitates provision of targeted supplementary feed, and refuge from predators. Microchip-automated doors installed on nest boxes allow microchipped animals access to these nest boxes. Animals of other species or even individuals of the same species without the correct microchip cannot access the resource. This individually targeted technology can be used by a wide range of threatened species for resource supplementation.

Expected outcomes

This research will be the first step in investigating the use of microchip-automated technology in the wild. If successful, it can assist in developing a method that can be altered and applied to a wide range of species. This will allow for targeted supplementation of resources such as protected nesting sites and food, which will directly increase the success of wildlife reintroductions.

Read more

<http://bit.ly/insitu-microchips>



Red fox relative abundance and survey method efficacy

Research level: Honours

Student: Karmen Butler

Advisors: Associate Professor Peter Murray,
Dr Megan Brady



Background

No other continent in the world has seen a greater impact of invasive predators to biodiversity than has occurred in Australia. In particular, meso-predators such as the fox are more adapted to habitat fragmentation than their hierarchal apex predators such as the dingo or wild dog, resulting in habitat-mediated meso-predator release and increased negative impacts on the ecosystem in fragmented landscapes. Research into reliable methods of determining red fox abundance is therefore crucial to assist with their management, especially in areas with scarce information such as South East Queensland.

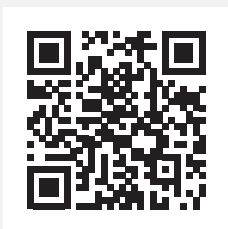
Foxes are notoriously difficult to survey to obtain accurate abundance estimates. Due to the fox's non-specific diurnal, nocturnal and crepuscular habits, as well as their wide range of habitat use, several non-invasive census techniques have been deployed to determine relative abundance of foxes. Non-invasive methods of collecting and quantifying data can be uncertain because animals can't be identified individually due to imperfect detections of signs or tracks. It is therefore recommended that multiple independent techniques be incorporated and the value quantitatively contrasted within abundance studies.

Expected outcomes

Assessment of the efficacy of multiple survey methods, including the development of a new method for using detection dogs to gain quantitative information, will allow more robust fox abundance estimates to be made. This research will contribute to baseline data for long-term research into feral predator impacts and dynamics and is an important step in the development of fox adaptive management programs.

Read more

<http://bit.ly/fox-abundance>



The effectiveness of stem-injected chemical and biological herbicides for the management of invasive woody weeds

Research level: Honours

Student: Ciara O'Brien

Advisors: Professor Victor Galea,
Dr Megan Brady



Background

Restoration of native ecosystems at Hidden Vale, like vast areas of South East Queensland, is currently hindered by numerous invasive woody weeds. Historical clearing for agricultural expansion has caused degradation and erosion, as well as facilitated the spread of invasive plant species. Common current mechanisms of control, whilst their efficacy is undisputed, often result in collateral damage to non-target species through herbicidal drift. This can result in a reduction in the richness, abundance and diversity of sensitive plant species in adjacent habitats. Therefore, the development of environmentally sensitive methods of weed control is paramount. This research project investigated the effectiveness of Bioherbicide Australia's (BHA Pty Ltd) proprietary stem-injection system ("InJekta") for controlling woody weed species in conserved or environmentally sensitive habitats.

Expected outcomes

The preliminary screening of these encapsulated herbicides will assist in the development of weed management protocols that can improve efficiency and effectiveness of weed control over broad and sensitive habitats. Successful local-scale eradication at the trial sites will also facilitate the regeneration of native riparian vegetation thereby improving the habitat values for resident and migratory fauna.

Read more

<http://bit.ly/stem-injected-herbicides>



Fox control efficacy and non-target impacts using canid pest ejectors and PAPP

Research level: Honours

Student: Alex Munro

Advisors: Associate Professor Peter Murray,
Dr Megan Brady, Dr Benjamin Allen



Background

To help mitigate the impacts of introduced red foxes, control is necessary. Para-aminopropiophenone (PAPP) is a toxin recently scheduled for use in Australian pest control programs. Benefits over the poison 1080 include relative humaneness and an accessible antidote, while lacking the controversy associated with 1080. PAPP has the potential to overtake 1080 as the poison of choice for fox control.

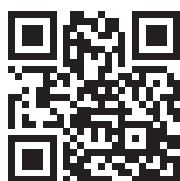
However, an issue with PAPP is that its target specificity has not been researched to the same extent as 1080, potentially posing a risk to a number of species. It is believed that this risk can be reduced by using a meat lure and canid pest ejectors. The ejector mechanism requires a pull force (to eject the toxin) that has been predicted to functionally inhibit all Australian-resident mammal species from the toxin, besides foxes, dogs/dingoes, quolls and Tasmanian devils. Further, the toxin can be delivered at a dose rate that is believed to be non-lethal to adult dogs, however, this has not been tested in the field. The efficacy of using this fox dose rate of PAPP in canid pest ejectors in reducing fox numbers has not been reported, and its non-target impacts not quantified. This is important information that needs to be known prior to large scale use of PAPP.

Expected outcomes

It is expected that fox numbers will drop as a result of the use of PAPP. Furthermore only foxes, dingoes/wild dogs, goannas, and potentially possums will be capable of triggering ejectors and accessing the poison. Infrared camera data will show how these species trigger the ejector to help determine whether they are at risk of a fatal dose or not. The results of this research will inform development of integrated fox management programs at a local scale but will also potentially be used in land management across Australia, where efficacy of pest control and consequences on non-target species are important factors.

Read more

<http://bit.ly/fox-control>



Biodiversity in remnant, regrowth and pasture landscapes

Research level: Honours

Student: Thomas Scott

Advisors: Associate Professor Peter Murray,
Dr Megan Brady, Dr Greg Baxter



Background

Landscape modification by human land use has resulted in landscapes worldwide being dynamic mosaics of elements of cleared matrix, and remnant and regrowth vegetation. Landscape modification has a pervasive influence on biodiversity, including on both fauna and their habitat. As landscapes are modified, core remnant habitat can decrease or become unsuitable as habitat and the nature of regrowth vegetation and matrix attributes becomes increasingly important, although the effect varies between taxa.

Attributes such as vegetation structural complexity and species composition that influence the value of habitat for wildlife can be influenced by recent and historical management including grazing, fire regimes, weed management and other vegetation management and landscape restoration activities.

Expected outcomes

Research outcomes in complex landscapes can suffer from a paucity of long-term research, especially as impacts of landscape modification and management operate over both spatial and temporal scales. This research will contribute to the development of baseline data for vegetation and wildlife attributes for long-term research projects into management of land use impacts on biodiversity. It will also quantify the habitat value of often ignored landscape elements such as the cleared (grazed) matrix and regrowth vegetation.

An understanding of both short and long-term effects, and the factors that change conservation value of different elements of landscape mosaics can contribute to optimising proactive landscape management at local, regional and global scales.

Effective management of landscape disturbance and biodiverse habitat is needed for threatened species conservation and human land use to harmoniously coexist.

Read more

<http://bit.ly/biodiversity-landscapes>



Designing condition multi-metrics for surrogates of biodiversity

Research level: Honours

Student: Thomas Lally

Advisors: Associate Professor Peter Murray,
Dr Megan Brady



Background

Vegetation and fauna habitat monitoring is essential to modern land management at every scale. However, conservation and land managers rarely have the time or resources available to undertake thorough monitoring of the flora and fauna they are responsible for protecting.

Vegetation condition assessments (or condition multi-metrics) have been developed to provide a quick and simple tool to assess vegetation condition by analysing attributes that act as surrogates for biodiversity values. It is clear that these tools would be favourable to land managers as an alternative to intensive, technical and time-consuming fauna and flora surveys. However, metrics are often fraught with deficiencies, may deliver inaccurate results and can be immensely difficult to design in a way that accurately reflects ecosystem integrity. Their accuracy in explaining the nature of faunal populations in particular is poorly understood and potentially significantly limited.

Expected outcomes

Disentangling the complex relationships between vegetation condition assessments and faunal populations will allow us to improve upon them and make them more effective conservation management tools. This research will contribute to developing long-term condition monitoring programs that can assess trends and help manage impacts of human land use on biodiversity values in multi-use landscapes.

Read more

<http://bit.ly/condition-multi-metrics>



TFF-driven research opportunities

In addition to UQ-led research, The Turner Family Foundation drive additional conservation initiatives which UQ research students and staff are able to be involved in, and these linkages are expected to increase over time.

Some initiatives not already detailed in this report include:

- A range of on-ground ecological restoration projects on TFF properties;
- Eastern bristlebird captive breeding for reintroduction;
- The 'Hidden Vale Koala Project': combining conservation research and ecotourism;
- Rufous bettong research, comprising captive and field components.

TFF-led initiatives have direct on-ground management impacts whilst also providing important real-world context for research.



Peer-reviewed publications

- Edwards, M. C. 2018. Are Queensland brush-tailed phascogales different? *Australian Mammalogy*, 40, 297-300.
- Edwards, M. C., Hoy, J. M., Fitzgibbon, S. & Murray, P. J. 2019. Training a wild-born marsupial to use microchip-automated devices: The brush-tailed phascogale (*Phascogale tapoatafa*) as proof of concept. *Australian Mammalogy*, 41, 279-282.
- Edwards, M. C., Hoy, J. M., Fitzgibbon, S. & Murray, P. J. 2020. Bandicoot bunkers: training wild-caught northern brown bandicoot (*Isodon macrourus*) to use microchip-automated safe refuge. *Australian Mammalogy*, doi: 10.1071/WR19151.
- Edwards, M. C., Hoy, J. M., Fitzgibbon, S. & Murray, P. J. 2020c. The Relaxed Predation Theory: size, sex, and smarts matter! *Biological Reviews*, Accepted.
- Muns, S. J., Hoy, J. M. & Murray, P. J. 2018. Microchips for macropods: First use of a microchip-automated door by a bridled nailtail wallaby (*Onychogalea fraenata*). *Zoo Biology*, 37, 274-278.
- Orr, B. & Tribe, A. 2018. Animal welfare implications of treating wildlife in Australian veterinary practices. *Australian Veterinary Journal*, 96, 475-480.
- Tribe, A. & Orr, B. 2018. Wildlife rehabilitation practices in Australia. In: Vogelnest, L. & Portas, T. (eds.) *Medicine of Australian Mammals*.

Manuscripts in progress

Note: there is no guarantee the following manuscripts will be published in the journals indicated, or during 2020, but they demonstrate recent progress in Hidden Vale manuscript development.

Under revision

- Edwards, M. C., Ford, C. A., Hoy, J. M., Fitzgibbon, S. & Murray, P. J. 2020. How to train your wildlife: a review of predator avoidance training. *Applied Animal Behaviour Science*, Under revision.
- Edwards, M. C., Hoy, J. M., Fitzgibbon, S. & Murray, P. J. 2020. Monitoring with microchips: microchip-automated doors as a novel method for tracking released wildlife. *Pacific Conservation Biology*, Under revision.
- Jiang, A., Tribe, A. & Murray, P. J. 2020. A new improved balanced koala scat survey method. *Australian Journal of Zoology*, Under revision.

Submitted

- Field, K., Hoy, J. M., Shapland, F., Pritchard, T. & Murray, P. J. 2020. Habitat influence on brush-tailed rock-wallaby activity patterns in Queensland. *Journal of Zoology*, Submitted.
- McMichael, L., Adam, D., Tribe, A., Bynon, B., Bradshaw L., Hoy, J., Murray, P. & Kopp, S. 2020. Captive mahogany gliders (*Petaurus gracilis*) haematology and biochemistry reference intervals and responses to environmental change. *Journal of Zoo and Wildlife Medicine*, Submitted.

Conference presentations

- Caro, F., Williams A. & Adkins, S. (2018). Enhancing seed-based restoration of Australian native species. *National Landcare conference*. Brisbane, Queensland.
- Caro, F., Williams A. & Adkins, S. (2018). Seed enhancement of Australian native species to improve seed-based restoration outcomes. *12th Australasian Plant Conservation conference*. Canberra, Australian Capital Territory.
- Caro, F., Williams A. & Adkins, S. (2019). Seed-enhancing technologies to improve seed-based restoration using native grass species. *Seed Ecology VI Conference*. Regensburg, Germany.
- Edwards, M. C., Hoy, J. M., FitzGibbon, S. & Murray, P. J. (2018). Bandicoot bunkers: training bandicoots to use microchip-automated doors and avoid introduced predators. *Ecological Society of Australia Annual Conference*. Brisbane, Queensland.
- Edwards, M. C., Hoy, J. M., FitzGibbon, S. & Murray, P. J. (2018). Could predator avoidance training increase the reintroduction success of bandicoots? *17th International Behavioural Ecology Congress*. Minneapolis, United States of America.
- Edwards, M. C., Hoy, J. M., FitzGibbon, S. & Murray, P. J. (2018). Creating panic rooms for wildlife: training northern brown bandicoots to access safe refuge using microchip-automation. *Australian Mammal Society 64th Annual Scientific Meeting*. Brisbane, Queensland.
- Edwards, M. C., Hoy, J. M., FitzGibbon, S. & Murray, P. J. (2018). To eat or not to eat: A bandicoot's dilemma when facing predation. *Australasian Society for the Study of Animal Behaviour Conference*. Brisbane, Queensland.
- Edwards, M. C., Hoy, J. M., FitzGibbon, S. & Murray, P. J. (2018). The very hungry bandicoot: how food may affect the success of predator avoidance training. *RSPCA Animals in Focus*. Brisbane, Queensland.
- Edwards, M. C., Hoy, J. M., FitzGibbon, S. & Murray, P. J. (2019). Why run when you can eat? Recognition of predators by northern brown bandicoots, *Isodon macrourus*. *Australian Wildlife Management Society*. Darwin, Northern Territory.
- Edwards, M. C., Hoy, J. M., FitzGibbon, S. & Murray, P. J. (2019). Catch me if you can! Using microchip-automation to avoid introduced predators. *Student Conference on Conservation Science*. Brisbane, Queensland.
- Edwards, M. C., Hoy, J. M., Martin, S., FitzGibbon, S. & Murray, P. J. (2017). Knock knock, who's there? Microchip-automation for individualised animal access. *Australasian Wildlife Management Society Annual Conference*. Katoomba, New South Wales.
- Ford, C. A., Hoy, J. M., Brady, M. & Murray, P. J. (2019). Critter college: Who's got the personality to pass predator avoidance training? *Student Conference on Conservation Science*. Brisbane, Queensland.
- Hoy, J. M. (2018). Back to the future: Using new technologies to improve wildlife conservation. *RSPCA Animals in Focus*. Brisbane, Queensland.
- Hoy, J. M., Adam, D. & Murray, P. J. (2018). The Hidden Vale Wildlife Centre: Collaborative next-generation research. *Australian Mammal Society 64th Annual Scientific Meeting*. Brisbane, Queensland.
- Hoy, J. M. & Murray, P. J. (2017). The Future of Microchip-Automation for Australian Wildlife. *Workshop on Animal Interaction Design, OzCHI: the 29th Australian Conference on Human-Computer Interaction Conference*. Brisbane, Queensland.
- Hoy, J. M., Nicolson, V. & Murray, P. J. (2018). Why collaboration is crucial for next-generation wildlife research. *24th Zoo and Aquarium Association (ZAA) Conference*. Wellington, New Zealand.

- Jiang, A., Tribe, A. & Murray, P. J. (2019). Koala-cattle Interaction Study. *Student Conference on Conservation Science*. Brisbane, Queensland.
- Muns, S. J., Hoy, J. M. & Murray, P. J. (2018). Teaching an old macropod new tricks: The challenges of training a captive bridled nailtail wallaby. *Australian Mammal Society 64th Annual Scientific Meeting*. Brisbane, Queensland.
- Murray, P. J., Tribe, A., Hoy, J. M., Englebright, R. & O'Hara, P. (2016). Hidden Vale UQ Wildlife Facility Project. *Australian and New Zealand Laboratory Animal Association (ANZLAA)*. Auckland, New Zealand.
- O'Hara, B. (2017). Conservation driving tourism success. *Australian Land Conservation Alliance Conference*. Hobart, Tasmania.
- O'Hara, B. (2018). Hidden Vale and the Little Liverpool Range Initiative - Field Trip. *National Landcare Conference*. Grandchester, Queensland.
- Oh, R. R. Y., Carrasco, L. R., Fielding, K. S. & Fuller, R. A. (2019). Extinction of experience and an emotional disconnect with nature are not inevitable consequences in urban residents. *Ecological Society of Australia*. Launceston, Tasmania.
- Oh, R. R. Y., Fielding, K. S. & Fuller, R. A. (2019). Changes in experiences of and connection to nature across time. *Student Conference on Conservation Science*. Brisbane, Queensland.
- Tinsley, C., Murray, P. J., Hoy, J. M. & Kopp, S. (2019). The impact of anthropogenic landscapes on pathogen exposure in bandicoots. *Wildlife Disease Association Conference*. Hobart, Tasmania.
- Tinsley, C., Murray, P. J., Hoy, J. M. & Kopp, S. (2019). The proof is in the pathogen. Do anthropogenic landscapes impact pathogen exposure in bandicoots? *Student Conference on Conservation Science*. Brisbane, Queensland.
- Tinsley, C., Murray, P. J., Hoy, J. M. & Kopp, S. (2019). Wildlife-pathogen dynamics in anthropogenic landscapes. *Australian Wildlife Management Society*. Darwin, Northern Territory.
- Tinsley, C., Murray, P. J., Hoy, J. M. & Kopp, S. (2020). The impact of anthropogenic landscapes on wildlife-pathogen dynamics. *Australian Veterinary Association Conference*. Gold Coast, Queensland.
- Tribe, A. (2017). Challenges and conflicts with wildlife rehabilitation – an Australian perspective. *Humane Society of the United States Animal Care Expo*. Fort Lauderdale, Florida, USA.
- Tribe, A. (2017). Humane management of kangaroo populations in South East Queensland. *ISAE Australasia-Africa Regional Meeting*. Brisbane, Queensland.
- Tribe, A. & Butler, K. (2019). The Hidden Vale Koala Project: Combining Conservation Research and Ecotourism. *Private Land Conservation Conference*. Adelaide, South Australia.
- Tribe, A., Hoy, J. M., Maccoll, M. & Murray, P. J. (2016). Wildlife at Spicers Hidden Vale – A Multi-Dimensional Conservation Initiative. *Zoo and Aquarium Association Queensland (ZAAQ) Conference*. Brisbane, Queensland.
- Tribe, A., Stent, D. & Murray, P. J. (2015). Conservation on Spicers Hidden Vale – A Cooperative Venture. *Wildlife Tourism Association Annual Conference*. Geelong, Victoria.

External funding obtained

Year	Awarded to	Award details	Amount (\$AUD)
2020	Julia Hoy, Peter Murray, Natalie Fraser	Lockyer Valley Regional Council – Mata Hari Judas research	30,000
2020	Gloeta Massie	Aust Government Research Training Program Scholarship	98,000 (approx.)
2019	Fernanda Caro Beveridge	SAFS Travel Scholarship	2,500
2019	Caitlin Ford	Ecological Society of Australia	1,996
2019	Kellie Goodhew	Aust Government Research Training Program Scholarship	98,000 (approx.)
2019	Julia Hoy, Peter Murray, Natalie Fraser	Lockyer Valley Regional Council – Mata Hari Judas research	30,000
2019	Charlotte Tinsley	Holsworth Wildlife Research Endowment	2,550
2019	Caitlin Ford	Aust Government Research Training Program Scholarship	70,000 (approx.)
2019	Charlotte Tinsley	SVS Bequest and Research Donation	2,700
2018	Meg Edwards	ISBE Conference Travel Scholarship	1,800
2018	Meg Edwards	Sporting Shooters Association of Australia Bursary	1,800
2018	Meg Edwards	SAFS Travel Scholarship	2,500
2018	Caitlin Ford	Ecological Society of Australia	1,500
2018	Julia Hoy, Peter Murray	Lockyer Valley Regional Council – Mata Hari Judas research	30,000
2018	Alex Jiang	Royal Society of Queensland Research Fund	3,000
2018	Alex Jiang	Aust Government Research Training Program Scholarship	98,000 (approx.)
2018	Charlotte Tinsley	Conservation and Wildlife Research Trust	4,500
2017	Meg Edwards	Australasian Wildlife Management Society	200
2017	Meg Edwards	Bunnings West Ipswich	550
2017	Meg Edwards	Conservation and Wildlife Research Trust	1,470
2017	Julia Hoy	Alumni donation for mahogany glider research	10,000
2017	Julia Hoy	SurePetCare sponsorship	6,000
2017	Charlotte Tinsley	Aust Government Research Training Program Scholarship	98,000 (approx.)
2016	Meg Edwards	Aust Government Research Training Program Scholarship	98,000 (approx.)
2016	Peter Murray, Julia Hoy	Queensland Government Mata Hari Judas queen research	30,000
TOTAL			723,066



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