ARI Terrestrial Quarterly Update

FEBRUARY 2024

Koala and Joey

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 50 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.

The Great Victorian Koala Survey

Our iconic koalas have variable population status across their distribution. They are listed as endangered in NSW, QLD, and the ACT, yet in Victoria and in South Australia they can reach high densities and require management. Our knowledge of Victorian koala populations is patchy.

As part of the new Victorian Koala Management Strategy, we've partnered with Deakin University, Federation University, The University of Melbourne, The University of Queensland and the Victorian community to fill in these knowledge gaps.

- Koala surveys will use ground-based counts and passive acoustic recorders that detect koala vocalisation. Statistical modelling will relate koala abundance across Victoria to environmental variables such as eucalypt food trees, temperature, rainfall and elevation.
- Health and welfare assessments will involve tissue sampling and disease surveillance to support a better understanding of the significance of diseases within individuals and populations.

- Genetic sampling will identify the occurrence and degree of isolation and movement between populations and determine the overall genetic health of Victoria's koala populations.

Get involved – Koala Scat Collection in Gippsland

As part of this project, we're comparing the genetics of the Gippsland koala population to koala populations across the state. We do this by sampling DNA from the scats. The Gippsland Koala population differs from others in Victoria in having a higher genetic diversity. Volunteers can get involved by participating in our koala scat collection program.

Volunteering sessions are underway across Gippsland between October 2023 and March 2024.

For more information, or to get involved, contact Kelly Smith from Federation University: kellyj.smith@federation.edu.au

For more information on The Great Victorian Koala Survey contact Dave Ramsey: david.ramsey@delwp.vic.gov.au

News

The battle for space in Victoria's native grasslands

Native grasslands are highly threated worldwide, with weed invasion a key threat to areas that have avoided conversion to crops, infrastructure and housing. Weeds can outcompete native plants, alter animal habitat and degrade cultural values. Herbicide control is often used to reduce the weed cover in native grasslands. However, understanding how well native plants recover after weed control (i.e. do native plants colonise the space left behind?) is unclear.

To better understand this, a four-year project exploring the effectiveness of weed control, was conducted on native grasslands adjacent to high quality roadsides and rail lines in western Victoria. Evidence suggests that annual use of herbicide can substantially reduce weed cover, but not completely eradicate weeds within a four-year period. The results also show that native grassland plants do not colonise the space left behind, at least in the first two years post weed control. These findings suggest that management actions (which might include additional actions like burning and seed addition) need to be implemented over longer time frames for effective grassland restoration. A factsheet has been developed highlighting project outcomes, and a journal article published to provide project details and inform grassland managers.

Brad Farmilo and Claire Moxham partnered with Glenelg Hopkins and Corangamite Catchment Management Authorities, DECCA Regions, VicRoads, local shires, Country Fire Authority, private contractors and the community across the Victorian Volcanic Plains on the project, with funding through the Australian Government's National Landcare Programme and DECCA's Bushfire and Forest Services (Barwon South West).

ARI's Brad Farmilo surveying native grassland

How we estimate wildlife abundance within landscapes

To manage animal populations, it is important to understand numbers and locations of animals in the landscape. In large or complex landscapes, and for species that are rare or difficult to detect, traditional survey methods may not be feasible. In such cases, ARI researchers use statistical models to estimate animal populations.

Eastern grey kangaroo

Initial surveys with carefully designed methods count animal numbers within portions of a landscape to include environmental factors such as climate, food and shelter. ARI researchers can then create and apply statistical models to estimate animal numbers across the larger, unsurveyed area.

ARI has applied statistical models in several collaborative projects:

- Understanding koala populations in East Gippsland and the impacts of the 2019/20 bushfires, using a technique that included the estimated number of koalas likely to have been missed in surveys within dense forest.

- Assisting to design and implement aerial surveys to estimate the numbers of introduced Himalayan tahr in New Zealand's rugged Southern Alps. These surveys revealed that tahr were much more abundant than previously thought, and that more control efforts are now needed.

- Aerial surveys were also used to estimate the abundance of western grey kangaroos and eastern grey kangaroos in non-forested areas of Victoria, to inform policy decisions on their sustainable harvest.

- To estimate the abundance and distribution of Hog Deer across their range, ARI researchers implemented statewide surveys using remote infrared cameras.

Hog Deer

Population modelling continues to be a critical part of wildlife management worldwide. Using the latest peer-reviewed methods, ARI can estimate population numbers to inform resource managers and measure confidence of model predictions.

This work has been funded by DEECA's Biodiversity Division, and the New Zealand Department of Conservation.

For more information, contact david.ramsey@delwp.vic.gov.au

News

Post-fire recolonisation of Leadbeater's possum and range extension

ARI has been conducting surveys for the threatened Leadbeater's possum for many years, contributing to management actions aimed at supporting the protection of colonies from timber harvesting. We have built on this work to investigate their response to widescale fire and to discover more about their eastern distribution.

Fire response

The 'Black Saturday' fires of February 2009 burnt 36% of potential montane ash habitat within the species' distribution. Subsequent surveys found that the species was absent or extremely rare on burned sites within the first three years post-fire. Our study shows that unburnt habitat patches within the fire footprint were likely key in facilitating population recolonisation and recovery since then, rather than unburnt habitat beyond the fire boundary. This has allowed for the consideration of unburnt patches within future fire management strategies.

Short distribution extension

After extensive surveys into new areas, we believe we have established the north-eastern edge of Leadbeater's possum current distribution, which is 5.5 km further than previous records. This included finding the species in less typical non-ash, and non-snow gum habitat. Our results add to previous findings indicating that Leadbeater's possum has slightly broader range limits and habitat flexibility than previously thought.

For relevant published papers see Feature publications:
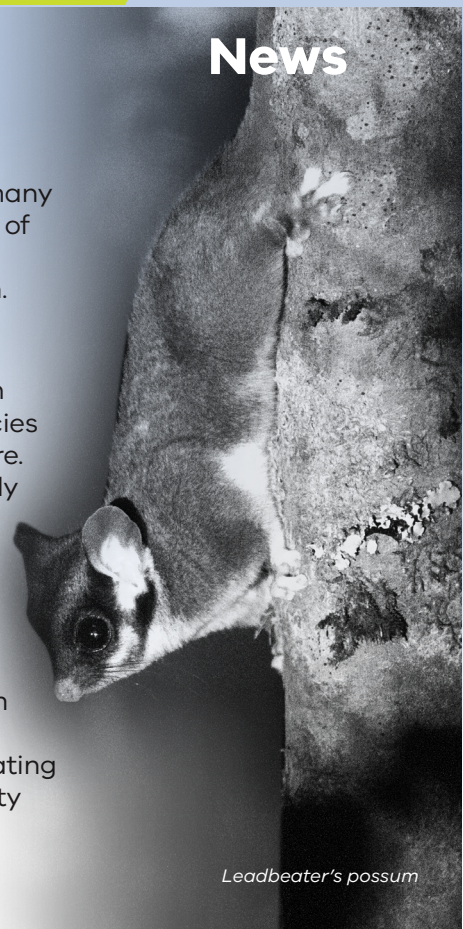
Leadbeater's possum

Feature publications

Cally, J.G. & Ramsey, D.S.L. (2023). Abundance of Deer in Victoria: Regional and state-wide estimates of deer density and their impact on vegetation. ARI Technical Report No. 368. https://www.ari.vic.gov.au/__data/assets/pdf_file/0035/686591/ARI-Technical-Report-368-Deer-abundance-in-Victoria.pdf

Durkin, L.K., Maloney, P., Cripps, J.K., Nelson, J.L., Macak, P.V., Scroggie, M.P., Collins, L., Emerson, L.D., Molloy, J. and **Lumsden, L.F.** (2023). Unburnt refugia support post-fire population recovery of a threatened arboreal marsupial, Leadbeater's Possum. Forest Ecology and Management 551: 121487 https://doi.org/10.1016/j.foreco.2023.121487

Farmilo, B.J., Moxham, C. (2023). The effectiveness of weed control in a threatened plant community: A grassland case study. Ecological Engineering. Vol 193. https://doi.org/10.1016/j.ecoleng.2023.107017

Macak, P.V., Nelson, J., Durkin, L.K., Cripps, J.K., White, M.D., Emerson, L.D. and Lumsden, L.F. (2023). Short range extension delineating the north-eastern limit, and use of atypical habitat by highland Leadbeater's possum. Australian Mammalogy https://doi.org/10.1071/AM23003

Rainsford, FW., Giljohann, KM., Bennett, AF., Clarke, MF., **MacHunter, J.,** Senior, K., Sitters, H., Watson, S., Kelly, L. (2023). Ecosystem type and species' traits help explain bird responses to spatial patterns of fire. fire ecol 19, 59 (2023). https://doi.org/10.1186/s42408-023-00221-3

Ramsey, D.S.L., Forsyth, D.M., Perry, M., Thomas, P., McKay, M., Wright, E.F. (2022) Using helicopter counts to estimate the abundance of Himalayan tahr in New Zealand's Southern Alps. The Journal of Wildlife Management. https://doi.org/10.1002/jwmg.22252

Robledo-Ruiz, D., Austin, L., **Amos, N.**, Castrejon, J., Harley, D., McGrath, M., Sunnucks, P., & Pavlova, A., (2023). Easy-to-use R functions to separate reduced-representation genomic datasets into sex-linked and autosomal loci, and conduct sex assignment. Molecular Ecology Resources, 00, 1–21 https://onlinelibrary.wiley.com/doi/epdf/10.1111/1755-0998.13844

Wilfahrt, P.A., … **Moore, J.L.**, … (& 40 other authors) (2023). Nothing lasts forever: Dominant species decline under rapid environmental change in global grasslands. Journal of Ecology 111, 2472–2482, https://doi.org/10.1111/1365-2745.14198

Yu, S., Li, D., **Liu, C.** & Katz, O. (2023). Propagule size and seed development duration: high photosynthate allocation and growth allometry. Planta 79(18), 655-667. https://doi.org/10.1007/s00425-022-03862-x

Influencing Change

Knowledge transfer

ARI seminars (subscribe here on the ARI website):

Presentation at Weed Society of Victoria conference. **Hauser, C.E.** How modelling can support effective weed management. 26th August 2023.

Student panel presentation at the University of Melbourne. **Lee, K.**
Victorians Value Nature: Making a difference through collective impact. 9th October 2023.

Presentation at Frogs Victoria. **Durkin, L. and Griffioen, P.**
AI learning models and their application for automated frog call recognition. 23rd October 2023

Presentation at Warrnambool Landcare. **Lumsden. L.**
Bats Fascinating Creatures of the Night. 10th November 2023.

Presentation at the Melbourne University. **Sparrow, A.**
Theory of change: Practical reflections from an environmental scientist's perspective. 19th November 2023.

Presentation at DEECA Biodiversity Division. **Bruce, M. & White, M.**
Statewide soil microbiome project: Past, present and future. 27th November 2023.

Presentation at Emergency Management Spatial Information Network Australia National Group Meeting. **Francis, L.,** Withers, N., Smith, L. Streamlining fire severity mapping in South-east Australia with satellite imagery and machine learning. 30 November 2023.

Presentation at Forest and Fire: Science Events. **Durkin, L.D., White, L.**, Stock, S., **Pacioni, C.** and West, M. Short-term spatial ecology of Watson's Tree Frog - informing habitat protection prescriptions. 6th December 2023.

Presentation at Forest and Fire: Science Events. **Lentini, P. E., Nelson, J. L., Scroggie, M. P.** and **Cally, J. G.** Assessment of protection prescriptions for Southern Greater Gliders and Leadbeater's Possums. 6th December 2023.

Presentation at Forest and Fire: Science Events. **Macak, P., Nelson, J., Schneider, T. and Bryant, D.** Smoky Mouse Persistence in Special Management Zones. 6th December 2023.

We acknowledge Victorian Traditional Owners and their Elders past and present as the original custodians of Victoria's land and waters and commit to genuinely partnering with them and Victoria's Aboriginal community to progress their aspirations.

Compiled by Daniel Purdey
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Arthur Rylah Institute for environmental research

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