November 2020



About us

The Arthur Rylah Institute's terrestrial ecology teams produce high-quality science to support evidence based decision-making by governments and communities.

Our 45 scientists have extensive expertise in fauna and flora research, ecological modelling and data interpretation. We work collaboratively with national, state and local agencies, universities and the community.

What makes a successful fox control program?

Australian fauna is extremely susceptible to fox predation which has contributed to numerous extinctions of 'critical weight range' (35 g – 5.5 kg) mammals. Significant investment in baiting programs has been made over long periods with the aim to minimise the impacts of foxes on native fauna. However, there is limited knowledge about how differences in fox bait deployment influence the effectiveness of fox control programs.

ARI's Alan Robley and Lachlan Francis (in collaboration with The University of Melbourne) have applied a fox population model '**FoxNet**' across numerous fox control programs to determine changes in fox numbers in response to various fox baiting strategies. The results of <u>the report</u> provide guidance on the spatial scale, bait layout, bait density and timing of baiting required for successful fox control programs.

The development of a transparent approach for quantitatively assessing current and future investment in fox control in Victoria will improve the design of future fox control projects and help guide the best use of funding. It is anticipated that this will improve the conservation of native fauna across a range of spatial and temporal scales.



The modelled reduction in fox density due to baiting at Wilsons Promontory National Park

See the ARI website for a summary of the work.

November 2020

News

Join ARI in the field – virtually

Not everyone can experience the wonder of Victoria's nature like ARI scientists do. ARI's Andy Geschke has set out to share the stories and passion of our ARI researchers with a 360° perspective in virtual reality (VR) films. The films create virtual, first-hand experiences to bring ARI science to life.

It is hoped these films inspire viewers to be curious about ARI's research, connect with the natural world and learn something new about Victoria's amazing fauna and flora.

Take a walk with our scientists in the field by visiting our website (VR headset not mandatory).





Planned burn surrounding Hairpin Banksia (Banksia spinulosa var cunninghamii)

ARI brought Banksia experts together to share knowledge and advance science

Victorian Banksias are facing decline due to climate change, frequent fire and fragmentation. ARI's Annette Muir ran an online workshop that brought together Banksia experts from government agencies, universities and volunteer groups.

The workshop documented our existing knowledge on population trends of six Victorian Banksia species. A number of adaptive management strategies were identified; including modifications to fire planning, and augmentation of small populations. The online format, due to COVID-19 restrictions, enabled the participation of people from around Victoria and interstate who might not have otherwise attended.



Impacts of COVID19 on biodiversity

While COVID-19 is having a profound impact on human life, we also have a duty to think about how it will influence biodiversity. ARI's Tracey Regan is co-author of a recent editorial that provides a snapshot of the quickly evolving situation in relation to global biodiversity.

The publication offers encouragement and insights from colleagues in lockdown, and is available online via the **ScienceDirect website**.

| HISINE A | Connection endowed in the Connection of Conn | |
|--|--|--|
| Fillenda | partial homopage news sharing combined | and and a second se |
| impacts of the common | iver pendencir on hindpoints | |
| 1.000 | the second se | |
| <text><text><text><text></text></text></text></text> | | |





Concentrations of Nitrogen Dioxide (indicator of air quality) across eastern China before (left) and during (right) COVID-19 quarantine.

November 2020



Influencing Change

Identifying cost-effective management actions

Making decisions about the best way to spend limited conservation funds across Victoria is an urgent, but complex task. Until recently, approaches to this problem relied almost entirely on expert opinion; however, with the emergence of powerful computing and the need for more transparent and reproducible approaches, this is rapidly being replaced with systematic planning tools that better support evidence-based decision making.

A team of DELWP scientists, led by ARI's Jim Thomson, have developed a spatial conservation action planning tool '**Strategic Management Prospects**'. This tool forms part of Victoria's **NaturePrint** suite of decision-support products that are providing significant advances for prioritisation of conservation actions.

The Strategic Management Prospect tool (otherwise known as SMP) combines species distributions (via **habitat distribution models**) for 4400 native terrestrial species, 19 modelled threats (for example foxes and weeds), 17 management actions and their associated costs and benefits, across the state. This information can be used to rank location-specific actions by their cost-effectiveness to minimising the risk of species loss in Victoria over the next 50 years.

SMP provides decision-makers in Victoria with transparent evidence for identifying cost-effective actions at a range of scales relevant to management. A <u>recently published</u> peer reviewed article provides more technical information about this extremely impressive and important tool.





Threats to manage



Deer

- Goats
- Feral Predators
- Overabundant Kangaroos
- Ungulates (Deer/Goats/Horses/Pigs)

Herbivores (ungulates/rabbits/kangaroos) Predators & Weeds

- Predators & Weeds Predators & Herbivores
- Herbivores & Weeds
- Predators, Herbivores & Weeds
- Other

November 2020



Influencing Change

Using genetics to inform and improve conservation of a threatened mammal

In Victoria, there is a critical need to consider genetic diversity as part of effective approaches to conservation as it relates to habitat fragmentation, bushfires and climate change.

ARI's Carlo Pacioni has led a series of projects, in collaboration with Murdoch University and the Western Australian Department of Biodiversity Conservation and Attractions, aimed at improving the conservation status of the critically endangered Woylie (Bettongia penicillata). The work uses genetics to investigate the role of translocation as a conservation strategy. In particular, the work aims to improve the utility of mathematical models to inform the design and targets of translocation programs for threatened species.



A Woylie (Bettongia penicillata) trapped for genetic sampling

This work has:

- developed a modelling framework that combines genetic diversity with other 'real-life' forces (e.g. breeding • success, survival rates) to provide practical management guidelines for translocation programs
- validated the modelling framework using the Woylie as a case study •
- designed a trapping regime to ensure individuals sourced for translocations are unrelated

This large body of evidence, and associated tools, will ensure that the risk of extinctions for threatened species being considered for translocation programs is reduced, improving conservation outcomes for these species.



Eastern Yellow Robin in Tall Mixed Forest

andsape after a fire

Integrating different types of evidence to improve decision making

The Fire Analysis Module for Ecological Values (FAME) is an award-winning decision analysis tool used for fire management planning in Victoria which was developed by ARI and The University of Melbourne. FAME brings together spatial data on fire history, vegetation and animal populations to evaluate the impacts of fire on ecological values. An important aspect of FAME is the ability to predict how species will respond to bushfires and planned burns. These predictions are helping land managers plan for a combination of forest ages that will allow all species to thrive.

One of the key aspects of FAME is that it is adaptable. New information (either refined expert knowledge or data) can be incorporated into FAME to ensure predictions are based on the best available knowledge. However, the variety of survey methods and expert predictions all have different measurement scales, and FAME doesn't yet include a process for blending them.

ARI's Cindy Hauser has been building a statistical model that will allow multiple sources of new information to be incorporated into the tool to improve predictions. As new information about how ecological values respond to fire is generated, the FAME tool will better reflect our current understanding and optimise fire as an effective management tool in an uncertain future.

ARI Terrestrial Quarterly Update November 2020



Influencing Change

Feature publications

Thomson, J., Regan, T.R., Hollings, T., Amos, N., Geary, W.L., Parkes, D., Hauser, C.E. and White, M. (2020). Spatial conservation action planning in heterogeneous landscapes. Biological Conservation, 250: 108735. https://doi.org/10.1016/j.biocon.2020.108735

Pacioni, C., Ramsey, D.S.L., Schumaker, N.H., Kreplins, T. and Kennedy, M.S. (2020). A novel modelling framework to explicitly simulate predator interaction with poison baits. Wildlife Research (early online). https://doi.org/10.1071/WR19193

Watson, G.M., French, K. and **Collins, L.**, (2020). Timber harvest and frequent prescribed burning interact to affect the demography of Eucalypt species. Forest Ecology and Management, 475: 118463.

https://doi.org/10.1016/j.foreco.2020.118463

Kohout, M., Coupar, P. and Elliott, M. (2020). Battling an "aggressive pioneer" after fire: '*Phytolacca octandra*' (Inkweed). Journal of the Australian Network for Plant Conservation, 29: 7-8. https://search.informit.com.au/ documentSummary;dn=279438688585677;res=IELIAC

Muir, A., Bluff, L., Moloney, P., Amos, N., and Thomson, J. (2020) Hairpin Banksia: A widespread plant threatened with decline by frequent fires. Journal of the Australian Network for Plant Conservation, 29: 9-11. <u>https://search.informit.com.au/</u> documentSummary;dn=279457321556936;res=IELIAC Brandimarti, M.E., Gray, R., Coulson, G., **Cripps, J.K.**, Wilson, M.E., Death, C., Snape, M., Wimpenny, C., Silva, F.R.O., Miller, E.J. and Scanes, E. (2020). Reference intervals for parameters of health of eastern grey kangaroos *Macropus giganteus* and management implications across their geographic range. Wildlife Biology, 2020(3). https://doi.org/10.2981/wlb.00692

Huaman, J.L., **Pacioni, C.**, Forsyth, D.M., Pople, A., Hampton, J.O., Carvalho, T.G. and Helbig, K.J. (2020). Serosurveillance and molecular investigation of wild deer in Australia reveals seroprevalence of Pestivirus Infection. Viruses, 12:752. https://doi.org/10.3390/v12070752

McNellie, M.J., Oliver, I., Dorrough, J., Ferrier, S., **Newell, G.** and Gibbons, P. (2020). Reference state and benchmark concepts for better biodiversity conservation in contemporary ecosystems. Preprints 2020, 2020070093. https://doi.org/10.20944/preprints202007.0093.v1

Wagner, B., Baker P., Stewart S., B., **Lumsden L., Nelson J., Durkin L., Cripps J., Scroggie M.**, Bluff L. and Nitschke C. (2020). Climate change drives habitat contraction of a nocturnal arboreal marsupial at its physiological limits. Ecosphere 11(10). <u>https://doi.org/10.1002/ecs2.3262</u>

Knowledge transfer: some recent presentations and workshops

ARI seminars (subscribe here on the ARI website):

- 'Marvellous, mysterious mammals: ARI's legacy in mammal research over recent decades' (Lindy Lumsden, Wildlife Ecology Section)
 LIVE ATTENDANCES EXCEEDED 300
- 'ARI's bright future science, policy and collaboration' (Josephine MacHunter, Tracey Regan, Annique Harris, Khorloo Batpurev)
 LIVE ATTENDANCES EXCEEDED 150
- 'Laying the foundations: wildlife research at ARI, 1970-1995' (Peter Menkhorst, Waterbirds and Wetlands Program) LIVE ATTENDANCES EXCEEDED 250
- 'Nature conservation in Victoria 1969-2020 an abridged and idiosyncratic rendering' (Matt White, Ecological Analysis and Synthesis Program) LIVE ATTENDANCES EXCEEDED 150
- 'ARI: celebrating 50 years of great science that matters for Victorians' (Kim Lowe, ARI Director) LIVE ATTENDANCES EXCEEDED 200

Further info: research.ari@delwp.vic.gov.au

DELWP Science Symposium (view all the presentations via the **YouTube playlist** or click on the icon below):

- 'Regional Forest Agreements Landscape scale surveys for flora and fauna' (Jemma Cripps, Threatened Fauna Program)
- 'Monitoring weed control activities in Melbourne's peri-urban environment' (Brad Farmilo, Vegetation Ecology and Threatened Flora Program)
- 'Investigating patterns of recolonisation and recovery by Leadbeater's Possum after the 2009 Black Saturday bushfires' (Louise Durkin, Threatened Fauna Program)
- 'Greater FAME: building better stats into the Fire Analysis Module for Ecological values' (Cindy Hauser, Ecological Analysis and Synthesis Program)





delwp.vic.gov.au