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INSIDE THIS ISSUE!

Editor: ***Brian Wilson***

Design and Layout: ***Amy Rowles***

PHOTO COMPETITION

Due to a lack of entries the photo competition was not run for this edition.

Email your favourite flora or fauna photo to admin@ecansw.org.au to enter a competition and have your photo on the cover of the next ECA newsletter. Win your choice of one year free membership or free entry into the next ECA annual conference. The winner will be selected by the ECA council. Runners up will be printed in the photo gallery

Photos entered in the competition may also be used on the ECA website

Front Cover Photo: *Xerochrysum sp.* In the Snowy Mountains.

Courtesy of Amy Rowles

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ECA COUNCIL MEETINGS

The ECA Council meet every three months to discuss and deal with any current business of the association. Meetings this year will take place on the 5 March, 4 June, 3 September and 3 December. Any member who wishes to view the minutes from any of the ECA council meetings may do so by contacting the Administration Assistant Amy Rowles admin@ecansw.org.au

ECA postal address
415 Parishs Road
Hilldale
NSW, 2420

Message from the President

Dear Members,

The 2018 ECA conference was a great success with the highest number of attendees ever. The introduction of a pre-conference workshop was well received and we are planning to hold a pre-conference workshop next year on another topic of relevance to our industry. ECA is very grateful for the contribution presenters made to the conference, and presentations from the day are now available on the ECA webpage. The Vegetation workshop was a great opportunity for consultants and science staff from OEH to exchange information on the processes and complexities of plant community assessment.

ECA hold the Annual General Meeting at the same time as the conference to make it easy for members to attend. It is an important event in the ECA calendar where the members of the ECA Council for the following year are elected, resolutions impacting members voted on and a summary of the previous twelve months of ECA activities is provided. It was disappointing that even though the AGM is scheduled for the same day as the Conference, many members chose not to be involved in this important event. ECA Council is working on other incentives to encourage members to be involved in the AGM and we hope to see more attending next year.

Volunteering to work on the ECA Council may seem like a time-consuming task, but these days we are able to hold our quarterly meetings via the internet so that travel long distances to attend is no longer required. The contribution required to the ECA Council varies from as little as attending meetings and reviewing and voting on membership applications to the significant contributions made by the Executive (President, Vice President, Secretary and Treasurer) and in relation to preparation for the annual conference, planning workshops and student prizes. ECA would like to ask Employers, who may themselves be too busy to participate in the Council, to encourage their member employees to join the ECA Council by allowing them to participate in meetings in their work hours. In this way Employers can contribute to the Association and the industry as a whole without having to contribute their time individually.

As we enter the busiest time of the year for ecological consultants I wish you all the best as we start to implement the new requirements and tools mandated by the Biodiversity Conservation Act 2016.

Belinda Pellow

UPCOMING ECA EVENTS

ECA ANNUAL CONFERENCE

Date: July 2019

Thursday conference: TBA

Friday workshop : Nest-boxes

Location: TBA

PROPOSED FUTURE ECA WORKSHOPS

- **Orchid Workshop**

Date: August 2019
Location: TBA
Register your interest: admin@ecansw.org.au

- **Camera Trapping Workshop**

Date: 2019
Location: TBA
Register your interest: admin@ecansw.org.au

- **eDNA Workshop**

Date: 2019
Location: TBA
Register your interest: admin@ecansw.org.au

- **Vegetation Community Workshop—allocating PCT's**

Date: 2019
Location: TBA
Register your interest: admin@ecansw.org.au

NON ECA EVENTS

Bat Call Analysis Workshop

Date: 19-20 January 2019

Location: Yuraba Conference Centre, Eatons Hill, Brisbane

Cost : $590 (includes lunch and dinner)

Booking: (07)3205 8450 or

email Julie.bb@titley-scientific.com

August 2017 ECA Membership Report

Amy Rowles
ECA administrative assistant

In total we have 189 members, comprised of 139 Practising Ecological Consultants, 10 Associate (Consultants), 23 Associate (Government Ecological/ Environment Officer), 6 Associate (Non-practising), 1 Associate (Subscriber) and 3 Students.

ECA RESEARCH GRANT WINNERS 2018

Terrestrial Ecology Grant:

Vanessa Gorecki—Roosting ecology of bats in road structures in Brisbane ($2000).

Ray Williams Mammal Research Grant:

Alexandra Ross—Assessing the success of the Nailtail Nursery: a novel conservation strategy ($2000).

ECA Conservation Grant:

Corey Callaghan—A citizen science environmental tool to assess avian biodiversity in urban greenspaces ($2000).

Vegetation Community Workshop

Overview Native Vegetation Science Branch NSW OEH

Jeremy Black, OEH

No abstract provided

Vegetation classification and mapping: purpose, theory, trade-offs and new approaches

David Keith, UNSW

Classifying and mapping vegetation can be an obsessive enterprise. Sometimes it's easy to lose sight of why we are doing it, and even the scientific theories, principles and methods on which it is built. As a backdrop to presentations that follow, I review some of the motivations and key assumptions that underpin the role that vegetation classifications and maps play in ecosystem management and nature conservation. Niche theory and community assembly theory can help understand both the capabilities and limits of classifications and maps for these purposes, highlighting the nexus between continuum and discrete models of variation in nature. I discuss trade-offs and challenges in developing classifications and maps, and describe new approaches designed to address them. Despite recent advances in methods, the uncertainties in ecological classifications and maps are inherently diverse. I will conclude with suggested strategies for reducing uncertainties and dealing with them in decision making.

Plant Community Type Classification in NSW

Daniel Connolly, OEH

OEH is undertaking a review of Plant Community Types in eastern NSW as part of recent NSW government reforms to biodiversity legislation. The aim of the project is to make NSW Plant Community Types (PCTs) in the region easier to use with biodiversity assessment methods and to reduce uncertainty associated with field identification. We outline some of the problems with the existing schema, and introduce a new state-wide framework for our revisions. The revision will retain current plant community types where they are robust and defensible, remove those that have weak floristic and environmental evidence or duplication and introduce new PCTs where they are supported by new data within an Eastern NSW context. Poorly understood vegetation patterns that require additional data for characterisation and validation will be identified and prioritised for future survey. The objective is to provide a set of PCTs that are defined at a consistent scale based on the analysis of standard field survey plot data and which can be fully described using a standard set of floristic and environmental attributes. The framework we have adopted will enable the application of new diagnostic tools that improve the consistency of assigning new samples (for example, full-floristic BAM plots) to the revised eastern PCTs.

Final Determinations for TEC's - intent and utilisation

Mark Tozer, OEH

No abstract provided

Plant Community Type Mapping in NSW

Michael Day, OEH

The NSW Office of Environment and Heritage (OEH) is producing a new map of the state's native vegetation. The State Vegetation Type Map will represent the most complete and consistent information available about the distribution of Plant Community Types across NSW. It has been progressively produced across NSW over the last five years, region by region, and now covers almost 80% of NSW. This presentation will provide a technical overview of the map and demonstrate its format, methods and mapping innovations. Specifically, it will explore what the map contains, how it is generated, its reliability and status, and how it incorporates existing mapping. The presentation will also demonstrate other integral mapping products such as the state wide aerial photo interpretation of vegetation photo patterns and a high resolution categorical surface of the state's native vegetation extent.

Vegetation Information (Data and Systems)

Ron Avery, OEH

The past decade has seen a major evolution in vegetation and biodiversity data products in NSW, and there is more on the way. The first part of this presentation provides an overview of the journey so far, including insights into major milestones including establishment of the centralised flora survey plot database, plant community type classification system, and VIS map catalogue. More recently the publication of Bionet integrated open data services and their adoption as the primary data supply pathway for a growing list for reporting and decision tools (including BAM) opens the way for greater transparency and innovation opportunities.

The presentation will include a live stroll through the BioNet web pages to highlight the current data products, applications, standards and other resources.

To conclude the presentation will examine the current program of works and what's on the horizon:

- Upload of east coast PCTs, and development of a quantitative PCT ID tool
- Integrated open data services: eg delivering vegetation plots linked with each plant community type; or delivering seamless PCT maps live linked to vegetation classification and threatened entities web services.
- Biodiversity Field Data Capture Solution: removing barriers to the capture and supply of data to Bionet, BAM and other programs. Koala pilot project
- Improved Data Value Supply Chain: remove barriers in the supply chain from field data capture to product development and implementation within decisions tools. Recognising the value of data.
- SEED – mobilising industry data; enhancing data and functionality to deliver greater benefits to users including consultants and business programs
- National standards and collaboration
- Joint Species Distribution Modelling Research Program
- BioNet Advisory Council

Vegetation Information (Data and Systems)

Ron Avery, Dani Murphy, Daniel Connolly, Michael Day - OEH

Ron and Dani will lead you though a live deep dive into the Bionet – Atlas, Bionet -Vegetation Classification and SEED applications to demonstrate how you can use these systems to support your routine tasks. As we go, we will also discuss and seek your feedback on how these procedures can be improved in future.

Some tasks we will explore include:

- Desktop investigation of vegetation maps using SEED: determine what's available for my area of interest, and what plant community types are likely to occur there (or in the vicinity).
- Running area of interest search for threatened Species in BioNet Atlas.
- Search for candidate PCTs in BioNet Vegetation Classification
- Running an area of interest (AOI) search in SEED to intersect a predefined list of environmental sensitive layers using the mining and exploration tool
- Using BioNet Open Data Web services to access live lists of plant community type, species lists and growth forms. Mashing data services to pull down lists of threatened biodiversity associated with a plant community type
- How to submit and upload species sighting and systematic survey data sheets into BioNet Atlas to meet conditions of your scientific license.

Implementing the Biodiversity Conservation Act 2016

Jane Gibbs, Director Ecosystem Assessment and Planning, Regional Operations Group, NSW Office of Environment and Heritage

The Biodiversity Conservation Act 2016 commenced on 25 August 2017. It represents a modernisation of the biodiversity assessment framework and updates ecological assessment requirements and standards, including the introduction of a new accredited persons scheme for those applying the new assessment framework. This presentation will discuss the progress made in implementing the Biodiversity Conservation Act 2016 since its commencement focussing on the role of the Office of Environment and Heritage.

Local Land Services Act

Kristian Holz
Group Director Sustainable Land Management Office, Local Land Services

The Local Land Services Act, as amended by the Local Land Services Amendment Act 2016 (LLSA Act), provides a new regulatory framework for the management of native vegetation in NSW.

The new Land Management (Native Vegetation) Code supports landholders to manage their land to ensure more productive farming methods and systems, while responding to environmental risks. Some clearing under the Land Management Code will require land to be set aside, which will be listed in a new public register. Management of some native vegetation may be carried out without approval for the purposes of allowable activities.

Higher impact clearing will require approval from a new Native Vegetation Panel, and landholders will be required to assess and offset the biodiversity impacts of approved clearing.

Biosecurity Act - 2015 – Overview and Responsibilities

Sydney Lisle, Biosecurity and Food Safety Invasive Species Program, Department of Primary Industry

Biosecurity is the protection of the economy, environment and community from the negative impacts of pests and diseases, weeds and contaminants.

NSW biosecurity legislation operates under the principle that biosecurity is a shared responsibility between government, industry and communities. Preceding 2008 there were a number of major biosecurity events worldwide (mad cow disease, foot & mouth disease etc.) that raised questions about Australias biosecurity capability.

The Australian Government commissioned and independent panel to comprehensively review our Biosecurity and quarantine systems. The panel presented is report – One Biosecurity: a working partnership (the Beale review) – at the end of 2008. In general terms this report recommended adopting partnership approach across government, industry and the community, reforming biosecurity legislation towards all jurisdictions having complimentary legislation and adopting a scientific, risk-based approach.

New South Wales was the second jurisdiction to implement new legislation with the Biosecurity Act 2015 (the Act) coming into force July 1 2017.

The Act has a number of objects, the principal one being;

(1) The primary object of this Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

The Act wholly repeals 10 biosecurity related NSW Acts, including subordinate statutes, and partly repeals four others. The subjects of these acts, weeds, pest animals, diseases etc., now fall under the catch all classification of Biosecurity Matter

Responsibilities

The Act introduces a range of new roles and responsibilities, the principle one being the General Biosecurity Duty;

Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised.

Environmental consultants, or their clients, are almost certainly likely to have a General Biosecurity Duty.

There are other duties and obligations that must be complied with, for example;

- Mandatory Measures specified in the regulations.
- Prohibited Matter (dealing with) specified in Schedules in the Act
- Prohibited Matter (notify presence)
- Biosecurity Orders
- Biosecurity Zones

Ecological consultants are persons who are likely to, at some time, be dealing with biosecurity matter or advising clients that may be dealing with biosecurity matter. It is important that consultants become familiar with the legislation and its application. It is probable that the General Biosecurity Duty applies.

Ecological consultants move from place to place as part of their business. In doing this it is conceivable that they could transfer biosecurity matter from place to place as contaminants on clothing, equipment, vehicles and in samples; it is also conceivable that their clients operations will do so. This is dealing with biosecurity matter.

Ecological consultants are professionals and experts in their fields who not only deal with the environment but with a wide range of statutes and legislation. Lack of knowledge is unlikely to be successful as an excuse; the actual risk or species does not need to be known, only that a biosecurity risk is likely to be posed by their actions.

Actions taken should be commensurate to the risk posed and must be reasonably practicable.

Many properties now have Biosecurity Plans and may have specific requirements (such as wash down) before people, vehicles and equipment can be taken onto the land. Most will have signs requesting the landholder be contacted before entering. These requests should be adhered to.

Manage the Risks. Come clean – Go clean

Biodiversity reforms and offsets

Nari Sahukar, EDO – Senior Policy and Law Reform Solicitor

This presentation will review NSW offsetting requirements from an independent community legal centre perspective.

What are the benefits? What are the risks? What are we aiming for?

And how can offsets be strengthened to achieve these outcomes?

Reducing barrier effects for Eastern Pygmy Possums in the peri-urban environment

Cassie Thompson, University of Sydney

Habitat connectivity is important in fragmented landscapes for the long-term viability of populations, particularly for threatened species. However, the importance of connectivity for urban-sensitive species has been poorly studied. Urban-sensitive species are those that are unable to persist or are restricted to isolated, remnant vegetation patches in peri-urban areas.

In peri-urban Sydney, the extensive road network may create a barrier between occupied patches for urban-sensitive species. As small mammals have been shown to have road crossing inhibitions, my research focuses on the urban-sensitive and threatened Eastern Pygmy Possum. It aims to determine if barrier effects are currently influencing the movement and viability of local Eastern Pygmy Possum populations.

My research also aims to test measures to increase the permeability of the landscape. This includes the installation of purpose-built crossing structures for urban-sensitive small mammals, and management actions aimed at improving the long-term viability of the local Eastern Pygmy Possum population in the peri-urban environment.

My presentation will include my research plan and early results of my study, including the distribution and genetic analysis of the Eastern Pygmy Possum population in relation to roads in peri-urban Sydney.

Compliance with habitat maintenance fire interval prescriptions in Land Management Zones?

Jane Williamson

Australian Catholic University

Prescribed burning is used to limit wildfire extent and intensity but can also have conservation objectives. Such ecological burning can create mosaics of vegetation of differing successional stages based on time since last fire. Managers are required to maintain percentages of the landscape within, above and below recommended ecological intervals (OEH, 2013). Fires are recorded and analysed to determine if these key performance indicators are met however, there is currently no analysis of distribution of fire intervals within each formation beyond whether KPIs are being met, and the level of error in the database is relatively unknown. Error is inherent in spatial data and the level of uncertainty in any dataset due to reporting bias and inconsistencies needs to be considered by fire researchers using the data for analyses of historic fire trends and for predicting and modelling future fire behaviour and occurrence.

My study uses a case study approach to determine the quality and completeness of fire records in NSW and assesses the temporal and spatial limitations of the data. I then quantify the temporal distribution of fires within each vegetation formation in NSW by analysing RFS and OEH fire history data. I compare known fire history with recommended fire intervals for each vegetation formation and have recorded where these fires occur across the fire interval timeline and in relation to threshold guidelines. In this talk I will present data on the distribution of

fire interval occurrence for selected vegetation formations. I will explore whether current management is resulting in an evenly spread set of times for each vegetation formation and look at trends within formations and regions. This study provides insight into timing of prescribed burns and feeds into work looking at effects of these guidelines on fauna habitat attributes.

Ecology of Invasive Rodents on Islands: Does marine-subsidised overabundance impact a restoring plant community?

Annabel Ellis, University of Sydney

The Rattus genus is one of the most prolific invasive groups, with the black rat (R. rattus), brown rat (R. norvegicus) and Pacific rat (R. exulans) having been introduced to an estimated 85% of the world's island archipelagos. Islands are at particular risk to the impacts of invasive rodents due to their high biodiversity, large numbers of endemic species and insular dispersal. Our project focuses on a population of invasive black rats on islands in Lake Illawarra, Wollongong, that contain an endangered ecological community, the Illawarra Sub-tropical Rainforest. We investigated the effect of an overabundant rat population, being supported by marine subsidies, on the restoring island community, in particular, on pioneer rainforest species. First, we conducted a mark-recapture survey of the population to calculate the density. Then, through stable isotope analysis (SIA) we investigated the diet of the rats and whether marine food sources are subsidising their diet and driving an exaggerated population density, as predicted by the island syndrome hypothesis. Finally, we conducted two manipulative experiments exploring the impact of rats on the seeds and seedlings of two pioneer rainforest species, *Hibiscus heterophyllus* and *Acacia maidenii*, to investigate if the rat population is limiting rainforest recruitment and restoration. In my presentation, I will be discussing the results and implications of this research.

Local Government/Consent Authority

Robbie Economos and Martin Fallding - Environmental Planners, Lake Macquarie City Council

Legislative changes relating to biodiversity and vegetation have had significant implications for local government policy and administration. The presentation reviews issues facing local government as confusion, uncertainty and change continue. Policy gaps and responses to the changes are identified, although it will take many years for the full effect of the changes to become evident. As local government comes to terms with the legislation, ecological consultants can expect further evolution of policy and practice, both local and state.

NSW Land category maps – what do they mean for Ecological Consultants?

Jeremy Black, Director of the Native Vegetation Information Science Branch, OEH.

In response to the 2014 Independent Review of Biodiversity Legislation in NSW (Byron et al) the NSW government amended the Local Land Services Act 2013 and introduced the new Biodiversity Conservation Act 2016 both of which commenced on 25th August 2017. To support this new legislative framework, OEH has produced two new state-wide spatial information products. The Native Vegetation Regulatory (NVR) map and the Biodiversity Values (BV) map. These two maps variously categorise land but are used in different ways. This presentation will describe the scientific methods and the processes used in the production and maintenance of the two maps and discuss how the maps may relate to work undertaken by ecological consultants in NSW.

BAM – where does fauna fit in to the requirements of the new biodiversity Act

Nathan Garvey, EMM

The Biodiversity Conservation Act commenced operation in 2016, with full implementation at the end of 2018. What does this mean for the assessment of impacts to fauna species in NSW? Under the new Act, the biodiversity assessment method sets out prescriptions for the assessment and offsetting of impacts to fauna (and flora), including such factors as what species require consideration, survey requirements for candidate species, measures to avoid and minimise impacts, offsetting requirements and offset rules. In this presentation we will explore some of these requirements, how they are implemented in a practical sense and discuss some of the benefits and risks of the new framework with a focus on fauna.

Accredited Persons under the BAM – Conflict of Interest and Managing Compliance

Tara Kennedy, Greencap / Muddy Boots Environmental Training

At its broadest level, conflict of interest may apply where a professional is in a position (be it actual or perceived) to exploit their professional capacity for their own benefit. Conflict of interest has long been an issue to formally manage for individuals and corporations in the banking, finance and legal sectors. Particularly over the last five years, it has continued to expand formally to other professionals, including those providing environmental services. For example, the NSW Biodiversity Conservation Act 2016 requires that those ecologists who take on the formal 'Accredited Person' role comply with a Code of Conduct. The Code requires that an Accredited Person must not act where there is an actual, perceived or potential conflict of interest. By including this requirement, Accredited Persons are obliged to:

- Understand the difference between actual, perceived or potential conflicts of interest.
- Identify when conflicts of interests may arise.
- Have systems in place to manage conflict of interest.
- Educate clients regarding their conflict of interest obligation.

REMAP: An online remote sensing application for land cover classification and monitoring

David Keith, UNSW

No abstract provided

Drones their application in the consulting industry

Justin McCann, PhD Candidate

Centre for Ecosystem Science, UNSW

Using drones in ecology research enables easy collection of aerial photograph data and 3D models. At the Centre for Ecosystem Science we use drones to count waterbirds and monitor vegetation change and we have been developing methods to use 3D datasets generated from drone imagery. In this talk I will use these examples to discuss the challenge of generating a viable and informative product from drone data.

Recent Literature and New Publications

Recent Journal Articles / Literature

Alistair S. Glen, James C. Russell, Clare J. Veltman and Rachel M. Fewster (2018). **I smell a rat! Estimating effective sweep width for searches using wildlife-detector dogs.** *Wildlife Research* 45(6) 500-504 **https://doi.org/10.1071/WR18021**

Rebecca K. Gibson, Linda Broome and Michael F. Hutchinson (2018). **Susceptibility to climate change via effects on food resources: the feeding ecology of the endangered mountain pygmy-possum *(Burramys parvus).*** *Wildlife Research 45(6) 539-550* **https://doi.org/10.1071/WR17186**

Jaime Heiniger and Graeme Gillespie (2018). **High variation in camera trap-model sensitivity for surveying mammal species in northern Australia** *Wildlife Research* - https://doi.org/10.1071/WR18078

Natalie J. Clark, Courtenay E. Mills, Nicolette A. Osborne and Kerry M. Neil (2018). **The influence of a new water infrastructure development on the relative abundance of two Australian freshwater turtle species.** *Australian Journal of Zoology* 66(1) 57-66 https://doi.org/10.1071/ZO17082

Phoebe A. Burns, Marissa L. Parrott, Kevin C. Rowe and Benjamin L. Phillips (2017). **Identification of threatened rodent species using infrared and white-flash camera traps.** *Australian Mammalogy* 40(2) 188-197 https://doi.org/10.1071/AM17016

Stephen Phillips (2017). **Differing mortality rates in two concurrently radio-tracked populations of koala (*Phascolarctos cinereus*).** *Australian Mammalogy* 40(2) 198-203 https://doi.org/10.1071/AM16047

Ross L. Goldingay (2017). **Population monitoring of an urban gliding mammal in eastern Australia** *Australian Mammalogy* 40(2) 214-219 https://doi.org/10.1071/AM17029

Leroy Gonsalves and Bradley Law (2017). **Seasonal activity patterns of bats in North Sydney, New South Wales: implications for urban bat monitoring programs.** *Australian Mammalogy* 40(2) 220-229 https://doi.org/10.1071/AM17031

Barbara A. Wilson, Mandy Lock and Mark J. Garkaklis (2017). **Long-term fluctuations in distribution and populations of a threatened rodent (*Pseudomys novaehollandiae*) in coastal woodlands of the Otway Ranges, Victoria: a regional decline or extinction?** *Australian Mammalogy* 40(2) 281-293 https://doi.org/10.1071/AM17036

Lee Harrison, Kylie Soanes and Rodney van der Ree (2017). **An evaluation of pipe traps for the capture of small arboreal mammals.** *Australian Mammalogy* 40(2) 301-303 https://doi.org/10.1071/AM17014

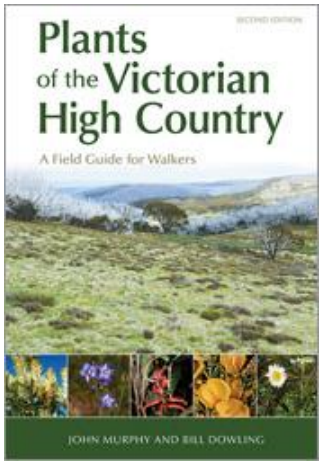
Recent Book Releases

Information Source: CSIRO Publishing
Website http://www.publish.csiro.au

Title: The Great Lizard Trek
Author: Felicity Bradshaw, Norma MacDonald
RRP: $24.99
No. Pages: 32
Publisher: CSIRO Publishing
Date: August 2018

Rocky, an ornate dragon, lives on granite rocks in the south-west of Australia. But further north, where it is getting hotter and wetter, his desert relatives are having trouble with their eggs. As the lizards trek through country in search of a new home, Rocky shares local Indigenous and Western understanding of these changing environments and the animals that live in them

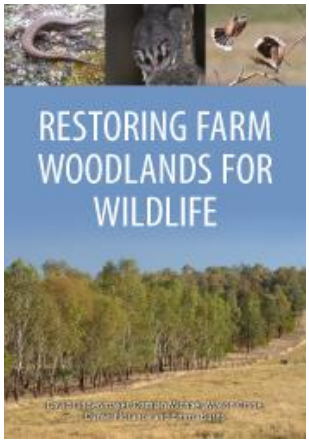
Title: Plants of the Victorian High Country: A Field Guide for Walkers. Second Edition.
Author: John Murphy, Bill Dowling
RRP: $39.99
No. Pages: 168
Publisher: CSIRO Publishing
Date: October 2018



Plants of the Victorian High Country allows walkers with little botanical knowledge to identify plants they are likely to encounter along the popular tracks of Victoria's High Country.

This Second Edition has been revised and expanded to describe 133 plants from the montane, sub-alpine and alpine zones, categorising them into five easily distinguished groups: herbs, daisy herbs, low woody shrubs, tall shrubs and trees, and eucalypts. The guide features a glossary of botanical terms, straightforward identification keys, clear photos of the leaves, flowers and stems of the plant, and includes notes on Aboriginal plant usage.

Title: Restoring Farm Woodlands for Wildlife
Author: Lindenmeyer D. et al.
RRP: $39.99
No. Pages: 136
Publisher: CSIRO Publishing
Date: October 2018



Restoring Farm Woodlands for Wildlife focuses on why restoration is important and describes best practice approaches to restore farm woodlands for birds, mammals and reptiles. Based on 19 years of long-term research in temperate agricultural south-eastern Australia, this book addresses practical questions such as what, where and how much to plant, ways to manage plantings and how plantings change over time. It will be a key reference for farmers, natural resource management professionals and policy-makers concerned with revegetation and conservation.

PUBLICATION REVIEW

Phytocoenologia Special Issue on Vegetation Classification Gellie et al. (2017) Overview of plot-based vegetation classification approaches within Australia.

Key findings

This review paper on Australian plot-based vegetation classification, summarises vegetation classification and floristic plot database systems across Australia, with reference to mapping.

- There are an estimated 190,000 databased full floristic plots sampled across Australia (with thousands more not databased). A summary table lists numbers of floristic plots for the 89 Australian bioregions revealing that adequate sampling covers at best 5% of the continent and only a few bioregions;

- Plot data are insufficient in quantity or quality over most of Australia to produce reliable unsupervised vegetation classifications or for use in species distribution models informing models of vegetation types. Yet we note modelling vegetation types is increasingly being applied using this adequate data to produce rapid vegetation maps;

- Each state and territory has developed their own classification systems, rules and bioinformation systems resulting in a lack of continental-wide consistency;

- Historically, vegetation mapping, often derived through interpretation of patterns in satellite or aerial imagery, has largely dictated Australian vegetation classification. We suggest this order should be reversed;

- Australia needs either Federal or NGO leadership (like NatureServe in the US) to standardise sampling methods and floristic data database systems across all Australian jurisdictions to encourage inter-jurisdictional data analyses and cooperation in developing national classifications that would inform national biodiversity assessments;

- Australian species and ecosystem conservation outcomes are compromised due to the problems outlined in the paper.

THE DINGO AND THE WILDCAT: CONSERVING A SPECIES WITH HYBRIDISATION ISSUES.

Emma Rawling, BA MSc, RCVN - Project Officer Scottish Wildcat Action

As an Australian wildlife biologist working in the UK I have had to adapt to a lot of differences working with new species and habitats, but some challenges, it seems, are universal. I currently work as a project officer for Scottish Wildcat Action, a project trying to conserve the most endangered mammal in the UK and its only native feline - a subspecies of the European wildcat *Felis silvestris silvestris.* But just like the Australian dingo, this species is plagued with multiple threats - not least the hybridisation issue.

Scottish Wildcats: image credit Scottish Wildcat Action

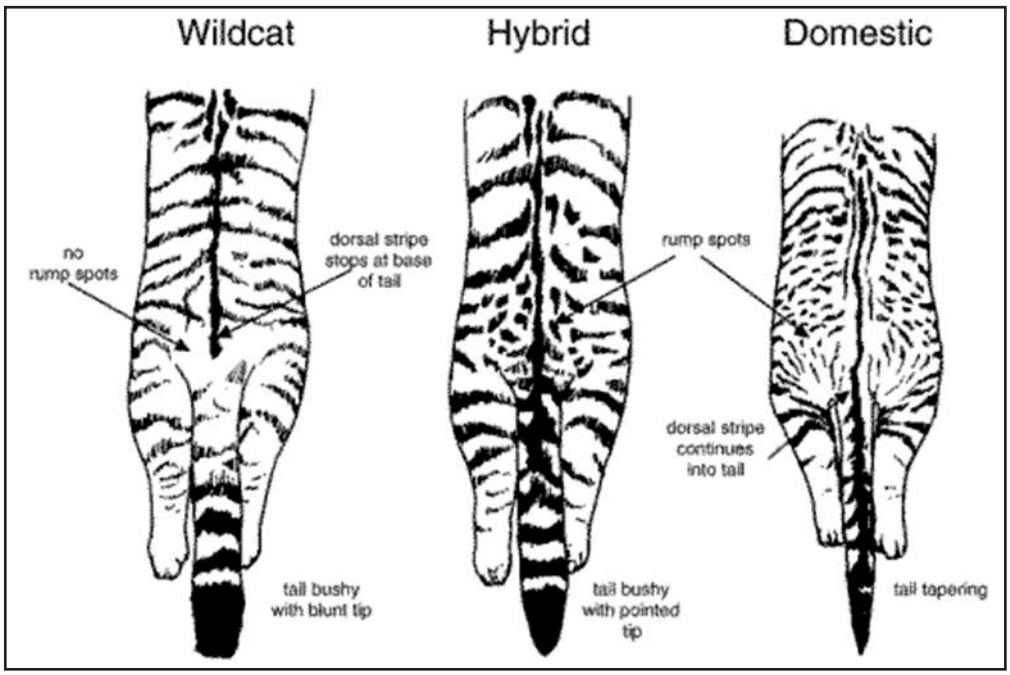
Just like the dingo, the Scottish wildcat suffers from poor public recognition, and lack of understanding of its role in the ecosystem as a native predator, and historical taxonomic arguments. Both species are considered pests by agriculture with real economic impacts and both have a long legacy of persecution. The Scottish wildcat was given legal protection in the 1980s but they have continued to decline sharply, and the latest population estimates are just 100-300 animals. The reasons are not just continued persecution, but also habitat pressure, prey declines etc – and like Dingoes, hybridisation with domesticated species.

Domestic origin cats (pets, strays, and ferals) are themselves descendants of the North African wildcat species and can unfortunately produce fertile hybrids with Scottish wildcats. These two species have been sharing the same habitat in the UK for about 2000 years, so introgression is likely to have been happening for centuries -- much longer than dingoes in Australia. However, as the wildcat population has declined the rate of hybridisation has increased, probably because the rate of interspecies encounter has risen, and low population density breeding depression in wildcats. We now appear to be facing a Hybrid Swarm situation with multigenerational hybridisation and a baffling spectrum of cats. Similarly the rate of hybridisation in dingoes is thought to have increased rapidly in the 20th century, so much so that most populations are considered to contain few or no 'pure' animals and they are IUCN listed as vulnerable.

As hybrids replace native wildcats and dingoes, they may have a different ecological footprint, and can present other risks - there is evidence in the UK of feral cats spreading feline diseases to wildcats for example. However, we also need to ask ourselves: Is hybrid vigour in fact of any advantage to either of these species, especially with tiny remnant populations?

So how do we find the 'pure' animals, or identify which animals are hybrids and which are worth conserving (if any)? Should we allow all the hybrids to go extinct/ allow them to be lethally controlled/ target them for eradication?

Just like dingoes, early attempts to distinguish wildcats and hybrids based on morphology struggled with consistency and the reliance on measurements taken from dead animals. Pelage Scoring is the tool developed in the UK by Dr Andrew Kitchener to identify a cat's ancestry, which has proved invaluable as a fieldwork tool, for making decisions which have life or death consequences for many cats as feral cats are legally culled by many landowners. However the method still has issues with some subjectivity. Our project policy of preserving the higher quality hybrids as well as 'pure' wildcats has also proved controversial, but is a precautionary approach with such a tiny wild population left. There are also plans to supplement wild populations with captive bred releases of 'pure' wildcats which it is hoped will raise the genetic quality of these hybrid populations.



Genetics research is making a big contribution to this debate, with modern DNA analysis giving us new tools for identifying an animal's ancestry, and therefore conservation status. However, there is still the challenge of getting samples (live trapping/ hair collection devices etc) and the time delay of several weeks for results. Perhaps in the near future we can hope to have an 'in the field' instant DNA test that could give fieldworkers the tools they need to make practical decision on hybrids. However, with such a legacy of hybrid swarms, conservationists will still have to make difficult decisions on where 'cut-off' lines are, and which hybrids, if any, to preserve.

So is there any such thing as a 'pure' Scottish wildcat or a 'pure' dingo left and does it matter? Or is it more important to preserve the best of the hybrids that look the part, act the part and fulfil that ecological role and niche effectively? There are no easy answers – some conservation dilemmas can be universal it seems.

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Daniels, M.J. & Corbett, L.K. 2003. Redefining introgressed protected mammals: when is a wild cat a wild cat and a dingo a wild dog? *Wildlife Research*, **30**, 213–218

Kitchener, A.C., Yamaguchi, N., Ward, J.M. & Macdonald, D.W. 2005. A diagnosis for the Scottish wildcat (*Felis silvestris*): a tool for conservation action for a critically-endangered felid. *Animal Conservation*, **8**, 223–237.

AUSTRALASIAN NETWORK OF ECOLOGY AND TRANSPORTATION (ANET) – IN CONJUNCTION WITH ENVIRONMENT INSTITUTE OF AUSTRALIA AND NEW ZEALAND 29 APRIL – 2ND MAY 2018. RACV GOLDFIELDS RESORT, CRESWICK, VICTORIA . SUMMARY REPORT.

Elvira Lanham, Arcadis Australia Pacific

How can you possibly NOT love a conference where one of the plenary speakers manages to not only play Chris Isaak during her presentation, but actually make it relevant to their research? One of two key note speakers, Kerstin Parris presented a fascinating discussion of light and noise impacts of roads on frogs. She used Chris' voice to show us that it is not only female *frogs* that preferred deeper male voices.

Her research on the impacts of roads on breeding behaviour in the southern brown tree frog *Litoria ewingii*, shows that male frogs competing with traffic noise began to call at a higher pitch. However, this could have long term breeding impacts, since these males appeared to be less attractive to females.

The other keynote speaker, Marcel Huijser, visiting from the Western Transportation Institute at Montana State University, summarised a 15-year long US Highway 93 wildlife mitigation project. The project involved a 90km long highway duplication that dissected important natural habitats, agricultural land, and small villages on the Flathead Indian Reservation.

He highlighted a topic that ran throughout many presentations – the importance of indigenous communities and their input into road location and design. For me, he perfectly summed up the reason we were at the conference when he revealed the project's philosophy that "roads are visitors in the landscape". The Native Americans instilled this philosophy in all who worked on the project. These five words made me think very differently about our attitudes to road development and upgrade, in relation to ecology and community. Should this be the starting point for any transport infrastructure project?

Vic Roads was a conference sponsor, and also organised the field trip on the last day. Their attitude to learning and incorporating ecological and indigenous considerations into their road design was refreshing. The theme from all Vic Roads presenters was that mistakes had been made in the past, but that they were eager to learn from these to improve future outcomes.

Other highlights of the program included a new "lightning" talk section, where seven participants had just five minutes to get their point across. There were some very interesting talks, and a lot of laughs as people were trying to beat each other's times! Brendan Taylor's talk on time lapse monitoring of frog pipes, which showed a surprising diversity of fauna that were using pipe crossings (seven frog species, nine species of reptile and 14 mammal species), is just one example. Rod van de Ree also plugged a new book concept where he plans to summarise mitigation measures of transportation infrastructure using case studies from around the world (please submit your case study for review!)… I think there was also a plant talk in there somewhere!

During the afternoon podium presentations, there was standing room only for Josie Stokes' talk from Roads and Maritime who later took the prize for best presentation of the conference with her summary of the evolution of microbat mitigation in Roads and Maritime projects in northern NSW.

There were many more interesting projects on landscape modelling, road kill risk for Taiwan's reptiles and amphibians, and managing the lack of ecological information in the options phase of project development. If I have whet your appetite, all presentations, presenter biographies and abstracts can be found here:

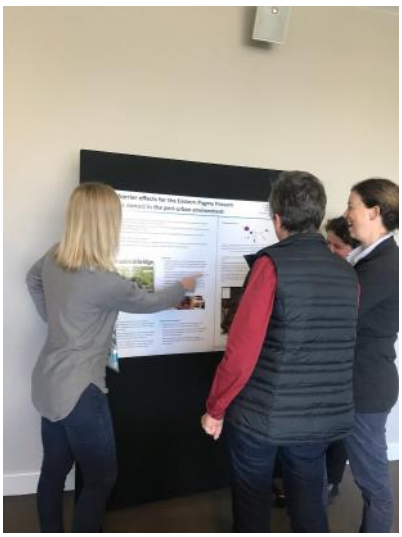
https://www.eianz.org/conference-information/conference-abstracts-2

The previous ANET conference was held in Coffs Harbour 2014, and those of us with a personal and/or professional interest in ecology and transportation, particularly the impacts of roads, had been waiting too long for this one. The conferences are refreshing in their mix of participants – researchers, environment managers, and ecologists all seemingly there to learn openly from one another. The knowledge share was far greater than some conferences where those carrying out applied research, which most road ecology is, are looked down upon by some academics.

However, I think the challenge for the next ANET conference is to take a leap from a primary focus on mitigation of roads and other infrastructure and incorporate some bigger questions. Can we ever really mitigate or offset to the extent that we can maintain or improve the biodiversity outcomes of a new or upgraded road? How would we know if we did? Transport infrastructure is a major contributor to habitat loss and fragmentation, can we build enough land bridges, underpasses or artificial habitat to compensate for them? What about the translocated threatened plants? Can we say that the genetic diversity of these populations is maintained or improved and can we find these things out before the next road, railway or airport has to be built?

It's a dilemma. On the one hand I want to be involved in innovative solutions to allow roads and other infrastructure to co-exist with the local ecology and indigenous communities, but really, I am a road ecologist hoping that one day my job will be obsolete. In a perfect future, there would be no demand for new infrastructure and we will have retrofitted the very best mitigation measures on all the existing linear infrastructure. Will the use of active transport (cycling, walking), driverless vehicles and other shared mobility deliver a reduction in demand, or will ecologists and road engineers have to work even more wonders as populations grow and habitat loss increases? As active ANET members, are we on the cutting edge of minimising these losses, or even improving the ecological outcomes from the base case or "do nothing" scenario, or are we moving the deck chairs around on the titanic?

While I am contemplating this dilemma, I am also very much looking forward to the next ANET conference, hopefully in three years, rather than four! It promises to be another stimulating discussion!



CURLY-BARK WATTLE (ACACIA CURRANII) MONITORING PROGRAM MONIA GAP, CENTRAL NSW

P Cameron[1], A Watson[2], D Shelly[3] and N Harrop[1]

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1. Background

Curly-bark Wattle *Acacia curranii* is very restricted. Most of the known populations are small, with most having fewer than 1000 mature individuals.

There are three centres of distribution being Lake Cargelligo and Gundabooka Range in western NSW, and Gurulmundi in south-eastern Queensland. The three centres are separated by several hundred kilometres and no plants have yet been found between them.

Approximately 20 populations are known to exist near Lake Cargelligo. The largest has several thousand individuals, the smallest only one individual. The Monia Gap (near Lake Cargelligo) population has been identified as the largest of the known populations.

Through the Saving Our Species Program, the Office of Environment and Heritage (OEH) has funded conservation actions for Curly-bark Wattle. Identified actions include the protection of key populations from grazing and on-going monitoring.

Approximately 12 hectares of Curly-bark Wattle habitat have been protected by 1600 metres of goat proof fencing on the property "Monia Gap". On-going monitoring in and outside the fenced area is designed to test the effectiveness of grazing exclusion on recruitment and survival of Curly-bark Wattle. Monitoring began in 2013. This analysis presents findings from the 2017 monitoring, including some comparison with previous results.

2. Identification

2.1 *Acacia curranii* Maiden (as 'Currani'), J. & Proc. Roy. Soc. New South Wales 49: 492 (1916)

Multistemmed shrub to 3 m high. Bark 'Minni Ritchi', maroon or grey. Branchlets angular towards apices, maroon-grey, ±silky-pubescent or subglabrous. Young shoots with appressed, yellow hairs. Phyllodes erect, linear, subterete or flattened, 8.5–18 cm long, 0.7–1.5 mm wide, thick, longitudinally striate with c. 25 closely parallel veins, usually ±shallowly grooved along midline between several raised veins, silky (especially in goove and between veins) to subglabrous; gland 1, basal, to 2.3 mm above pulvinus. Spikes obloid, 0.4–1.2 cm long, golden. Flowers 5-merous; calyx 0.9–1.3 mm long, dissected for 3/10– 5/8, the lobes densely pubescent; corolla 1.3 –1.8 mm long, dissected for 1/3–1/2, the lobes pubescent, with papillose margins; ovary densely pubescent. Pods linear, flat, +/-straight-sided to slightly constricted between seeds, 4–7 cm long, 2–3 mm wide, firmly chartaceous, with loosely matted hairs. Seeds longitudinal, ±narrow oblong-elliptic, 3–3.3 mm long, dark brown; pleurogram U-shaped, with yellowish halo; areole depressed, greyish brown.

Disjunct distribution, occurring near Guralmundi, Darling Downs District, Qld, in poorly drained soils over sandstone, and at Shepherds Hill and Kilparney, South Western Plains, N.S.W., in skeletal soil on igneous hills. Flowers Aug. & Sept.

The locality 'Cobar' for the type specimen is rather doubtful, as material of *A. curranii* has not been collected there again, or between Cobar and Shepherds Hill or Kilparney.

A broad (to 4 mm wide), flat phyllode variant occurs E of Hillston, N.S.W., e.g. Wollongong Gap, 35 km E of

Hillston, J.Brickhill 6 (NSW); Monia Gap Stn, J.Pickard 4223 (AD, BRI, CANB, CHR, E, G, K, MEL, MO, NE, NSW, NY, PERTH, PRE, UNSW).

2.2 Type of accepted name

Cobar (see below), N.S.W., 1887, Rev. J.Milne Curran; holo: MEL; iso: NSW.

2.3 Synonymy

Racosperma curranii (Maiden) Pedley, Austrobaileya 2: 347 (1987). Type: as for accepted name.

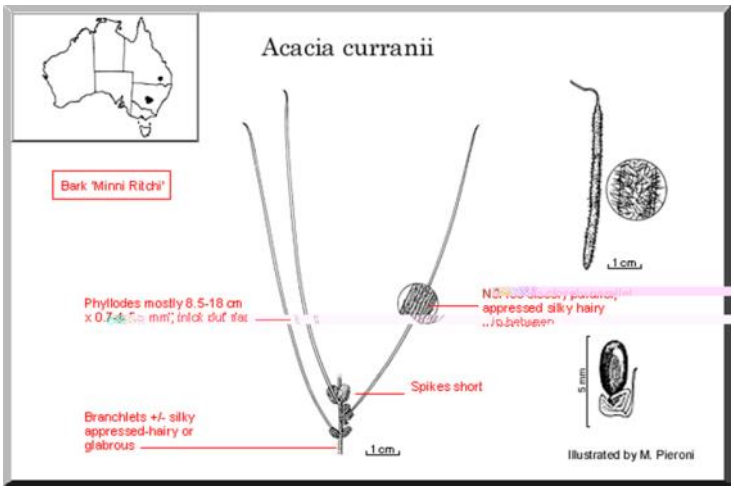
Acacia cyperophylla F.Muell. ex Benth., Fl. Austral. 2: 400 (1864), p.p., not as to lectotype, as to the Leichhardt paralectotype, fide L.Pedley, Austrobaileya 1: 127 (1978).

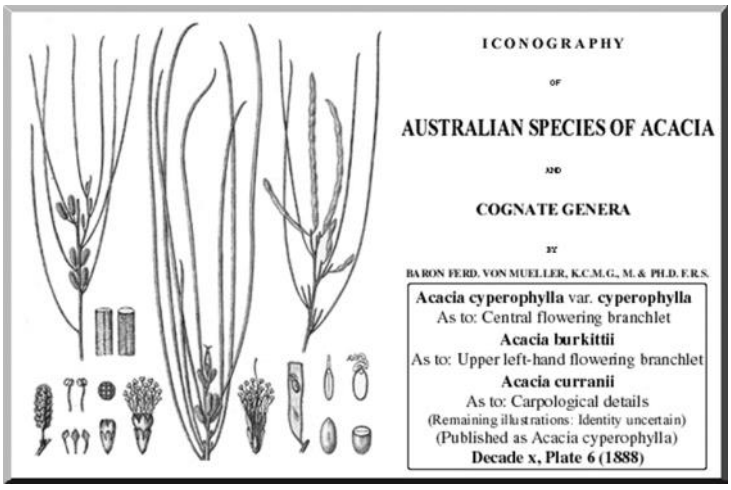
2.4 Representative collections

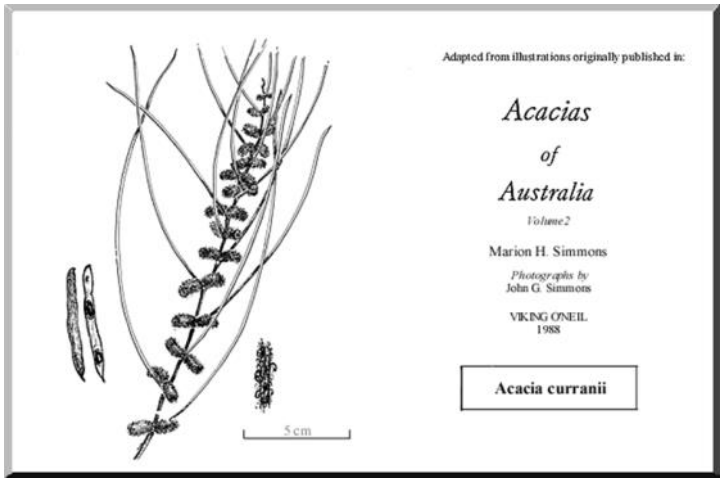
Qld: 10.6 km W from Gurulmundi turnoff on Wandoan–Miles road, I.B.Armitage 1453 (NSW); 3 miles [4.8 km] W of Gurulmundi on Dividing Ra., L.Pedley 877 (BRI, NSW). N.S.W.: 'Mt Solitary', Kilparney, D.Johnston 8132 (NSW); Shepherds Hill, J.Pickard 3508 (A, AD, BRI, CANB, G, L, UC, US).

2.5 Illustrations

F.Mueller, Iconogr. Austral. Acacia dec. 10 [pl. 6] (1888), as *A. cyperophylla*, fide J.H.Maiden, op. cit. 494; G.M.Cunningham et al., Pl. W. New South Wales 351 (1981); M.Simmons, Acacias Australia 2: 223 (1988).







3. Objectives

A key objective of the Curly-bark Wattle SOS project is to protect key populations from the major on-going threat of grazing and degradation of both Curly-bark Wattle and its habitat by feral goats. The following research questions are designed to meet this objective:

1. Does the density and size of *Acacia curranii* plants increase following the removal of goat grazing?
2. Does the construction of a fence eliminate all grazing by goats?
3. Does the removal of grazing by goats result in increased *Acacia curranii* recruitment?
4. Are factors other than goat grazing pressure reducing the health and survivorship of *Acacia curranii*? If so, what are they?
5. Have seasonal conditions masked *Acacia curranii's* response to the management actions?

4. Methods

The monitoring program involves tagging *Acacia curranii* trees and tracking their progress. Four 20m x 20m quadrats were selected as a sample, two inside the goat-proof fencing and two outside (**Figure 1; Table 1**). The life stage, condition, reproductive status, dimensions, disturbance and other notes for each *Acacia curranii* plant were recorded. For more details, see **Appendix 1**.

During the 2017 monitoring, the 20x20m plots were subdivided into four 5m x 20m zones using measuring tapes and lengths of rope. This approach was more systematic and intensive, reducing the likelihood of missed recordings.

Table 1: Coordinates of the northeast corner of each quadrat

Quadrat	Easting (GDA94, Zone 55)	Northing (GDA94, Zone 55)
1	400600	6277300
2	400584	6277100
3	400650	6277650
4	400530	6276720

Figure 1: Location of the quadrats

5. Limitations

Several materials have been used for the tags, including plastic, aluminium and brass. The older plastic and aluminium tags often faded or went missing due to natural processes including mice and bird theft / damage. Therefore there have been difficulties in recording the progress of individual trees.

Trees without tags have been tagged during each year's monitoring. It is likely that new tags have been added to previously-tagged trees where they have gone missing. This also makes the identification of newly-grown trees difficult. The number of new recordings does not necessarily reflect new growth. Additionally, the field methods for the monitoring process have varied as it has been undertaken by several different providers. The 2017 season of recording utilised brass tags and an intensive, systematic fieldwork program. It is hoped that this will provide a solid baseline for ongoing monitoring.

Another limitation is the quantity of data in Quadrat 3. The low numbers of trees in this quadrat in 2015 and, especially 2017 (n = 16) means that the proportions of different aspects within a dataset are affected significantly by single numbers.

Finally, the data available for this analysis is limited to the 2015 to 2017 monitoring seasons. Previous data was not available.






7. Analysis

Multiple attributes have been recorded in order to address the research questions. A summary of the data is provided in **Table 2**, with each attribute analysed in further detail below.

7.1 Population

The population of *Acacia curranii* plants within and without the exclosure is relevant to research questions 1, 3 and 4. A total of 502 *Acacia curranii* plants were recorded inside the fenced area (Quadrats 1 and 2) during the 2017 season. This compares to 122 outside the exclosure (Quadrats 3 and 4).

This comparison is only relevant to the research questions if compared to previous recordings. The rate of growth or decline within the areas open to goat grazing as compared to those protected from grazing is the relevant comparison. Previous data is only available from 2015 and 2016. A comparison of the change in population between 2015 and 2017 is presented in **Table 3**.

The recorded population of plants increased significantly between 2015 and 2017 in three of the four quadrats. When grouped into quadrats inside the fenced area and those outside of the exclosure, the overall growth in population was much higher in the protected areas than those outside the fencing (84% against 26%).

6. Landscape setting of each plot

Plot 1 (Inside exclosure)

Plot 2 (Inside exclosure)

Plot 3 (Outside exclosure)

Plot 4 (Outside exclosure)

Table 2: Summary of the data collected in the 2017 season*

	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Inside Exclosure	Outside Exclosure
Previous recordings	182	90	48	61	272	109
New Recordings	157	126	7	65	383	72
Missing Tags / Not Re-located	20	33	39	20	53	59
Total Population	319	183	16	106	502	122
Life Stage	I = 122 M = 197	I = 65 M = 116 S = 1 D = 1	I = 8 M = 6	I = 52 M = 54	I = 187 M = 313 S = 1 D = 1	I = 60 M = 60 S = 0 D = 2
Condition	H = 319	H = 182 D = 1	D=2	H = 106	H = 501 D = 1	H = 120 D = 2
Reproductive Status	N = 130 B = 189	N = 142 B = 41	N = 11 B = 6	N = 59 B = 47	N = 272 B = 230	N = 69 B = 53
Mean Height (cm)	94	115	139	95	99	100
Disturbance	N = 319	N = 181 Dead = 1 Horizontal Trunk = 1	BS = 7 Gr = 8 N = 1	N = 100 Gr = 5 BS = 1	N = 500 Dead = 1 Horizontal Trunk = 1	N = 101 Gr = 13 BS = 8

*See Appendix 1 for codes

Table 3: Changes in *Acacia curranii* populations between 2015 and 2017

	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Inside Exclosure	Outside Exclosure
Population 2015	183	90	39	58	273	97
Population 2017	319	183	16	106	502	122
Change (+ / -)	+136	+93	-23	+48	+229	+25
Change (%)	+74%	+103%	-58%	+83%	+84%	+26%

7.2 Dimensions

The differences in size of *Acacia curranii* plants within and outside the goat exclosure is a component of research question 1. A range of measurements have been taken from the plants in the monitoring areas, but height is considered the most relevant dimension as it is most affected by goat grazing. The mean heights of the trees in the monitoring areas are presented in **Table 4**.

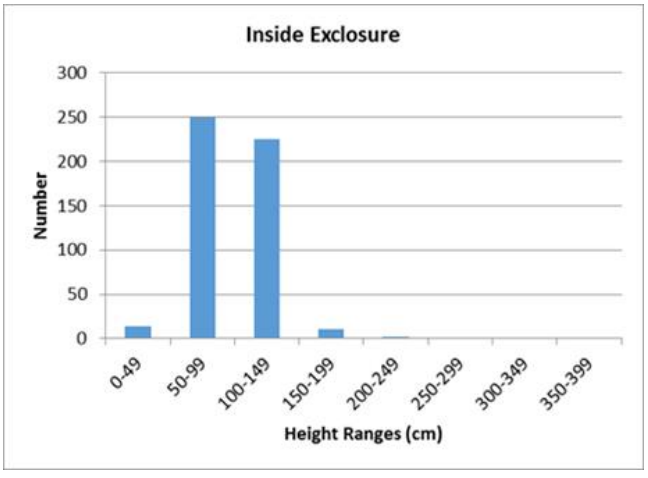
Mean plant heights increased in all four quadrats. This growth was much higher within the fenced area than outside the area (281% growth versus 43%). It is relevant that the 2015 mean plant heights were much lower in the exclosure than those without.

A further means of analysis can be derived from within the 2017 data set. By dividing the recordings into discreet height ranges, it may be possible to identify interruptions in the growth process. **Figures 2** to **3** present histograms of plant heights within 50cm brackets and <49cm / 50-149cm / above 150cm. These height ranges were determined based on graphs that plotted the plant heights individually. The differences in values represented in Figure 3 are clearer when presented in a pie chart, hence the different style of graph.

Table 4: Change in *Acacia Curranii* height between 2015 and 2017

	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Inside Exclosure	Outside Exclosure
Mean Height	24	32	82	47	26	70
Mean Height	94	115	139	95	99	100
Change (+ / -)	+70	+83	+57	+48	+73	+30
Change (%)	+292%	+259%	+70%	+102%	+281%	+43%

Figure 2: Comparison of 2017 plant height ranges (50cm) between plants inside and outside the goat protective fencing



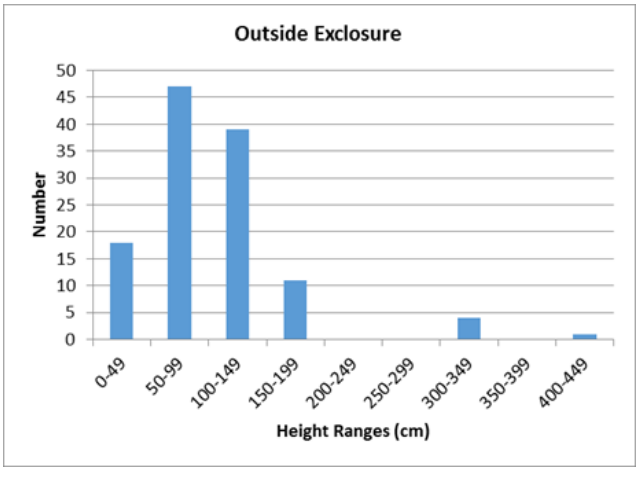
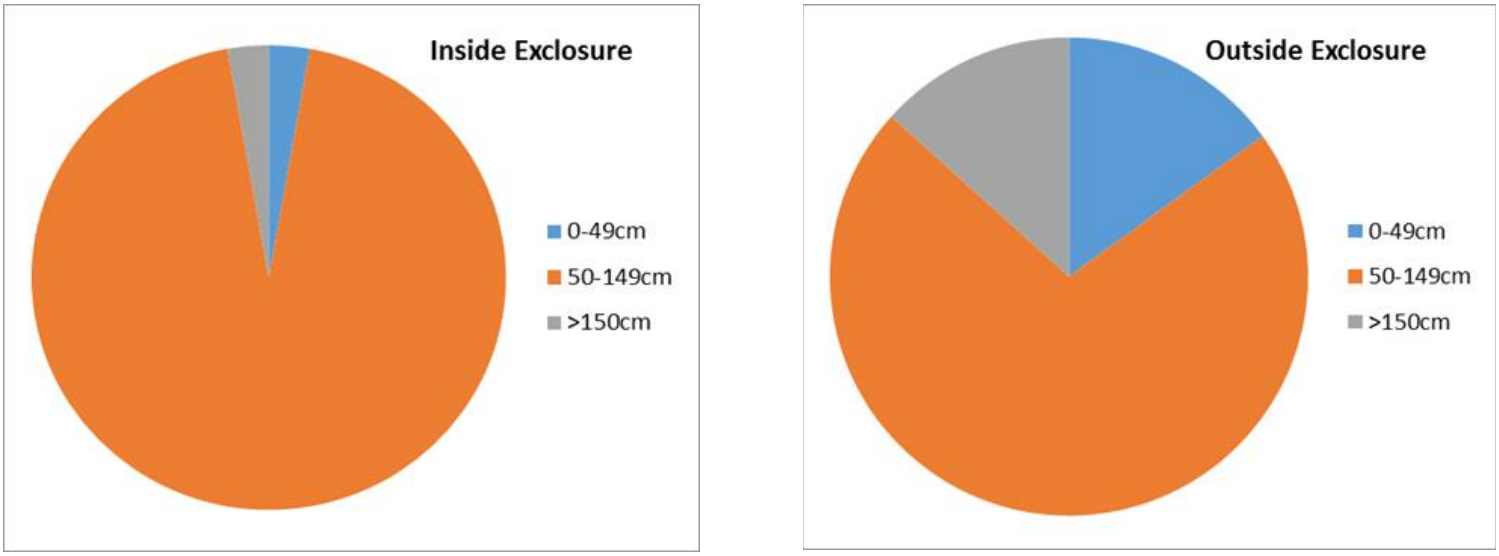


Figure 3: Comparison of 2017 plant height ranges (<49cm / 50-149cm / above 150cm) between plants inside and outside the goat protective fencing



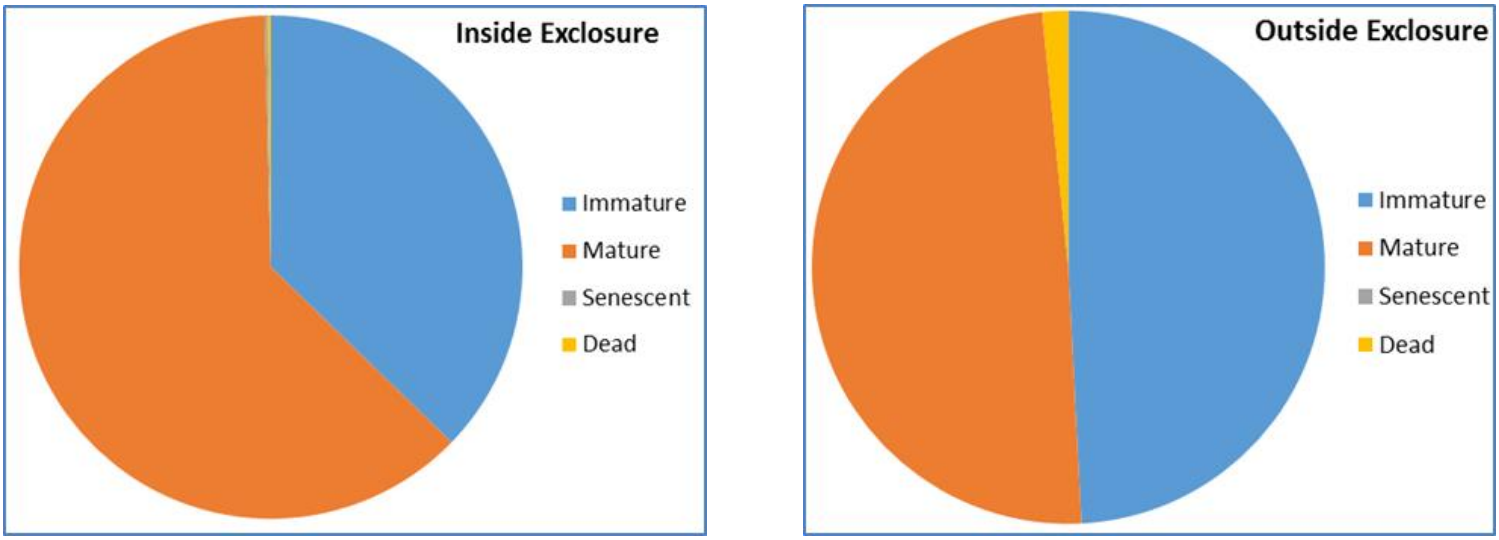
By splitting tree heights into 50cm increments (**Figure 2**), it is clear that the most frequent plant heights are between 50cm and 149cm. This is to be somewhat expected given that the mean heights of the trees fell within this range. However, rather than a gradual rise and fall from this peak, the jump at the 50cm divide and fall at the 149cm mark are pronounced. This sharp rise and fall in frequencies prompted a second grouping of data that illustrates a potentially significant difference between the tree heights inside the exclosure and outside.

Figure 2 separates the frequency of tree heights within the 50cm to 149cm range from the values above and below this range. The most noticeable feature of this grouping is that tree heights inside the fencing are more intensely grouped within the 50cm to 149cm range than those outside the fencing.

7.3 Life Stage

The ability of *Acacia curranii* plants to recruit is highly dependent on their ability to survive into maturity and continue to survive in a reproductive stage of life. A life stage analysis was undertaken for the four quadrats near Monia Gap. The results are summarised in Figure 4.

Figure 4: Comparison between the life stages of plants inside and outside the fenced area in 2017



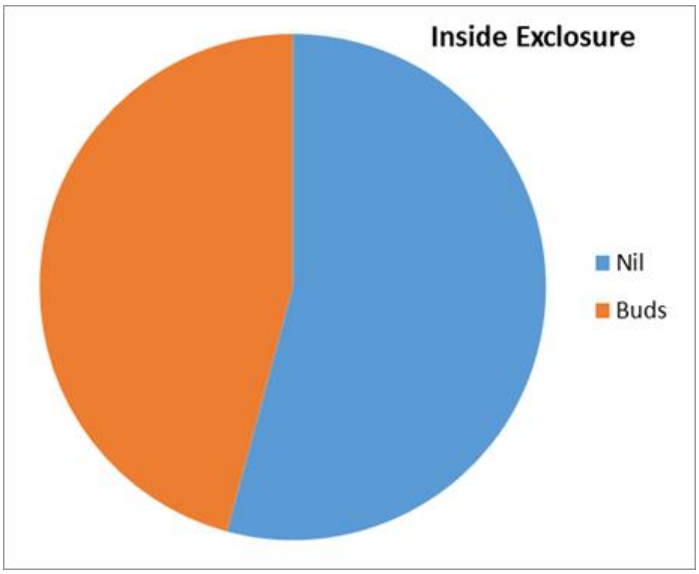
Just over half of the plants outside the exclosure were 'Immature' or 'Dead', meaning that they could not reproduce. This compares to the 62% of mature plants with the exclosure that were in a life stage in which reproduction was possible.

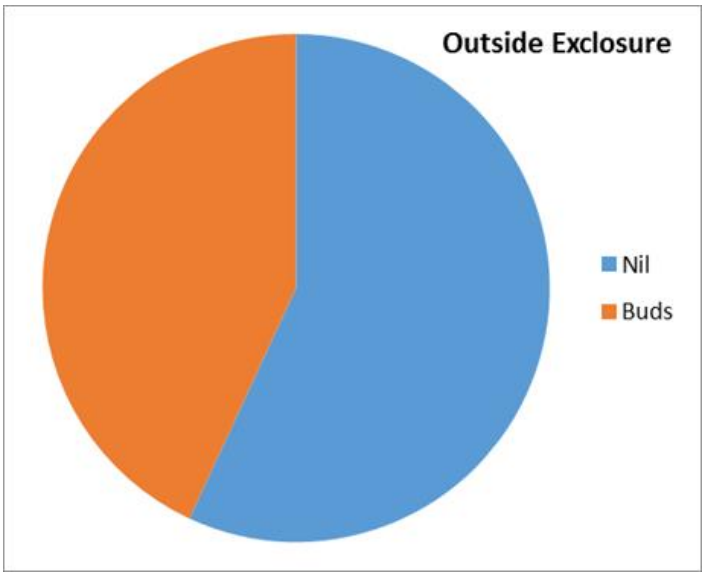
Nearly all trees recorded during the 2015 fieldwork for the project were immature, suggesting that populations of *Acacia curranii* have matured significantly since then, both inside and outside the exclosure. This statistic is more dramatic within the exclosure where the percentage of mature trees has risen from 1% to 62%, an increase of 61%. Outside the exclosure the increase of mature trees from 2015 to 2017 was from 9% to 49%, an increase of 40%.

7.4 Reproductive Status

Direct observations were made of the reproductive status of plants in the quadrats in addition to their life stages. A comparison of the reproductive status of plants inside and outside of the fenced area is presented in **Figure 5**. There was little difference between the proportions of plants that had showed signs of reproduction inside and outside of the exclosures. This is despite the greater proportion of mature plants inside the exclosure.

Figure 5: Reproductive status of plants observed in the 2017 monitoring season

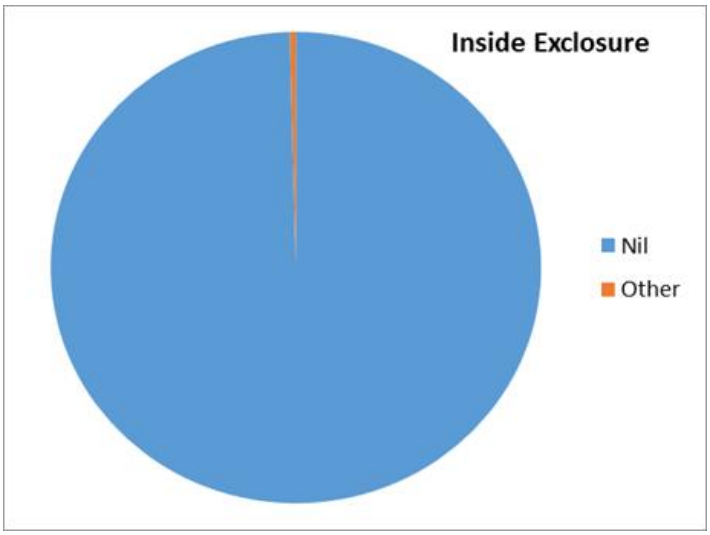


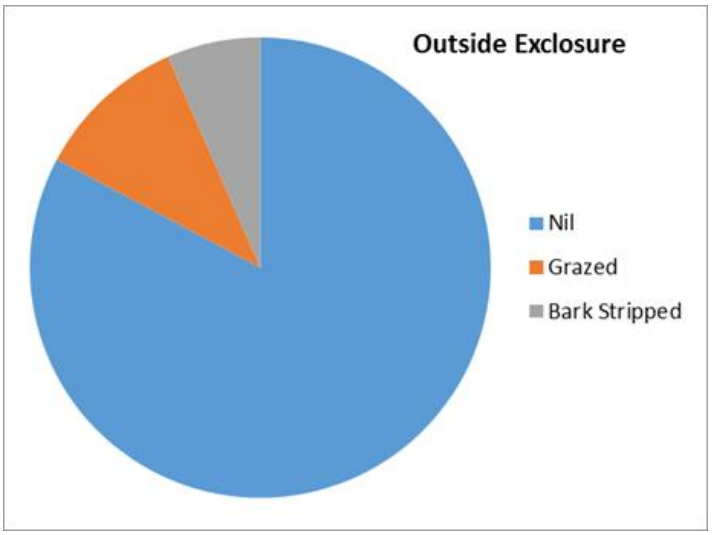


7.5 Condition and Disturbance

Almost all plants were in a 'Healthy' condition inside and outside of the exclosures (**Table 2**). Although the condition of the trees was almost entirely listed as healthy overall, there was some disturbance recorded on the trees (**Figure 6**). Less than one per cent of the trees within the protective fencing exhibited signs of disturbance whereas over 17% of the trees outside of the exclosure had some form of disturbance. Both grazing and bark stripping were noted in Quadrats 3 and 4.

Figure 6: Proportions and types of disturbance observed in the 2017 monitoring season





8. Discussion

Based on the analysis, the research questions can be addressed with varying levels of conclusiveness. Due to the limitations discussed in this document, some questions require further monitoring and greater statistical analysis to be confidently addressed.

Does the density and size of *Acacia curranii* plants increase following the removal of goat grazing?

The population, and therefore density, of *Acacia curranii* plants increased both inside and outside of the exclosure. This increase was much higher inside the protective fencing. Based on this simple comparison, it would seem that goat grazing has a significant impact on the density of *Acacia curranii* plants. However, more information and analysis is needed to confirm this.

The density of *Acacia curranii* plants in Quadrat 4, which is outside of the exclosure, increased by a greater percentage than those in Quadrat 1, which is inside the exclosure. The overall densities of plants outside of the exclosure were reduced by the decrease in Quadrat 3. Other factors may have contributed to the decline in population in Quadrat 3. This quadrat had the lowest population in 2015 by a significant degree, which may have been a factor in the population decline.

Another factor in assessing changes in density is that more systematic and intensive recording was undertaken during 2017. The increases in populations are likely to be, at least in part, a function of the more intensive survey. This does not account for the greater rate of density increase inside the fencing than outside though.

Another simple comparison can be made in terms of the increase in tree height from 2015 to 2017. The *Acacia curranii* plants grew much more dramatically inside the protective fencing than outside, and so it would be simple to ascribe this to the absence of goat grazing inside the exclosure. However, mean heights were much lower in 2015 inside the fencing than outside. The change in height of the plants should be compared with average growth rates under more stable conditions.

A more reliable comparison of tree height data is derived from within the 2017 data set alone. It appears that the different conditions inside and outside the exclosure have created a more narrow height range inside of the fenced area. A possible interpretation of this is that goat grazing has less effect on saplings under 50cm in height and trees above 150cm. However, this alone does not explain the absence of taller trees inside the protective fencing nor does it explain the absence of saplings under 50cm high within the fencing.

It could be provisionally posited that the removal of goat grazing has resulted in an increase in *Acacia curranii* plant densities and sizes. However, further analysis is required.

Does the construction of a fence eliminate all grazing by goats?

No grazing was recorded within the protective fencing. This compares to 17% of plants outside of the exclosure. In addition to this, a further 8% of *Acacia curranii* plants outside of the protective fencing showed signs of resprouting after being browsed. Although total number of grazed trees is still based on a small data set, it appears very likely that the fence has eliminated goat grazing entirely.

Does the removal of grazing by goats result in increased *Acacia curranii* recruitment?

If recruitment is measured by population growth alone, then a provisional argument could be made to suggest that the removal of grazing does increase plant recruitment. However, the analysis of life stage and reproductive status data is inconclusive in addressing this question. There were more mature and budding *Acacia curranii* plants inside the exclosure than outside. However, the proportions were quite similar between the two areas of comparison (inside and outside) for both attributes.

Perhaps the most relevant statistic is the increase in mature plants in proportion to immature plants from 2015 to 2017. Not only did *Acacia curranii* within the exclosure mature at a greater rate than outside, they began at a lower mean height. This particular aspect of the data is linked to the analysis of tree height.

Further explanation for the relative absence of immature trees within the exclosure would support the relevance of the differing proportions of mature and immature trees inside and outside the exclosure. An additional factor in assessing recruitment is the time of year for the monitoring. The numbers of budding or flowering plants is generally low, making comparisons difficult. With the available data, there is some indication that the removal of goat grazing has increased the likelihood that *Acacia curranii* will recruit. This assumption is subject to further population analysis and an increased data set.

The questions we have not address to date include:

- Are factors other than goat grazing pressure reducing the health and survivorship of *Acacia curranii*? If so, what are they?
- Have seasonal conditions masked *Acacia curranii's* response to the management actions?

9. Future Objectives

Based on the discussion, the following objectives are suggested for future monitoring and data analysis:

- A statistician should be consulted to review what data is being collected and to determine what it can be used for to refine the field methods.
- A continuation of monitoring for successive years using the approved methods would generate more reliable data. The more reliable brass tags and more intensive and systematic survey should provide a data set with few, if any, duplicates or missed recordings. The only outstanding task under the current methodology is to replace residual aluminium tags in Quadrat 1.
- Seasonal variations should be taken into account in selecting the time of year for the monitoring of the sample near Monia Gap. Comparisons of the reproductive status of plants, and therefore recruitment ability, are difficult over time if the plants are at different stages of their annual cycle. Observations within the data set of a single year would be more meaningful by increasing the size of the data set, and so monitoring during a time of year when *Acacia curranii* typically bud and flower would achieve this.
- The change in density of *Acacia curranii* between 2015 and 2017 should be compared with like data elsewhere with fewer variables (such as goat grazing). This could help explain the significant differences between the change in densities in Quadrats 3 and 4, both of which were seemingly exposed to similar conditions. Until this is resolved, the comparison of data inside and outside of the exclosure has limited value. Further analyses of the sample near Monia Gap in future years may also help resolve this.
- Likewise, the growth rates of plant heights in the sample area are based on different starting points. The comparison in height change between *Acacia curranii* plants inside and outside the protective fencing requires baseline data from typical height growth under stable conditions.

Appendix 1: Codes for field recording

Within each plot the following will be assessed for each individual Acacia curranii present:

- Plant identification number (or add a new brass tag and number to new plants)
- Life stage
  - Senescent = plant is over 1 metre, old, has a sparse crown and only has a few healthy branches (may also have some reproductive parts).
  - Mature = plant is over 1 metre with healthy foliage (crown is denser than sparse) and may have reproductive parts (flowers, buds or seeds). And any plant that is less than 1 metre tall that has reproductive parts (flowers, buds or seeds).
  - Immature = plant is less than 1 metre tall and does not contain reproductive parts.
  - Dead = plant is present but there are no alive parts.
- Reproductive status – presence or absence of buds, flowers and/or fruit.
- Plant height in centimetres (height from stem base to a horizontal projection of the highest point).
- Stem diameter. For all plants the stem diameter is taken at ground level in millimetres.
- Disturbance– presence or absence of disturbances, disturbance type where present (e.g. grazed) and extent of plant affected (%).

Within each goat exclosure and each 20 × 20 metre plot (outside the goat enclosures) assess the following using a rapid visual assessment:

- Per cent ground cover (< 1 metre) of grasses, herbs and forbs, low shrubs (<1 metre), bare soil, litter, rocks (> 100 millimetres in width at any point), logs (> 100 millimetres in diameter at both ends) and weeds.
- Per cent mid storey cover (1 to 5m) of shrubs, saplings, trees and weed species
- Per cent canopy cover (>5m) of trees and weed species
- Permanent photo points
  - Take a south facing photo of the vegetation in the exclosure/plot from the northern corner post/marker (or the nearest post/marker to the northern most point).
  - Take a north facing photo of the vegetation in the exclosure/plot from the southern corner post/marker (or the nearest post/marker to the southern-most point).

Within each goat exclosure inspect the condition of the fence and record the following:

- Metres of fence line that is functioning as a barrier and is excluding terrestrial medium to large mammals.
- Metres of fence that has holes or is allowing terrestrial medium to large mammals to enter the exclosure.

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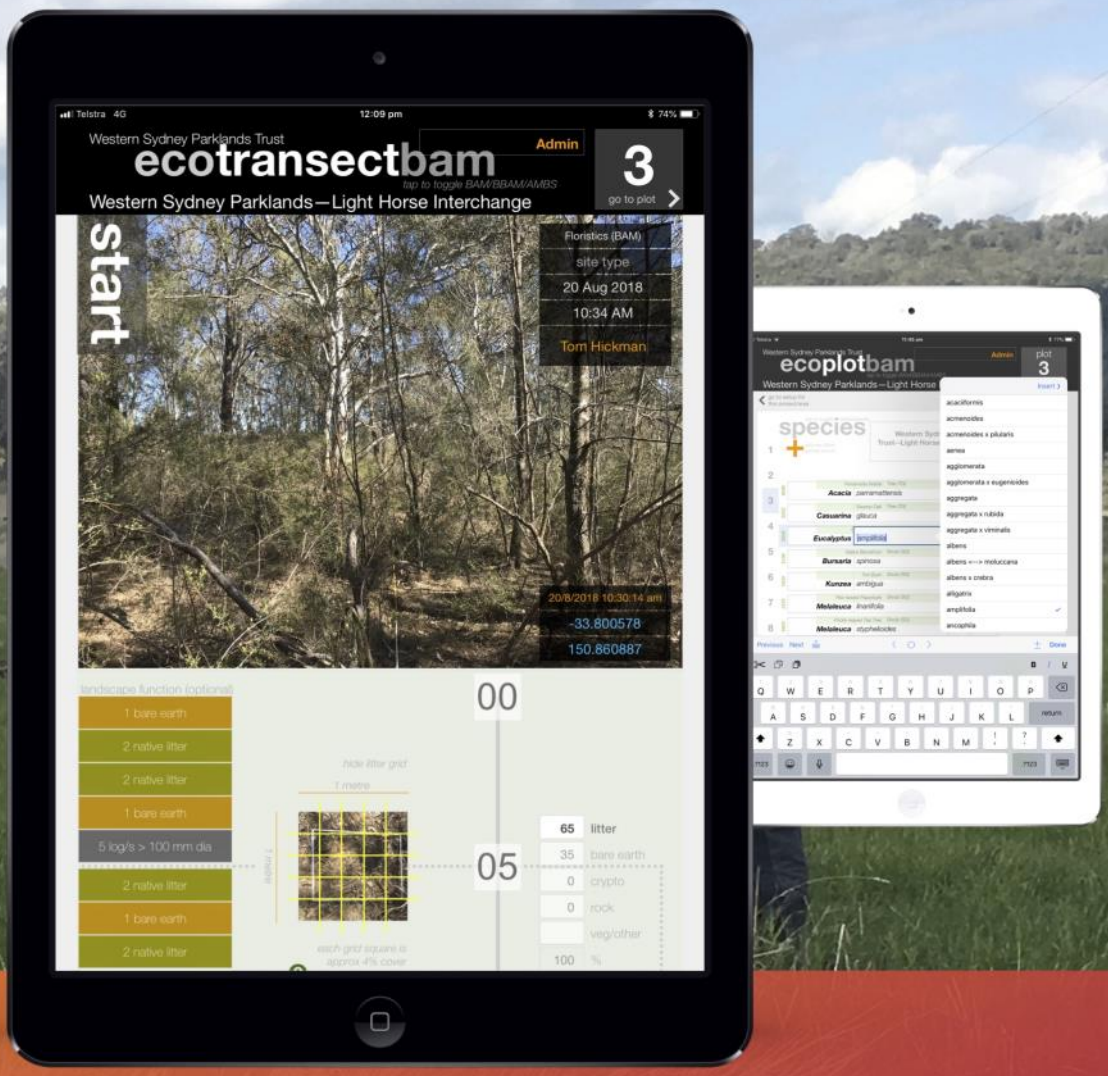

SICK OF ENTERING DATA FROM YOUR FIELD SHEETS INTO EXCEL? SICK OF LOSING YOUR DATA WHEN IT RAINS, YOU SPILL YOUR COFFEE OR YOUR PLANT SAMPLES AND DATA SHEETS START TO MELD INTO ONE?

HOW ABOUT COLLECTING YOUR DATA ON AN IPAD APP THAT REFERENCES OEH'S BIONET SO NOMENCLATURE IS CURRENT AS ENTERED, CALCULATES GROWTH FORM GROUP COVER FROM YOUR SPECIES DATA ENTRY, REFERENCES THE BAM BENCHMARKS BASED ON YOUR PCT AND SYNCS TO A SERVER SO NO AMOUNT OF COFFEE OR VEGETATIVE MATTER CAN MAKE YOU HAVE TO REDO YOUR PLOT?

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Contributions to the Newsletter, Volume 42

Contributions to the next newsletter should be forwarded to the administration assistant Amy Rowles admin@ecansw.org.au by the **15th of January 2019.**

- Articles may be emailed in WORD, with photos included or referenced in an attached file as a jpg.
- Please keep file size to a minimum, however there is no limit on article size (within reason)
- Ensure all photos are owned by you, or you have permission from the owner
- Ensure that any data presented is yours and you have permission from your client to refer to a specific site (if not please generalise the location).
- All articles will be reviewed by the editorial committee, and we reserve the right to request amendments to submitted articles or not to publish.
- Please avoid inflammatory comments about specific persons or entity

The following contributions are welcome and encouraged:

- ◊ Relevant articles
- ◊ Anecdotal ecological observations
- ◊ Hints and information
- ◊ Upcoming events
- ◊ Recent literature
- ◊ New publications (including reviews)
- ◊ Photographs

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ECA Photo Gallery

Left: Eastern Pygmy Possum. **Below:** Superb Lyrebird near hair funnel. **Below right:** Dingo pups investigating camera trap lure. *Photos courtesy of Andrew Lothian*.

Below Left: Yellow Box *Eucalyptus melliodora*. **Below Centre:** Red flowering Ironbark—species unknown. **Right:** Poplar Box *Eucalyptus populnea*. *Photos courtesy of Amy Rowles.*