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Front Cover Photo: Jumping Spider
(Lycidas scutulatus).

Ecological Consultants Australia were engaged by Inner West Council to monitor biodiversity throughout parks and reserves in Leichardt. The invertebrate aspect of the project involved systematic sampling and identification of invertebrates down to the family level. Statistical analysis was focused on comparing invertebrate abundance and species richness among parks and to investigate whether habitat management and native re-vegetation programs are having an effect on invertebrate populations. We found that re-vegetated areas of bush featured significantly greater invertebrate abundance and species richness compared to unmanaged weedy bush or turfed areas. I used this opportunity to take some close up photos of a range of invertebrates.

Courtesy of Michael Davis.

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Message from the President

Dear members,

I have just finished reading a review of a recent book by Thomas Freidman called "Thank You for Being Late – An optimist's guide to thriving in the age of accelerations". Freidman believes we are living in an age that is simultaneously chaotic, confusing and invigorating i.e. the waves of change, colliding and overlapping are pushing humanity into the deepest social upheaval and creative restructuring of all time. Strong stuff, but possibly true. He cites numerous examples that illustrate how rapid changes have influenced the way we live (in a single day Facebook connects 2,031,779 people from India and Pakistan). He postulates three complementary accelerations in lifestyle changes. These are:

- the power of technology,
- the extent to which our economies are enmeshed and entangled, and
- the impact of humanity's activities on the planet.

Most of his examples are global situations e.g. Syria, urban living, but I can see how his three accelerations closely fit the profession of ecological consulting.

Take the last acceleration first, the impact of humanity's activities on the planet. There is no denying that climate change, land clearing and increased pollution are impacting upon the planet, particularly the natural world. It is proposed that we are now leaving the Holocene era and entering the Anthropocene. This more unsettled era is one that we, as ecological consultants, have to deal with constantly. Ecological consultants are at the forefront of measuring, assessing and predicting change. This may seem an egotistical boast, but our day-to-day 'work' is precisely that and hopefully we can, at times, assist in highlighting changes that may be detrimental as well as providing guidance in reducing impacts from humanity's activities.

The second acceleration is involved very much with the manner in which the business of ecological consulting is undertaken. Ultimately, it is the 'bottom line' that is most important to any business, no cash input equals no business. To those who are involved with quotes and competing for the contracts, there is always some form of compromise in terms of what should be done and what the client is prepared to pay - try convincing a client to add several more sites as controls. Consequently, there is a necessity to cut corners and to provide cheaper alternatives, particularly with the number of ecological/environmental consultancies competing for the same contract. In the ideal world

quotes would be based on doing the best job.

However, chasing a contract needs to be placed into a much larger context. Globally, there is the to-ing and fro-ing of trade agreements, world-wide pricing and demands. I have worked with several large coal mine companies that are currently sitting on deposits of coal that will only be extracted once coal prices rise or the company can raise sufficient cash to proceed (the cost of developing a coal mine can be as high as \$200 million). I have listened to executives discuss whether to adopt the mitigation measures recommended or just take it to court and pay the fines - let the accountants tell us which is the best (cheapest). Ultimately, the extent to which our economies are enmeshed and entangled affects how we run our consulting business and who and how many we employ.

The final acceleration (the power of technology) is closely linked with economies and is very relevant to us practising ecological consultants. There is no doubt that the technology of locating and recording flora and fauna in the field has changed rapidly. When I first started undertaking surveys traps were made from wood and most animals were collected with a gun or 'break back' traps. Elliott traps were first built in Australia in the 70s from cast-offs from caravan builders, then came cage traps, pit traps, reptile funnels, hair tubes and finally remote recording by cameras, anabat recorders and songmeters. Even trained sniffer dogs are part of the technical arsenal. Similarly with vegetation, moving from field observations and herbariums to aerial photography and satellite imagery with detailed analysis.


Perhaps it is in the area of biodiversity and impact assessment where there has been the greatest acceleration in technology. The use of forms and clipboards has been replaced by keypads and ipads and decisions based on qualitative judgements are now spat out of specially designed software programmes secreted in black boxes. This ensures a reliable and repeatable process that eliminates human judgement (and error) but does place greater responsibility on those developing and providing such programmes. At present we are looking at a variety of changes in the technology of biodiversity assessment and biodiversity conservation. The new Biodiversity Conservation Act

leads us into offsetting strategies and Biodiversity Assessment Methodology (BAM) that we will all have to grapple with during this year and onwards. There have been many criticisms of the Act and BAM and a number of our members have worked long and hard to try to temper some of the extremes within the Act. To them I give my appreciation.

However, according to Thomas Freidman, these changes are inevitable and the three complementary accelerations in lifestyle changes must be embraced.

Of course you could look further into the future and cite from a famous beat poet of the 50s, Lawrence Ferlinghetti. In his poem "I am waiting", he says: *I am waiting for forests and animals to reclaim the earth as theirs.* Perhaps, when this happens, there will be no need to work with the three accelerations.

Martin Denny



The ECA Council meet every three months to discuss and deal with any current business of the association. The last meeting took place on the 13th February and the next meeting will take place on the 22nd May. 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

EUROKY

Euroky: ability of an organism to adapt to changes in the environment

If you have any interesting observations or useful hints and information that you would like to share in the euroky column, please forward them to the newsletter editor or administration assistant to be included in the next edition.

BIODIVERSITY REFORMS NEWS FLASH - NSW BIODIVERSITY CONSERVATION ACT 2016 (BC Act 2016)

Isaac Mamott

Sclerophyll Flora Surveys and Research Pty Ltd

Isaac Mamott provides a detailed synopsis of the new biodiversity legislation in NSW and its key implications in relation to Part 4 and 5 proposals under the EP&A Act. Details relevant as of February 2017.

- Passed by parliament in Dec 2016 and replaces NSW *Threatened Species Conservation Act 1995* (TSC Act - repealed)
- Due to commence mid 2017
- Regulations not yet available or exhibited for comment
- Lists Threatened species, populations, ecological communities, Key Threatening Processes as per the repealed TSC Act
- Part 4 (EP&A Act) proposals (other than State Significant Development [SSD]) will be assessed as having a likely significant impact on listed species, populations and EECs or their habitats if the new 5 part test of significance (replacing the existing 7 part test) concludes as such **OR** if the development exceeds a yet to be determined 'biodiversity offsets scheme threshold' (where removal of native vegetation exceeds a certain threshold extent – OEH

have previously advised 1 hectare is the likely threshold extent to be prescribed in the Regulations). If deemed a likely significant impact based on the 5 part test of significance or offsets threshold exceedance, a 'biodiversity development assessment report' (BDAR) would need to be prepared as part of the Part 4 EIA documentation. The BDAR must include a detailed impact assessment and a biobank assessment to be undertaken on the proposed development site to determine the type and amount of biodiversity credits needed to offset the loss of biodiversity. Should a BDAR be required as part of a Part 4 proposal, the Proponent has a number of options available to meet their offsetting obligations as determined by the biobank assessment, these being:

1. purchase and retire the required number and type of biodiversity credits on the open market (if available); **OR**
 2. purchase and establish a biobank 'stewardship' site managed in perpetuity for conservation using the biobank assessment methodology (on the proposed offset site); **OR**
 3. pay an amount of money into a newly established Biodiversity Conservation Fund (BCF) which will use the funds to purchase and manage biobank stewardship (conservation) sites. The amount of money required to pay into the BCF in order to offset the loss of biodiversity on the proposed development site will be calculated using an offsets payment calculator currently being developed by OEH and is likely to be an amount that is equivalent to or greater than the payment needed for option 2. The BCF would be managed by a 'Biodiversity Conservation Trust' which would function as a fund manager and would be made up of a yet-to-be determined public or private body(ies).
- No SISs to be prepared for Part 4 proposals as those deemed as having likely significant impacts on listed species, populations and EECs will require a BDAR to be prepared instead;
 - What are the key implications from this new Part 4 planning/biodiversity assessment framework? Should the biodiversity offsets scheme threshold remain at 1 hectare as previously advised by OEH,

this is likely to result in an increase in the number of mandatory biobank assessments required as part of Part 4 proposals. Will Part 4 consent authorities (ie. Councils) have the necessary expertise to review BDARs which contain biobank assessments or will they need to refer the BDARs to OEHL (or to accredited biobank assessors) for comment. In either case, it is thought that this framework may result in a workload issue for the consent authorities (this could represent a significant new area of work for accredited biobank assessors);

- Part 5 (EP&A Act) proposals (other than State Significant Infrastructure [SSI]) will be assessed as having a likely significant impact on listed species, populations and EECs or their habitats if the new 5 part test of significance (replacing the existing 7 part test) concludes as such. Should the 5 part test conclude that the Part 5 proposal is likely to result in significant impacts on one or more listed Threatened species, population and EECs, this would trigger the need for the preparation of an SIS **OR** a BDAR, either of which the proponent (ie. government determining authority) may choose to prepare. If the likely significant effect on threatened species, populations or EECs listed under the new BC Act is the **only** likely significant effect on the environment, then an environmental impact statement (EIS) will **NOT** be required as part of the Part 5 proposal;
- SSD (Part 4) and SSI (Part 5.1) proposals must be accompanied by a BDAR as part of the EIA/EIS documentation **UNLESS** the head of the NSW Department of Planning and Environment (DPE) determine that the proposed development is not likely to have a significant impact on 'biodiversity values'. Where a BDAR is not deemed to be required for an SSD/SSI proposal by the DPE, the DPE Environmental Assessment Requirements (EARs) that inform the EIS content will prescribe the nature of the biodiversity assessment that would be required;
- Of particular interest is Clause 7.13(4) which states that for Part 4 proposals (other than SSD), the consent authority **may reduce or increase** the number of biodiversity credits that would otherwise be required to be purchased/retired (as determined by the biobank assessment within the BDAR) if the consent authority determines that the reduction or

increase is justified having regard to the environmental, social and economic impacts of the proposed development. Whether any Council or DPE decide to use the power of this clause will remain to be seen. Interestingly, there is no such clause in relation to SSD/SSI proposals where a BDAR is required. The BC Act also includes a similar clause for Part 5 proposals which allow determining authorities to reduce the number of biodiversity credits as determined in a BDAR with appropriate justification (no mention of an increase in credits);

- Part 4 proposals (other than SSD) will be refused approval should they be deemed to result in '**serious and irreversible impacts**' on biodiversity, which will be defined in the upcoming Regulations (likely to be defined as significant impacts to critically endangered species and ecological communities, etc.). SSD/SSI and Part 5 proposals will **not** be subject to this limitation;
- Biodiversity Stewardship Payments Fund (BSPF) will be established to fund biodiversity stewardship agreement sites (ie. biobank sites) which are managed for conservation in perpetuity. The BSPF will be managed by the BCT fund manager;
- Details on the revised Biobank Assessment Methodology, offsets payment calculator, biodiversity offsets scheme threshold(s) and serious and irreversible impacts definition will be provided once these are made public in the upcoming Draft Regulations.

As part of the NSW biodiversity reforms, a new Local Land Services Amendment Act 2016 has passed parliament (yet to be commenced). This Act applies to all rural zoned land in NSW and is relevant to all proposals which do not typically fall under Part 4 or 5 of the EP&A Act. Once the Draft regulations are made public, Sclerophyll Flora will provide a similar detailed synopsis (there is too much detail missing to provide a worthy summary at present).

Disclaimer – The above news flash summary represents Sclerophyll Flora's interpretation of the new biodiversity legislation (as a professional ecologist) as of February 2017 and should not be relied upon without seeking expert legal advice.

CONTENTS OF FOUR OWL PELLETS COLLECTED FROM DOLPHIN POINT, NSW

Deryk Engel¹ and Georgeanna Story²

¹ Lesryk Environmental Pty Ltd

² Scats About

During an investigation of a private parcel of land that is located within the New South Wales seaside township of Dolphin Point, four owl pellets were collected. Dolphin Point is located on the southern side of the ocean outlet to Burrill Lake, approximately 4.5 kilometres south of Ulladulla. South of the Dolphin Point urban area, Barnunj State Conservation Area is present, this reserve covering an area of around 164 hectares.

The pellets were collected on 9 September 2016, two being moist (presumably recently regurgitated), the others dry (Plates 1 and 2 respectively).



Plate 1: Moist owl pellets



Plate 2: Dry owl pellets

The pellets were all located under a Scribbly Gum (*Eucalyptus haemastoma*) that was approximately 10 m high. The presence of both fresh and old pellets would imply that this tree was being regularly used as a roosting site by an owl species. No hollows suitable for the breeding requirements of an owl were observed in association with this tree.

The size and content of the pellets would suggest they were from a medium sized owl, such as the State listed Sooty Owl (*Tyto tenebricosa*) or Eastern Barn Owl (*Tyto javanica*), both of which have been recorded in this locality (authors field notes).

Though the area was subject to a targeted search, no owls were observed at, or close to, this location at the time of the investigation.

The pellets measured (approximately):

- Moist 1 – 32.2 millimetres (mm) by 25.7 mm
- Moist 2 – 52.4 mm by 29.5 mm
- Dry 1 – 59.9 mm by 29.9 mm
- Dry 2 – 44.2 mm by 28.4 mm

Each of the pellets contained bone and hair material, which, upon analysis, were identified as:

- Moist 1 – Brown Antechinus (*Antechinus stuartii*) (1 individual)
- Moist 2 – Brown Antechinus (*Antechinus stuartii*) (2 individuals)
- Dry 1 – Bush Rat (*Rattus fuscipes*) (1 individual)
- Dry 2 – Bush Rat (*Rattus fuscipes*) (1 individual)

The pellets were analysed in house.

The removed contents from the four pellets collected are presented in Plates 3 and 4.



Plate 3: *Antechinus stuartii* remains



Plate 4: *Rattus fuscipes* remains

WHO IS QUALIFIED TO CONDUCT A BUSHFIRE ASSESSMENT?

*Robbie Economos
Lake Macquarie City Council*

Anyone can use the tools on the Rural Fire Service (RFS) web site (including Planning for Bushfire Protection 2006) to do a bushfire threat assessment and submit this to Council with a DA. The assessing officer (usually Planners and/or Building Surveyors) will assess the site, the proposal and the submitted bushfire threat assessment/report then decide whether the report is adequate. For simple sites and simple assessments the reports can be done by just about anyone (self-assessment). However, should it be a difficult site (i.e. complicated slopes, landuses and vegetation) or high fire risk, or the report appears not to reflect site conditions, (or have errors) the assessing officer will request a suitably qualified or certified person to do the assessment.

When a DA is assessed by a certified Bushfire Planning And Design (BPAD) accredited consultant and a BAL Risk/Threat Assessment Certificate is submitted in association with a development, the proposal can be immediately accepted, as meeting bushfire requirements, by the assessing officer without question, if the proposal has a BAL of up to BAL 40. If the Bushfire Attack Level is higher than BAL 40, ie Flame Zone (FZ), the application must go to RFS for their assessment.

A BAL Assessment Certificate is also required in

association with Complying development. In this case if a property boundary is BAL 40 or FZ it cannot be complying development.

Only someone who is on the list of Fire Protection Association Australia, Bush Fire Planning and Design (BPAD) Accredited Practitioners can issue a BAL Risk/Threat Assessment Certificate or BAL Assessment Certificate. However, Council officers can also issue a BAL Assessment Certificate in association with complying development. Some consultants may have tertiary qualifications in this area (i.e. Bushfire) but cannot issue BAL Assessment Certificates unless accredited by the Fire Protection Association of Australia.

In short, anyone can do Bushfire Assessments for certain sites without qualifications. However, only suitably qualified consultants i.e. BPAD accredited practitioners can issue certificates and do assessments for the more complicated and higher risk sites. Bushfire assessment reports undertaken by consultants that are not (BPAD) accredited may or may not be accepted by Council depending on the circumstances of the DA.

PHOTO COMPETITION

Congratulations! to **Michael Davis** for winning the last photo competition with his photograph featured on the front cover of a magnificent spider.

Thank you to everyone who entered our photo competition. All entries have been included in the ECA Photo Gallery on the back cover and central pages of the newsletter.

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

INTERESTING GROWTH HABITS OF AN ENDANGERED *Marsdenia viridiflora* R. Br. Subsp. *viridiflora*

Kath Chestnut
Senior Ecologist
GHD

These photos show an example of the endangered *Marsdenia viridiflora* R. Br. subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas. The plants were part of a larger patch of the species, with multiple individuals of various ages, from juvenile plants <5cm in height, to mature plants that were well established with a relatively thick stem. The occurrence of these plants is in what could be considered a surprising location; growing on a cyclone security fence, adjacent to a fire break and access track, in a highly modified and disturbed environment next to a busy road. It just goes to show that even fences can be exciting, and can provide habitat for threatened flora species.



Wandering through valleys in the Hunter it was a glorious surprise to stumble upon this hidden treasure. A grove of *Xanthorrhoea johnsonii*, their trunks blackened, appear to have survived untroubled for decades, perhaps hundreds of years. Can anyone hazard a guess as to the age of these *Xanthorrhoea*? Photo and text courtesy of Chantelle Doyle.

UPCOMING ECA EVENTS IN 2017

ECA ANNUAL CONFERENCE (See page 13)

Date: 28th July 2017

Proposed theme: Ecologists Making a Difference on the Ground.

Location: Kooindah Waters Golf and Spa Resort, Wyong.

ECA WORKSHOPS 2017

◆ Threatened Invertebrates

Date: 22 June 2017

Location: Australian Museum, Sydney

Registration: www.ecansw.org.au

◆ Soils for Ecologists

Date: 1 September 2017

Location: Asquith Golf Club

Presenter: Pamela Hazelton

Registration Open: July 2017

Non ECA Events

• 19th NSW Weeds Conference

Date: 16th–19th October 2017

Location: University of New England, Armidale

Details: <http://conferencecompany.com.au/weedsconference/>

• The 12th International Mammalogical Congress

Date: 9th-14th July 2017

Location: Perth, WA

Details: <http://www.promaco.com.au/IMC12/>

• 2017 Australasian Bird Fair and Wildlife Expo

Date: 3rd–5th November 2017

Location: Sydney Olympic Park, Sydney

Details: birdfair.com.au

Contact: admin@birdfair.com.au

• EcoTAS 2017: Putting Ecology to Work Joint Conference of the Ecological Society of Australia and the New Zealand Ecological Society

Date: 26 November–1 December 2017

Location: Cypress Lakes Conference Centre in the Hunter valley in NSW

Details: <http://ecotas2017.org.au>

• Australasian Ornithological Conference 2017

Date: 8–11 November 2017

Location: Deakin University, Waterfront Campus in Geelong, Victoria.

Details: <http://www.birdlife.org.au/get-involved/whats-on/aoc>

February 2017 ECA Membership Report

Amy Rowles

ECA administrative assistant

In total we have 190 members, comprised of 147 Practising Ecological Consultants, 6 Associate (Consultants), 21 Associate (Government Ecological/Environment Officer), 5 Associate (Non-practising), 2 Associate (Subscriber) and 9 Students. We have had 7 new members and they are introduced below:

- Alan Midgley (Practising Member)
- Trevor Cameron (Associate Consultant Member)
- David Cummings (Practising Member)
- Jonathan Carr (Practising Member)
- Deb Landenberger (Practising Member)
- Amy Rowles (Practising Member)
- Emily Strautins (Associate Consultant Member)

2017 Membership

Renew On-line

www.ecansw.org.au

THE ECA'S CERTIFICATION OF PRACTISING ECOLOGICAL CONSULTANTS (CPEC) SCHEME: LESSONS FROM THE CPEC BUNKER AND ADVICE FOR FUTURE APPLICANTS.

by the ECA's Certification of Practising Ecological Consultants Panel

INTRODUCTION

The Ecological Consultants Association of NSW's (ECA's) CPEC Panel recently assessed the first batch of applicants for certification as practising ecological consultants in NSW. The Panel comprised Dr Martin Denny (President of the ECA and Chair of the CPEC Panel), Dr Charles Morris (Western Sydney University), Dr Jennifer Taylor (Australian Catholic University), Ms Robbie Economos (Lake Macquarie City Council) and Dr Stephen Ambrose (a Past President and current member of the ECA). The ECA's Administration Officer, Amy Rowles, has ably assisted the CPEC Panel with the paperwork and other administrative matters.

When each of us signed up as volunteers to assess CPEC applications, we did not fully realise the complexity of issues that would be on the table. However, for the most part, we felt after the assessment of the first batch of applications that the CPEC assessment process was a fair and effective means of certification of ecological consultants. The first stage of assessment relies largely on assigning numerical scores and ticking of boxes to determine if applicants have met the minimum requirements of certification. The second stage involves listing the applicants on the ECA website and inviting comment from consultants and other professionals about their possible certification (i.e. peer review). If issues are raised during the peer review process then they are investigated further by the CPEC Panel, including seeking feedback from the applicant, internet research, clarification of issues from the third parties, additional comment from relevant industry professionals, and extensive deliberations between CPEC Panel members. In the event of a public submission, applicants may be asked by the Panel to provide additional information beyond that provided in their initial application. Relevant information from all sources is taken into account when the CPEC Panel makes a final decision about certification. At the end of the review process, each applicant is notified by the Panel about the outcome of their application.

The process of vetting the first batch of applications was a steep learning curve for everyone on the CPEC Panel. It involved:

- those on the Panel not directly involved in ecological consultancy learning more about the industry;
- all Panel members learning how to investigate and respond to issues raised by others on the suitability of applicants as CPECs;
- fine-tuning the CPEC documentation to be more explicit about the information required to be submitted by CPEC applicants; and
- decisions on how best to profile certified ecological consultants on the ECA website.

Concern was expressed by one applicant about the Panel seeking peer reviews from consultants and other professionals, especially as consultants compete for project work. While it is inevitable for competition to exist between consultants, industry peers are often in the best position to review a consultant's quality of work. Peer review is a common feature of professional life and academia, and is used to regulate admission to professions, advancement within them, and in academia, to allocate grants and assess papers prior to publication. Subsequent investigation and discussion by the Panel determine how much weight is given to issues raised by peers when reaching a final decision about certification. Therefore, the Panel maintains that this form of review is a vital part of the assessment process.

While the CPEC Panel is likely to fine-tune the certification process into the future, we now feel that we have a good system in place and are looking forward to assessing future applications. General issues that came to our attention early on are discussed below to assist future candidates to prepare their applications for certification.

PROFESSIONAL INTEGRITY

One of the most significant issues that arose during the assessment of the first set of applications was professional integrity. Although the applications are for certification as practising ecological consultants, the CPEC Panel also needs to consider if other environmental services offered by CPEC applicants can be delivered satisfactorily. This means that the consultant must be suitably qualified and experienced to deliver these services, as well as providing a quality of service that meets environmental industry standards. Offering environmental services without a suitable professional background demonstrates a lack of professional integrity, could lead to the delivery of poor-quality environmental services (or non-delivery) to clients, and adversely affect the reputation of the ECA for certifying an ecological consultant with unethical business practices.

Article 8 of the ECA's *Code of Business Practice, Professional Conduct and Ethics 2002* (the Code) states:
Ecological Consultants must not advertise or conduct themselves in a manner that would bring disrepute to the profession.

In this case, an Ecological Consultant is defined by the Code as a Practising Member of the Ecological Consultants Association of NSW.

Therefore, all ecological consultants who are members of the ECA, not just CPECs, should ensure that they are adequately trained and experienced to provide the environmental services that they offer personally to clients. If you are unsuited to provide these services, you should not offer them, or you should sub-contract them to others, or employ staff who can provide the services. In its investigations, the CPEC Panel came up with the following information that may help ecological consultants seek adequate training and experience in fields related to ecological consultancy. We acknowledge that this is not an exhaustive set of criteria, and that criteria are likely to evolve over time, but they are a good starting point or guide for assisting a consultant or potential client to determine who is suitable for conducting specific tasks.

Bushfire Threat Assessment

Bushfire risk management in relation to a development application often has impacts on flora and fauna and their habitats, and the ecological value of a site may sometimes influence the way in which this risk is managed. Therefore, some ecological consultants conduct bushfire risk assessments and provide risk management advice.

The NSW Rural Fire Service (NSW RFS) website <<http://www.rfs.nsw.gov.au/plan-and-prepare/building-in-a-bush-fire-area/legal-obligations/qualified-consultants>> states:

If you are proposing to gain approval to build as complying development under the Codes SEPP on bush fire prone land, a 'BAL Risk Assessment Certificate' must be obtained from a 'suitably qualified consultant' or the local council.

and

For the purposes of the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 (the Codes SEPP) and section 79BA of the Environmental Planning and Assessment Act 1979 the NSW RFS recognises the consultants within the following accreditation schemes:

- *Fire Protection Association Australia, Bush Fire Planning and Design (BPAD) Accredited Practitioners* <<http://www.fpa.com.au/bpad>>

In contacting the NSW RFS directly, we discovered that a “suitably-qualified consultant” is determined largely by the council reviewing bushfire threat assessments in relation to a development application.

Anyone can use the tools on the NSW RFS web site (including *Planning for Bushfire Protection 2006*) to do a bushfire threat assessment and submit this to a council with a development application. The planners and building surveyors in the council will assess the site, the proposal and the bushfire report then decide if the report is adequate. For simple sites and simple assessments the reports can be done by anyone (including self-assessment). However, should it be a difficult site (i.e. complicated slopes, land-uses and vegetation) or high fire risk, or the report appears to have errors, the planners and building surveyors will ask for a suitably qualified or certified person to do the bushfire threat assessment.

When a development application is assessed by a certified BPAD consultant and a BAL Risk/Threat Assessment Certificate is submitted in association with a development proposal, it is immediately accepted by the assessing officer, without question, if the proposal has a Bushfire Attack Level (BAL) of up to BAL 40 (see *Australian Standard AS 3959-2009: Construction of Buildings in Bushfire-prone Areas* <<https://law.resource.org/pub/au/ibr/as.3959.2009.pdf>> for explanation of BAL categories). If the Bushfire Attack Level is higher than BAL 40, i.e. Flame Zone (FZ), then the application must go to the NSW RFS for its assessment.

A BAL Assessment Certificate is also required in association with complying development (a development with a property boundary that is BAL 40 or FZ cannot be complying development).

Consultants cannot issue BAL Assessment Certificates unless accredited by the Fire Protection Association of Australia. Qualified accreditation is available through attainment of tertiary level qualifications in an appropriate bushfire risk assessment and management course. Council officers can also issue a BAL Assessment Certificate in association with complying development.

Contamination Assessment

The NSW EPA <<http://www.epa.nsw.gov.au/clm/selectaclmcons.htm>> recognises contamination assessors who have been certified under one or more of the following schemes:

- the [Site Contamination Practitioners Australia](http://scpaaustralia.com.au/) (SCPA) scheme <<http://scpaaustralia.com.au/>>;
- the Environment Institute of Australia and New Zealand’s (EIANZ) [Contaminated Land Assessment Specialist Certified Environmental Practitioner](http://www.cenvp.org/apply/cenvp-cl-specialist/) (CLA Specialist CEnvP) scheme <<http://www.cenvp.org/apply/cenvp-cl-specialist/>>; and
- the Soil Science Australia [Certified Professional Soil Scientist Contaminated Site Assessment and Management](http://www.cpsaccreditation.com.au/) (CPSS CSAM) certification <<http://www.cpsaccreditation.com.au/>>.

Effluent and Waste Water Disposal Assessment

Environmental consultancy firms advertising job vacancies in this field usually require applicants to have at least a TAFE Certificate III in Waste Water Operations or Waste Water Treatment or an equivalent qualification.

Soil Assessments and Erosion Control

The Soil Conservation Service (part of the NSW Department of Primary Industries) offers training courses in “Construction Site Erosion and Sediment Control” and “Conservation and Land Management” <<http://www.scs.nsw.gov.au/education-and-training>>. Trainees who complete these courses are considered certified to meet the relevant industry standards <http://www.scs.nsw.gov.au/_data/assets/pdf_file/0020/493031/SCS_Education-and-Training_May-2016.pdf>.

Tree Health Assessment

Environmental consultancy firms advertising job vacancies in this field usually require applicants to have at least a TAFE Certificate III in Arboriculture or an equivalent qualification.

Bushland Regeneration and Vegetation Planning

Environmental consultancy firms advertising job vacancies in this field usually require applicants to have at least a TAFE Certificate III or IV in Bushland Regeneration or an equivalent qualification.

ADEQUACY OF APPLICATIONS

The procedure for applying to become a CPEC, and the list of documents that must be submitted to the CPEC Panel are on the ECA website <<http://www.ecansw.org.au/certified-practising-ecological-consultant/>>. Most applicants, so far, have been thorough in providing the information required for the CPEC assessment process. However, we remind future applicants to check that all documents are submitted with their application and that they address the specific requirements of the CPEC Panel. Additional documents that the Panel had to request from one or more applicants when assessing the first batch of applications included:

- referees' reports that specifically address the applicant's suitability to become a CPEC;
- examples of written or published work relevant to ecology or ecological consulting that are not more than 10 years old; and
- proof of ongoing professional development and commitment to maintaining an appropriate understanding of current sound ecological assessment methodologies.

Provision of all relevant documents at the outset ensures that your application is assessed efficiently and in the shortest time possible by the CPEC Panel.

THE CPEC LIST

The current list of CPECs can be viewed on the relevant page of ECA website <<http://www.ecansw.org.au/certified-practising-ecological-consultants/>>. The list contains the name, work address, contact phone numbers, relevant professional qualifications, work position (i.e. professional role), email address and website links of each CPEC.

Although more than one professional role may be assigned to a CPEC within this list, it is important to note that CPEC accreditation is for ecological consultancy only, and should not be considered an endorsement of qualifications or suitability of consultants to provide other types of environmental services. However, listed professional roles (such as bushfire consultant) must relate to a recognised accreditation, and the CPEC Panel or ECA Administrative Officer may request proof of this.

If you want to be considered for inclusion on that list, then the CPEC Panel welcomes your application!

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ECA ANNUAL CONFERENCE 2017

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Traditional custodian Gavi Duncan will start the conference with a smoking ceremony and Sharing the wisdom of thousands of years of traditional environmental management.

From this strong setting the conference delves into

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- ECA research grant winners sharing their research results.
- requirements of specific types of fauna with experts in areas such as frogs and owls.
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Dinner, Trivia Quiz and Prizes, Tea & Coffee, bar facilities to buy your own drinks. \$55 per person to be paid upfront.

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Recent Journal Articles / Literature

Population genetics of the koala (*Phascolarctos cinereus*) in north-eastern New South Wales and south-eastern Queensland. S. Dennison, G. J. Frankham, L. E. Neaves, C. Flanagan, S. FitzGibbon, M. D. B. Eldridge and R. N. Johnson (2017).
Australian Journal of Zoology 64(6): 402-412
<https://doi.org/10.1071/ZO16081>

Population monitoring of a threatened gliding mammal in subtropical Australia. Ross L. Goldingay, Darren McHugh and Jonathan L. Parkyn (2017)
Australian Journal of Zoology 64(6) 413-420
<https://doi.org/10.1071/ZO17002>

Assessing body condition in the platypus (*Ornithorhynchus anatinus*): a comparison of new and old methods. J. W. Macgregor, C. Holyoake, S. Munks, J. H. Connolly, I. D. Robertson, P. A. Fleming, R. A. Lonsdale and K. Warren (2017)
Australian Journal of Zoology 64(6) 421-429
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Bait preference for remote camera trap studies of the endangered northern quoll (*Dasyurus hallucatus*). Caitlin Austin, Katherine Tuft, Daniel Ramp, Teigan Cremona and Jonathan K. Webb. (2016)
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Targeted field testing of wildlife road-crossing structures: koalas and canopy rope-bridges. Ross L. Goldingay and Brendan D. Taylor (2016)
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Genetic affinities of a remnant population of the brush-tailed rock-wallaby (*Petrogale penicillata*) in Mt Kaputar National Park, northern New South Wales. Mark D. B. Eldridge, Linda E. Neaves, James

Faris and Todd Soderquist (2017)
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Selection of sap feed trees by yellow-bellied gliders (*Petaurus australis*) in north-eastern Queensland, Australia – implications for site-specific habitat management. S. R. Heise-Pavlov, T. Chizinski and N. E. Walker (2017)
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Comparison of microhabitat use in young regrowth and unlogged forest by the eastern pygmy-possum (*Cercartetus nanus*). Bradley Law, Mark Chidel, Alf Britton and Caragh Threlfall (2017).
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Foxes in trees: a threat for Australian arboreal fauna? Valentina S. A. Mella, Clare McArthur, Robert Friend and Mathew S. Crowther (2017).
Australian Mammalogy - <https://doi.org/10.1071/AM16049>

Quantifying predation attempts on arboreal marsupials using wildlife crossing structures above a major road. Kylie Soanes, Briony Mitchell and Rodney van der Ree (2016)
Australian Mammalogy - <https://doi.org/10.1071/AM16044>

Does the 'extinct' eastern quoll (*Dasyurus viverrinus*) persist in Barrington Tops, New South Wales? Greta J. Frankham, Sean Thompson, Sandy Ingleby, Todd Soderquist and Mark D. B. Eldridge (2016).
Australian Mammalogy - <https://doi.org/10.1071/AM16029>

The impact of artificial lighting on bats along native coastal vegetation. Grant D. Linley (2016).

Australian Mammalogy - <https://doi.org/10.1071/AM15047>

Challenges faced by shorebird species using the inland wetlands of the East Asian–Australasian Flyway: the little curlew example. M. Bellio, C.

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Large-scale dieback of mangroves in Australia’s Gulf of Carpentaria: a severe ecosystem response, coincidental with an unusually extreme weather event. Norman C. Duke, John M. Kovacs, Anthony D. Griffiths, Luke Preece, Duncan J. E. Hill, Penny van Oosterzee , Jock Mackenzie , Hailey S. Morning and Damien Burrows (2017).

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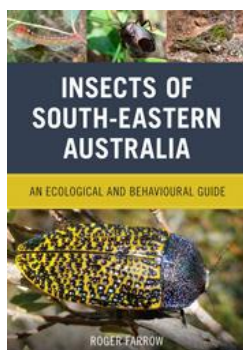
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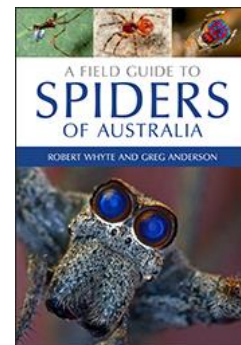
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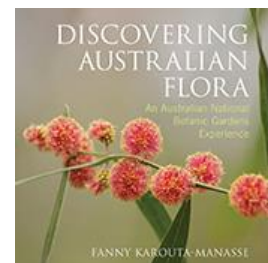
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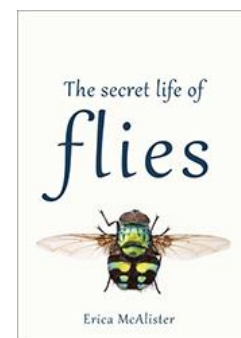
Title: A Field Guide to Spiders of Australia
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 No. Pages: 464
 Publisher: CSIRO Publishing
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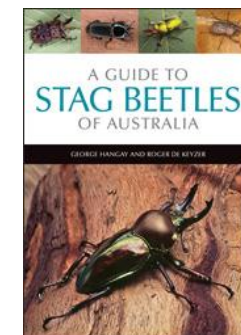
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 Author: Fanny Karouta-Manasse
 RRP: \$35.00
 No. Pages: 104
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 Author: Erica McAlister
 RRP: \$29.95
 No. Pages: 256
 Publisher: CSIRO Publishing
 Date: April 2017



Title: A Guide to Stag Beetles of Australia
 Author: George Hangay and Roger de Keyser
 RRP: \$49.95
 No. Pages: 256
 Publisher: CSIRO Publishing
 Date: April 2017



SEE Volume 39 Consulting Ecology, August 2017 for a Review of these New Release Titles



ECA Photo Gallery



Left: *Litoria tyleri* at Macksville.

Right: Common Ring-tailed Possum roosting in house gutter in Kotara.

Below left: Indian Myna chicks from a felled tree in Wadalba, waiting to go to a vet.

Below: Native grass hopper at Glenugie

Photos courtesy of Andrew Carty



Right: Robber Fly (*Asilidae* spp.).

Below: Native Leafcutter Bee (*Megachile* spp.)

Photos courtesy of



Above: *Thelymitra ixiodes* at Norah Head. Photo courtesy of Bruce Hansen.



Right: Coastal Petaltail. Photo courtesy of Arthur Shultz



ECA Photo Gallery



Left: flat rock early morning. **Right:** flat rock tern roost.. Flat Rock is a low rocky promontory extending into the ocean north of Ballina and is an important resting area as well as



foraging area for shorebirds, both resident and migratory. The diversity of species emphasises the importance of Australian littoral areas for these specialised species, areas that are becoming



increasingly impacted by human disturbance and degradation. The Little Black Cormorant, Eastern Reef Heron, Brahminy Kite and Crested Tern are resident locally breeding species whereas the Common and Little Terns breed in Asia, the Ruddy Turnstone breeds on the edge of the Arctic Circle .



Above left: Common Tern. **Above right:** Easter Reef Heron, foraging. **Left:** Sanderlings resting. **Above:** Ruddy Turnstone, resting **Below left:** Grey-tailed Tattler at rest. **Below right:** Little Black Cormorant. Photo and text courtesy of David Milledge.



Build Your Own Wildlife Nest Box – A Guide for Western Sydney

(Published by Greater Sydney Local Land Services)

Reviewed by P.A. Conacher (Conacher Consulting Pty. Ltd.)

- *There's nothing more beautiful than raising your own parrots (p20)*
- *Most of our wildlife needs tree hollows for shelter (p2)*
- *Antechinus are small marsupials which have huge ears and eyes (p10)*
- *Warm and tough materials are critical for your nest box to be effective (p2)*

These are some of the awkward, incorrect and misleading or unsuitable statements provided by the NSW Government via the Greater Sydney Local Land Services in their publication "Build Your Own Wildlife Nest Box: A Guide For Western Sydney".

This document has been released as an electronically delivered publication accessed via the internet. There are currently two versions of "Build Your Own Wildlife Nest Box: A Guide For Western Sydney" available on the internet (www.wires.org.au and greatersydney.lls.nsw.gov.au). Both versions are dated August 2015; however the second version was produced in May 2016. The second version has corrected many of the errors contained in the first version but there are still some significant problems with the text and incorrect measurements in the various design plans provided for the different types of nest boxes.

The Guide contains many errors in relation to punctuation, grammar, spelling, repetitive text and layout/context matters. In combination these problems seriously degrade the value and quality of the document as an informative guide for nest box construction and use. These errors should have been identified and corrected in the edits to the first version of the document and certainly not presented in the

second version of the document.

The Guide also contains inconsistencies and errors in relation to the technical aspects of nest box construction. For example:

- Design plans (p6-21) are missing measurements.
- Box dimensions are not supported by scientific references.
- Saw or router cuts in plywood as recommended for the exterior surfaces will decrease the structural integrity of the plywood outer layers and result in de-lamination of the ply layers.
- Router cuts are not required above entry holes or inside boxes if the entry hole is at the bottom of the box.
- The guideline recognises that the best method for securing a nest box to a tree is a spring-wire attachment. However, the only attachment method outlined is by securing the box to the tree with Coach Screws.
- A three inch (75mm) screw (Tek or Coach Screw) to secure the box to the tree is unlikely to be long enough to penetrate into the heartwood of a tree as recommended on page 3. At least 30mm of this screw is required to be available outside of the tree to secure the box and spacers. This would only leave 45mm of screw available to penetrate the bark and sapwood layers of the tree before entering the heartwood. (Perhaps there is another error provided in referring to the heartwood of the tree rather than the sapwood for securing the screws.)

The text and technical matters identified above do not cover all of the errors and problems with the Build Your Own Wildlife Nest Box Guide. However the most significant problems with the recommendations provided in the publication relate to the design and location of the recommended nest boxes, as summarised below.

Design

Wildlife can be very fussy so you need the correct design and dimensions to attract your target species (p2).

If the design criteria are important then the Guide

should utilise nest-box designs which have been successfully implemented for a variety of projects for habitat enhancement, research or fauna population recovery. The document does not contain any relevant references for other nest-box designs.

If these plans were to be used for building nest boxes as part of a nest box strategy it would be advisable to construct a sample box for a particular design which would identify the design faults before cutting timber for multiple boxes. For example, the design plans for the Red-rumped Parrot Box contains the following errors:

- i. No measurements for the back panel of the nest box;
- ii. The base of the box has a 17mm gap between the sides;
- iii. The lid is too narrow to overhang the nest box, thereby allowing water runoff to enter the cavity of the box; and
- iv. A mix up of species names between the Musk Lorikeet and Little Lorikeet as species which may also use the Red-rumped Parrot nest box.

Location

Box orientation is less important in Sydney than in other regions. However facing generally north and using a variety of orientations with your boxes can ensure wildlife here have a good selection of sites. (p3)

Most animals use boxes 3-4m high (p3)

Why is nest box orientation less important in Sydney? Securing a nest box to a tree trunk at 3-4 metres above ground level with a northern aspect would ensure that the internal temperature experienced in the nest-box would be extreme and lethal to nesting birds during the spring and summer breeding season. Boxes with a northern orientation have facades facing the east, north and west and therefore would be exposed to direct sun exposure and heating for 10 to 12 hours per day. Most other nest box references recommend an easterly or south-east aspect to minimise direct sun exposure. Internal temperatures of nest-boxes above 38° will be lethal for cavity nesting birds (during egg incubation), including the vulnerable Little Lorikeet and the declining woodland species, Red-rumped Parrot.

The layout and sections of the publication also contain inconsistencies which should have been rectified through the editorial process. The Table of Contents lists the four sections of the publication as:

- Introduction
- Installation
- Recycling materials / Design your own
- Further information.

These Sections are somewhat misleading and incomplete. For example:

- i. The credits page provides details on “Purpose of this Guide”, which should be included in the Introduction section.
- ii. There is no section titled “Construction”. The construction details for nest boxes are incorporated into the Installation section.

This publication contains some background details and information for the interested public looking to investigate constructing and installing nest boxes. However, caution should be exercised if utilising the plans and details of the document for nest box and habitat enhancement strategies on a professional basis. Overall the quality and content of the publication is a disappointing result from a Government authority.

Perhaps the disclaimer to the publication provides the best summation and perhaps a predetermination for the quality of “Build Your Own Wildlife Nest Box” – “Local Land Services and the NSW Government does not warrant and does not represent that information contained in this document is complete, current, reliable and/or free from error”(p.i).



If you have 2nd hand ecological equipment that you would like to sell or would like to purchase you can place an ad in this newsletter. Free for members or \$40 for non-members. Contact admin@ecansw.org.au.

IS WOODY SHRUB ENCROACHMENT A LEGACY OF NATIVE MAMMAL DECLINE?

A report by Charlotte Mills, recipient of the 2015 Ray Williams Mammal Research Grant.

Charlotte can be contacted by email at charlotte.mills@unsw.edu.au

Introduction

Native shrub cover in arid and semi-arid NSW has increased dramatically over the past century, with woody shrub species increasing in density, displacing grass cover and reducing grazing viability. This shrub encroachment is typically viewed as an undesirable environmental change by pastoralists and conservation agencies (Eldridge and Soliveres 2015), who incur large expenses clearing shrubs from their land. The cause of shrub encroachment is usually attributed to over-grazing by livestock and increasing CO₂ levels favouring the growth of shrubs over grasses (Archer *et al.* 1995; Van Auken 2009) however there is little consensus on these drivers.

Since European settlement, many native Australian mammals have become rare or extinct, their declines preceding any understanding of their role in vegetation and seed bank dynamics (Short and Smith 1994). From opportunities presented by reintroduction programs, we now understand that small to medium sized Australian native mammals have important roles in soil turnover and nutrient capture as ecosystem engineers (James and Eldridge 2007; Davidson *et al.* 2012), however their consumptive impacts remain largely unknown.

In arid areas, native mammal decline has coincided with shrub encroachment (Noble *et al.* 2007). Around the world, mammals are recognised as important seed predators in arid ecosystems (Brown, Reichman, *et al.* 1979). However, in Australia, ants are described as the dominant seed consumers and mammals as insignificant consumers (Morton 1985). Recent research shows that where native rodents persist, they are significant consumers of shrub seeds (Gordon and Letnic 2015). Hence it has been hypothesised that the functional extinction of native mammals and resulting relaxation of seed predation by these consumers may have relaxed a recruitment bottleneck that once limited shrub populations (Noble *et al.* 2007). If small to medium sized native mammals were once

significant consumers of seeds from woody shrub species, it is conceivable that their decline may have precipitated shrub encroachment (Gordon *et al.* 2017).

This report explores granivory by Australia's declining mammal species and the impact the loss of mammalian seed predators has had on vegetation. To investigate this, I used foraging tray experiments inside rewilded areas and in areas with depauperate mammal communities to compare seed take by different taxa. I expected to find that native mammals were the main seed predators of an encroaching shrub species, and at least equal to ants in seed take for a non-encroaching shrub species.

Method

Study Site

My research sites are Arid Recovery Reserve and Scotia Wildlife Sanctuary (Figure 1). These reserves have populations of locally extinct mammals established inside predator proof fences (Figure 2). As such, they provide rare opportunities to study mammal assemblages as they may have existed 200 years ago. I used the different mammal communities on either side of the fence to investigate the ecological roles of reintroduced mammals and compare the ecological functions of "pre-European" mammal assemblages (rewilded) to "present day" (depauperate) assemblages.

Arid Recovery Reserve is located near Roxby Downs township in arid South Australia (mean annual rainfall 149.9mm; Roxby Downs; Australian Bureau of Meteorology 2016). Dominant landforms at Arid Recovery include east-west longitudinal dunes with clay gibber swales. Vegetation consists of annual and perennial shrubs with grass and forb dominated understorey. There are four species of mammal successfully reintroduced to Arid Recovery: the Burrowing Bettong (*Bettongia lesueur*), the Greater Stick-nest Rat (*Leporillus conditor*), the Western Barred Bandicoot (*Perameles bougainville*) and the Greater bilby (*Macrotis lagotis*). A number of other native species have profited from the exclusion of predators. Of these, the Spinifex Hopping Mouse (*Notomys alexis*) increased from undetectable levels to becoming the most abundant small mammal inside the reserve (Moseby *et al.* 2009).

Scotia Wildlife Sanctuary (Scotia) is a private conservation reserve run by the Australian Wildlife Conservancy in south-west New South Wales,

Australia. Scotia is semi-arid. The dominant landforms are east-west trending longitudinal sand dunes and loamy plains with an overstorey dominated by mallee (*Eucalyptus* spp.) or *Casuarina pauper*, with a midstorey of perennial shrubs and an understorey of *Triodia scariosa* or forbs. I conducted my experiment in one of the two predator-proof enclosures at Scotia, into which the Bridled Nail-tail Wallaby (*Onychogalea fraenata*), Burrowing Bettong (*Bettongia lesueur*), Greater Bilby (*Macrotis lagotis*) and Numbat (*Myrmecobius fasciatus*) have been successfully reintroduced.

Seed Species

In my experiments I used seeds from two shrub species: *Dodonaea viscosa* subsp. *angustissima* (J.G. West) (mean seed weight 10.4mg) and *Acacia ligulata* (A.Cunn. ex Benth) (mean seed weight 19.2mg). *Dodonaea viscosa* is considered an encroaching species in New South Wales (Department of Environment, Climate Change and Water, 2004). The seed has a small aril, no eliasome and the plant is generally considered unpalatable to stock (Cunningham *et al.* 1992).

Acacia ligulata is not considered an encroaching species in New South Wales (Department of Environment, Climate Change and Water, 2004). The seed of *Acacia ligulata* has a large eliasome which is well known to attract ant and bird dispersers (Davidson and Morton 1984). It is of moderate palatability depending on locality (Cunningham *et al.* 1992). *Acacia ligulata* has a persistent seedbank (Davidson and Morton 1984; Auld 1995).

I selected these species because they are widespread and often occur in the same habitat. *Dodonaea viscosa* is locally abundant at both my study sites while *Acacia ligulata* is abundant at Arid Recovery and rare but present at Scotia. Burrowing Bettongs have been observed preying on the fruiting bodies of *Dodonaea viscosa* (Mike Letnic pers obs) and *Acacia ligulata* (Bice and Moseby 2008).

Seed Take Experiment

To assess seed take by different taxa in rewilded and depauperate areas, I conducted foraging tray experiments at both Arid Recovery and Scotia. My experiment was conducted in August 2015 to represent a “winter” sample, when ant activity is low, and March 2016 to represent a “summer” sample, when ants are most active. *Acacia ligulata* was only tested at Scotia

during the summer sampling period.

At each reserve I selected sites at least 400m apart, both inside predator-proof fences in rewilded areas and outside in depauperate areas. At each site, five foraging trays were placed in a line 20m apart. Each foraging tray consisted of a plastic tray (20cm diameter) placed flush with the ground, and filled with soil sifted to remove any existing seeds.

Foraging trays at each site were randomly assigned one of five treatments in a randomised block design (Gordon and Letnic 2015) (Figure 3). The five treatments consisted of:

- mammal exclusion (caged enclosure),
- ant exclusion (ring of coopex insecticide powder),
- ant exclusion procedural control (ring of bicarb soda, allowing full access for all taxa),
- mammal exclusion procedural control (cage with no sides, allowing full access for all taxa),
- control (no cage or powder, full access)

In each foraging tray, 50 unblemished seeds of either *Dodonaea viscosa* subsp. *angustissima* or *Acacia ligulata* were placed on top of the soil. One seed species was used per site.

Trays were revisited after 48 hours and seeds sifted from sand and counted. Seed take was determined as the number of seeds removed from the foraging tray. Prior to sifting, any spoor or evidence of visitation including scats, tracks, presence of husks, removal of eliasomes and direct observation (ants only) was recorded. Motion-sensing cameras were used as additional observation tools.

If mammals were significant granivores I expected to find much higher seed take in rewilded areas compared to depauperate areas for all treatments, except the mammal exclusion treatment which would be consistently low across both the rewilded and depauperate areas. If ants were the dominant granivores and mammals insignificant granivores I expected no difference in seed take between rewilded areas and depauperate areas for all treatments, with the ant exclusion treatment experiencing consistently low seed take.

Procedural controls were used for both the mammal exclusion treatment and the ant exclusion treatment to

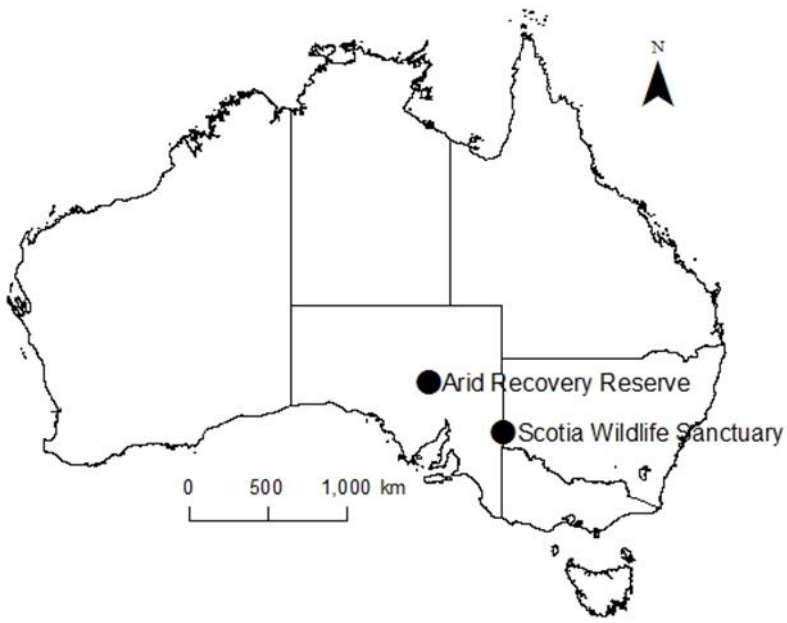


Figure 1: Map of Australia showing location of study sites

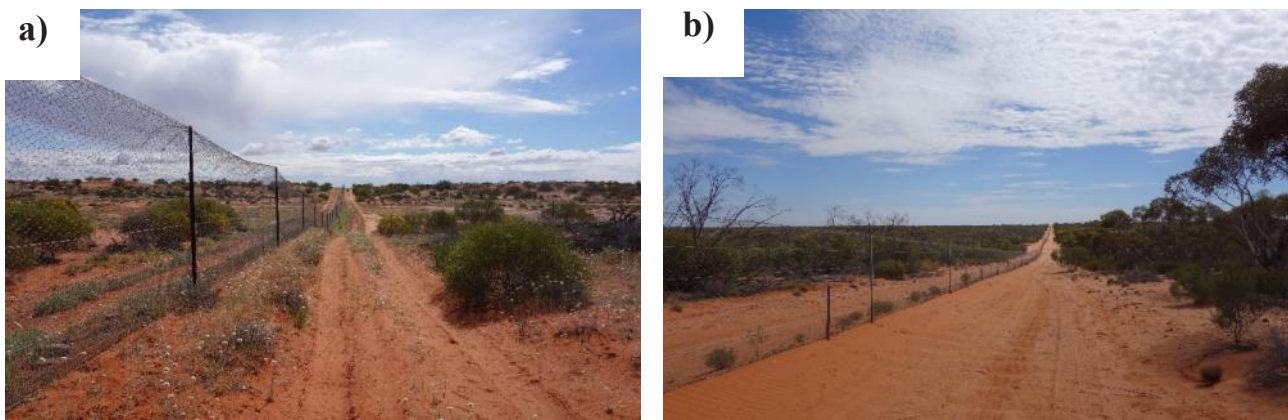


Figure 2: Photographs of study sites along predator proof fences: a) Arid Recovery Reserve and b) Scotia Wildlife Sanctuary. Right-hand side of each photo is the rewilded area.



Figure 3: Experimental setup. Bowls were set 20m apart along transects and 50 seeds of either *Dodonaea viscosa* or *Acacia ligulata* placed in them.

measure any effects of the exclusion structures on seed take. If the exclusion structures had no influence on the results I expected to find that seed take from procedural controls would not differ from that at the control.

Statistical Analyses

A linear mixed-effects model using the Gaussian distribution was used to compare how season, predator proof fence treatment (Fence) and experimental treatment affected seed take using the lme4 version 1.1-12 (Bates *et al.* 2015) and car version 2.1-2 (Fox and Weisberg 2011) packages in R version 3.3.1 (R Core Team 2016). To reduce a left skew, the data were on log+1 transformed prior to analyses. To account for the split plot design experimental treatment block was incorporated into fence treatment as a random factor. Treatment, Season and Fence were fixed factors. Tukeys tests were used to undertake post hoc pairwise comparisons and determine where the differences lay. Results were considered statistically significant if $P \leq 0.05$.

Results

Seed take was much higher in rewilded areas compared to adjacent areas outside predator-proof enclosures with the exception of the mammal exclusion treatment (Figure 4, Table 1). Seed take from the mammal exclusion treatment was similar in rewilded and depauperate areas for all combinations of site and treatment excepting *Acacia ligulata* at Scotia. Up to eight times more *Dodonaea viscosa* seed and up to three times as much *Acacia ligulata* seed were consumed inside rewilded areas than outside the predator proof enclosures in depauperate areas. *Acacia ligulata* seeds had consistently higher take than *Dodonaea viscosa* (Figure 4) on both sides of predator proof fences for all treatments and seed take was higher in Arid Recovery than in Scotia.

When compared within the same mammal community (i.e. rewilded or depauperate), procedural controls demonstrated no effect of treatments (P always > 0.05) and were within one standard error of the mean for control treatments (Figure 4) indicating that the physical presence of the experimental treatments had no unintended influence on seed take. Spoor observations revealed that mammals were detected most often at foraging trays at all instances excepting *Acacia ligulata* at Scotia. *Dodonaea viscosa* trays were visited mostly by *Bettongia lesueur* at both

sites, while for *Acacia ligulata* trays the main visitors were *Notomys alexis* at Arid Recovery and ants at Scotia. Birds were detected at $<1\%$ of all trays, and from camera observations were usually corvids. Overall, native mammals such as Hopping Mice (*Notomys alexis*) and the Burrowing Bettong (*Bettongia lesueur*) were the dominant predators of *Dodonaea viscosa*, and are approximately equal predators with ants for *Acacia ligulata*, a known ant-dispersed seed species.

Discussion

These results provide evidence that Australian mammals were once important seed predators in arid Australia and the principal predators of seeds from encroaching shrub species *Dodonaea viscosa*. Using a foraging tray experiment I have shown that rewilded mammal assemblages have higher seed take compared to depauperate communities for two shrub species across two rewilded sites in arid Australia. Contrary to long held paradigms (Morton 1985), my results suggest that mammals were once significant seed predators in arid Australia, at least equal to and in some places more important than ants. This finding highlights an important and overlooked consumptive role which native mammals once held in arid ecosystems and suggests that the loss of omnivorous native mammals has potentially been a driver of woody shrub encroachment.

That *Bettongia lesueur* and *Notomys alexis* are significant granivores concurs with previous studies which have investigated seed predation by *Notomys fuscus* (Gordon and Letnic 2015) and with the known diets of these marsupial omnivores (Murray *et al.* 1999; Robley *et al.* 2001). Of particular interest is the difference in magnitude of seed take between the rewilded areas at the two sites. I suggest that the relatively higher seed take by mammals as opposed to ants at Arid Recovery was due to the presence of the rodent *Notomys alexis* and therefore a more complete mammal assemblage there.

By preferring larger seeds (Davidson *et al.* 1984; Hulme 1998a), digging for buried seed (Reichman 1979; Hulme 1998a; b) and consuming seeds otherwise unattractive to ants or from ant refuse piles (Auld and Denham 1999), mammalian seed predators provide unique top-down pressure on seeds of plant species that may otherwise escape predation. Whether seed predation limits recruitment is a matter of some

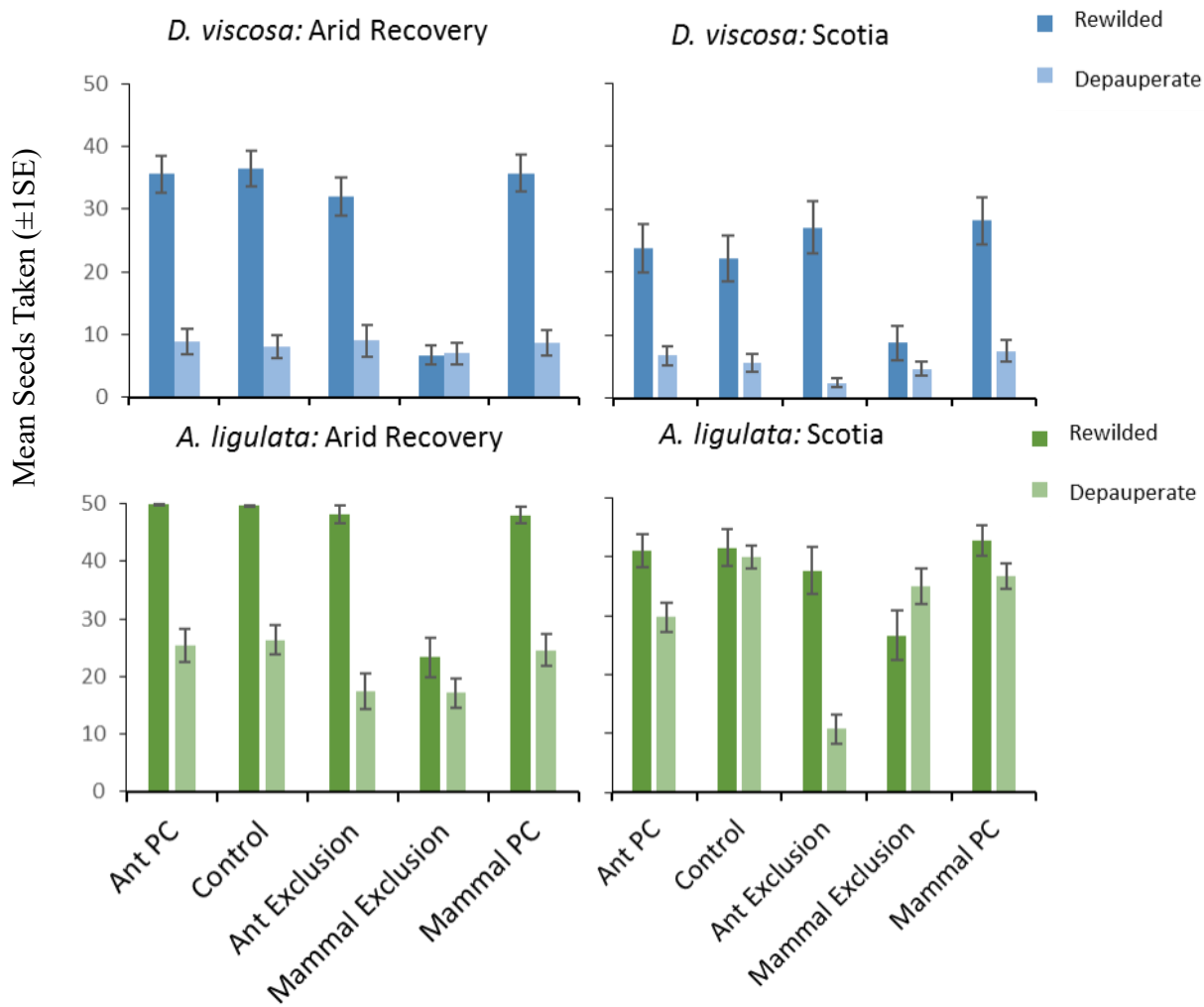


Figure 4: Average seed take (after 48 hours) for each treatment, with ± 1 SEM for each seed species at each study site. Total possible seed take is 50. Dark bars are inside predator proof fences where rare mammals have been rewilded and light bars are outside predator proof fences where native mammal community is depauperate. Graphs are combined for season, excepting *Acacia ligulata* at Scotia which was only tested in summer.

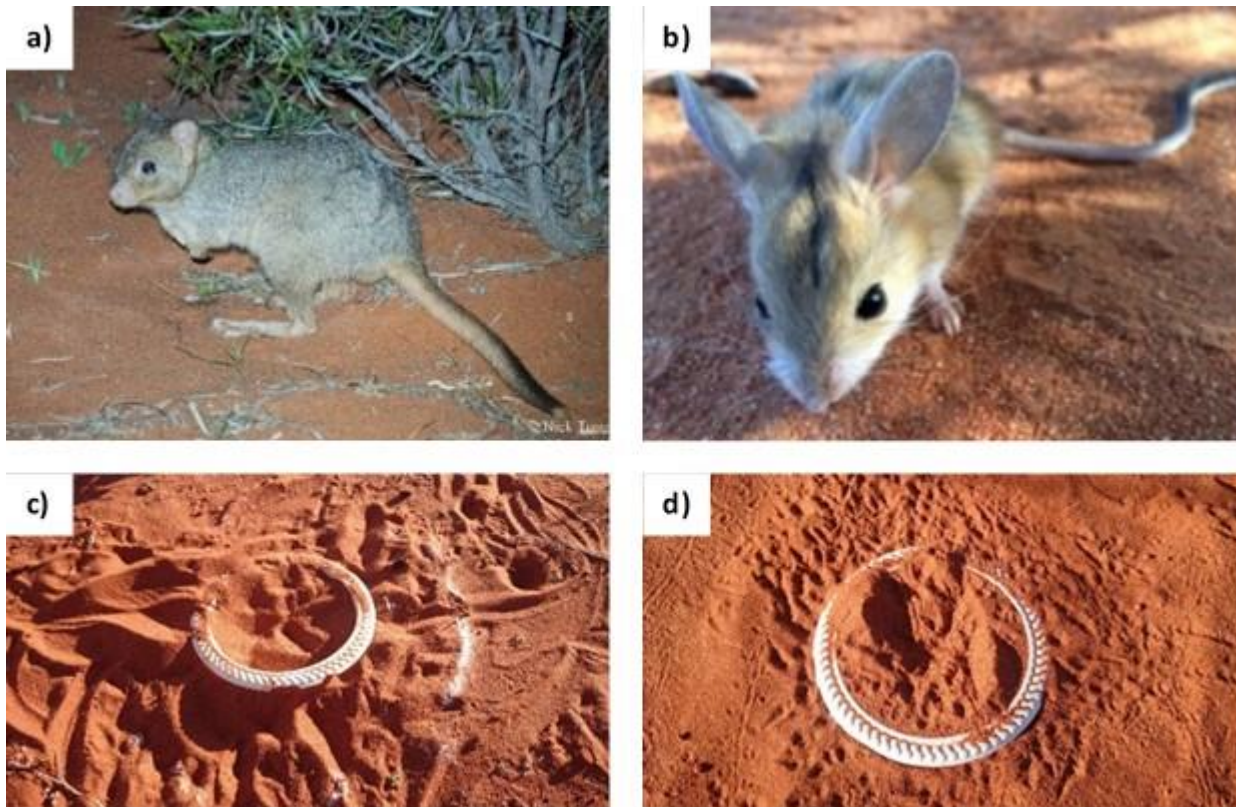


Figure 5: Seed predators and evidence of visitation. a) Burrowing Bettong (*Bettongia lesueur*), b) Hopping Mouse (*Notomys sp.*), c) evidence of visitation from Burrowing Bettong and d) Evidence of visitation from Spinifex Hopping Mouse (*Notomys alexis*) alongside lizard and beetle tracks. Spoor like these was used to identify which animals took seed from the experiment.

contention. Certainly there are plant communities where seed predation is not a strong defining factor influencing recruitment (Andersen 1989; Pinto *et al.* 2014), however where recruitment is seed-limited granivorous mammals have been repeatedly demonstrated to be an important driver of plant recruitment and community structure (Brown, Davidson, *et al.* 1979; Brown, Reichman, *et al.* 1979; Inouye *et al.* 1980; Davidson *et al.* 1984; Hulme 1998a; Curtin *et al.* 2000). I suggest that if mammalian seed predators are removed, relaxation of predation pressure may lead to changes in the seed bank (Reichman 1979) and greater recruitment success for preferred plant species, causing shifts in vegetation community structure (Brown, Davidson, *et al.* 1979; Brown, Reichman, *et al.* 1979; Brown and Heske 1990; Gordon *et al.* 2017).

I suggest that rewilded mammals directly inhibit growth and reproduction of the encroaching shrub *Dodonaea viscosa* through seed predation, and that the loss of these mammals has resulted in documented increases of problematic shrub species (Noble *et al.* 2007). Recent research has documented reduced seedling recruitment and lower densities of *Dodonaea viscosa* seed in the seed bank where the omnivorous native mouse *Notomys fuscus* persists (Gordon and Letnic 2015; Gordon *et al.* 2017). My results lend support to the suggestion that the loss of native mammals from the arid zone may be an unrecognised driver of shrub encroachment (Noble *et al.* 2007; Gordon and Letnic 2015).

Conclusions

The extinction of many native omnivorous Australian mammals preceded any understanding of their role as seed predators. Using rewilded populations of native mammals, I have demonstrated that the functional extinction of medium sized marsupials and native rodents from Australia's arid zone has resulted in the loss of an entire guild of consumers. Through seed predation these mammals may have shaped vegetation communities, and their loss may have precipitated vegetation change and shrub encroachment. Consequently, I suggest that the decline of omnivorous mammals across Australia may have facilitated shrub encroachment and altered vegetation communities in the arid zone (Noble *et al.* 2007; Gordon and Letnic 2015). This research has the potential to provide evidence for a more sustainable long term solution to shrub encroachment as well as economic incentives for

native animal conservation.

Acknowledgements

I would like to thank the Ecological Consultants Association and the Ray Williams Mammal Research Grant for financial assistance making this experiment possible. I would also like to thank Arid Recovery Reserve and Scotia Wildlife Sanctuary (Australian Wildlife Conservancy) for their hospitality and assistance. Lastly, thanks to all the volunteers who kept me sane and helped count thousands of seeds.

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- regularly monitors the effectiveness of projects so they can be improved over time
- encourages community, corporate and government participation in threatened species conservation by providing a website and a database with information on project sites, volunteering and research opportunities.

Under the program, threatened species are allocated to one of six management streams, namely site-managed, landscape-managed, iconic, data-deficient, partnership or keep-watch species. A suite of management actions or strategies has been identified for each species which ideally are to be implemented by any group or persons that engages with the program.

Whilst this author is not an advocate for the newly proposed biodiversity legislation in NSW, it is noted that \$100 million has been pledged by the state government to implement the program over a five-year period (commencing in from July 2016), as part of the new legislation.

As Conservation Officer for Australian Plants Society NSW, I decided to direct volunteer efforts towards this program. My target was to simply identify flora species (in our local Sutherland area) where we could not only assist, but solely accomplish the identified objectives for the particular species. Being a society of mainly older volunteers who are constantly active and time poor, I decided that any identified targeted surveys for plant species would be right up our alley and quite achievable.

The first species we have worked on is the threatened flora species *Prostanthera densa* (Villous Mint Bush – Vulnerable under the now repealed TSC Act 1995). Four management sites for the species have been identified on the east coast of NSW, namely South Cronulla (Bass and Flinders Point Reserve), the Marley area in Royal National Park, Tomaree in the Port Stephens LGA and Abraham’s Bosom in the Shoalhaven LGA. The population in the Marley area was considered to be data-deficient with very little information recorded regarding population size. We decided that this was an exciting challenge for us at APS.

Firstly, with my consulting hat on of course,

TARGETED SURVEY OF *Prostanthera densa* (Villous Mint Bush) IN THE MARLEY AREA, ROYAL NATIONAL PARK

Dan Clarke

(Dan Clarke is a qualified botanist who has been working since 2011 in the NSW Ecological Consulting industry. Dan now runs DM Clarke Botanical Consulting Services, and is also a part-time teacher of Conservation and Land Management at NSW TAFE (OTEN Campus). Dan is the voluntary Conservation Officer for Australian Plants Society NSW)

The Save our Species Program is a NSW Government run program which aims to implement strategies to save threatened fauna and flora from extinction. It is stated that the program:

- consults extensively with experts and applies independent peer reviewed science to species, populations and ecological communities projects
- takes a rigorous and transparent approach to prioritising investment in projects that ensure benefit to the maximum number of species
- provides targeted conservation projects that set out the actions required to save specific plants and animals on mapped management sites

background research had to be done to evaluate how much data had been collected and recorded. The usual avenues were explored – the NSW Wildlife Atlas (Bionet) as well as records on Australia’s Virtual Herbarium. I was also aware from my university days that Dr Trevor Wilson had collected plants at the Marley population previously during his PhD study on *Prostanthera* and so had some leads on exactly where I needed to go. Two recent collections (herbarium sheets) were heavily relied on, made in 2005 and 2008 by well-known native plant author Alan Fairley and Trevor Wilson respectively. I placed the GPS points on a GIS map and started to plan our expedition. Google aerial photos were highly relied on to identify the easiest and safest way into the Marley heathland. Interestingly, another tantalising record is recorded in 1972 by highly regarded NSW herbarium botanist Bob Coveny (now retired). The collection details are a bit vague stating “Audley”. From correspondence with the Herbarium, it seems the exact location details of the record is somewhat faded but is possibly along the Couranga Track. Excitingly, this remains an unexplored mystery to solve.

Our target site is the Marley locality in the Royal NP, only 2 km south of Bundeena. The *P. densa* population occurs in intact and weed-free heathland upslope and north of Marley Beach.

In June 2015, I was accompanied by fellow APS member and proprietor of Ausplants Nursery, Phil Keane. We walked a few kilometres down the Marley Firetrail close to where it intersects the Coast Walk. Here we headed north-west through dense heathland dominated by species such as *Darwinia fascicularis*, *Hakea teretifolia* and *Allocasuarina distyla*. In this area, exposed sandstone ledges of only 0.5 to 2 metres high were encountered with very soft edges which readily crumble underfoot. We decided this is a sensitive landscape and that we should take care to tread carefully, not only for our own safety but to preserve what I came to loosely call “fragile sandstones”. It is amongst these ledges that *Prostanthera densa* is found. We espied about 20 plants to begin with and searched further afield, then went home to plan a proper day of survey. This took place in August 2015, where a group

of fellow-APS members, as well as parks staff, assisted me to document detailed data for 27 plants. Data were recorded for variables such as GPS location, plant height/ maximum stem length (to nearest 10 cm), presence of flowers, and general plant health. Notes were sometimes taken for basal stem diameter. All plants were photographed.

Over half of the plants were assessed as being in good health and flowering. Maximal stem lengths were up to 1.8 metres and some plants had basal stem widths of 3 cm. There was no obvious evidence of deer or any other browsing even though deer and macropod scats were observed through the area. Dominant native species include *Darwinia fascicularis*, *Banksia ericifolia*, *Banksia marginata*, *Allocasuarina distyla*, *Hakea teretifolia* and *Epacris longiflora* which is consistent with the most recent vegetation mapping for the area (OEH 2013).

A second survey did not take place until April 2016 when another 35 plants were recorded in a somewhat disjunct patch to the north-west of the first. Prior to this survey, I had to inspect additional areas of likely habitat which meant choosing a different off-track entry to the site. This entailed approximately 200 metres of crawling through extremely dense shrubland – a process I like to call “claustrophobic bushwalking” and is not for the faint-hearted. However, likely all in a day’s work for ECA members.

This time, almost all plants were flowering and in good health. Some very small seedlings (or perhaps vegetative clones) were photographed. Most plants were observed to be receiving full sunlight whereas a few plants were growing out of sandstone crevices in deep shade, and would hardly receive any direct sunlight through the year. We now had plants with maximal stem lengths of 3 metres.

Our last survey took place in January 2017, where we recorded only another 17 plants giving 79 all up. In a similar fashion to the earlier surveys, these 17 plants were all in flower. Therefore, flowering was observed in August, April and January, lending more insight into the flowering time of this species. Further on from these last plants, habitat seems to change slightly with

bonsai-like stands of species such as *Corymbia gummifera* and *Acmena smithii* becoming more prevalent with larger drops between sandstone ledges. There are some drainage lines present which makes movement through the site even more challenging.

From detailed site survey and review of aerial photography, I have tentatively concluded that most extant plants in the Marley area have been found. However, additional site investigation is planned and we are not done yet.

Regardless, this achievement by Australian Plants Society is a strong advertisement for citizen science and reflects the need (at least from my point of view) to continually engage people of all ages in the discovery of natural habitats and the species they support. Citizen science teams do not have to be all that skilled with our levels of expertise but simply consist of members who are interested and enthusiastic. Only a small amount of coordination is needed (in this case by myself) to guide the job. Naturally, there are safety issues to consider, but with detailed planning, good communication and a risk assessment, things can easily go to plan.

Whilst we are all time-stretched and under pressing demands, it pays to consider participating in opportunities to explore wilderness and collect biodiversity data with like-minded people, without the pressure of a client's expectation or deadline, but simply for the love and thrill of what we do.

You can find three detailed progress reports for this project on the Australian Plant Society NSW website



under the Conservation tab: <http://austplants.com.au/conservation9.html>

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Prostanthera densa Management document for the Save Our Species Program (<http://www.environment.nsw.gov.au/savingourspeciesapp/ManagementSite.aspx?SiteID=645>)

CLIMATE CHANGE RESTORATION CONUNDRUM

Dr John Benson

The drive between Cooma and Jindabyne crosses the montane southern Monaro plateau containing grazed native grasslands, exotic pastures and patches of woodland. Three main types of inter-relating woodland described for this region (Benson unpublished) are:

ID716 Candlebark - Ribbon Gum - Snow Gum grass-shrub woodland mainly on granitic plateaux in the southern Monaro, South Eastern Highlands Bioregion

ID721 Snow Gum grassy woodland on hills in the southern Monaro plateau, South Eastern Highlands Bioregion

ID722: Ribbon Gum grassy woodland on the southern Monaro plateau, South Eastern Highlands Bioregion (Figure 1).

The Ribbon Gum dominated woodland ID722 occurs on granite and higher nutrient basalt soils. It is the most severely impacted by defoliation of the three regional woodland types although all are under threat. This vegetation type could be graded as Critically Endangered using the risk criteria in Benson (2006) and IUCN (Keith et al. 2013). In fact, its rapid loss of biological integrity places it in line to be registered as a collapsed ecosystem.

From about 2003, trees in this community suffered multiple episodes of dieback due to insect attack by mainly the eucalypt weevil (*Gonopterus scutellatus*) coinciding with the long and intense 2001 -2009 drought (Ross 2013). Regrowth has also been defoliated leading to a loss of trees altogether from some sites. Decades of pasture improvement and application of fertilizer exacerbating invasion of weeds serves as a secondary threat along with rabbit grazing that compounds total grazing pressure. However, observation suggests that areas fenced off from stock have also been impacted by the dieback, thus indicating causes other than stress from grazing pressure.

The southern Monaro has reduced rainfall compared to the 1970s and has always been subject to drought. It is likely that climate change is playing a role in threatening habitats including this woodland, where its main constituent species, Ribbon Gum (*Eucalyptus viminalis*), is growing at its hydrological limit. This raises some ethical issues about restoration and recovery.

At the recent Restore, Revegetate and Renew Conference held at the University of New England Armidale, Suzanne Prober and Kristen Williams from CSIRO Land and Water presented on maintaining biodiversity across Australia with climate change. They canvas options for maintaining 'desirable features' in the Australian landscapes. In the case of the dying Monaro Ribbon Gum, they raise the option of revegetating dieback sites with a different tree species, for example, the drier climate-adapted Monaro population of Yellow Box (*Eucalyptus melliodora*) or a Tasmanian Midlands dryland-adapted providence of Ribbon Gum. These are radical suggestions. My view is

that we should do all we can to discover local genotypes of Ribbon Gum itself surviving the dieback. However, if this fails what does one do? Let the woodland become a grassland or use other tree species or Ribbon Gum genotypes?

With increasing temperatures and changes in rainfall patterns, restoration ecology may need to think "outside the box" to restore or maintain function and structure in ecological communities, and this will raise ethical conundrums such as the one discussed here.

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Figure1. NSWVCA ID722 Dieback in Ribbon Gum (*Eucalyptus viminalis*) grassy woodland between Cooma and Berridale on the southern Monaro (GDA94) 36°17'41.6"S, 148°57'44.4"S, 7/1/13. Photograph John Benson;

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Contributions to the Newsletter, Volume 39

Contributions to the next newsletter should be forwarded to the administration assistant Amy Rowles admin@ecansw.org.au by the 15th of July 2017.

- 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

ECA Photo Gallery



Crested hawk taking a frog to feed its chick at the nest. Photo courtesy of Mark Mackinnon.



Shield Shrimp (*Triops australiensis*), taken in Sturt National Park in October 2016 after big rains. Photo courtesy of Charlotte Mills

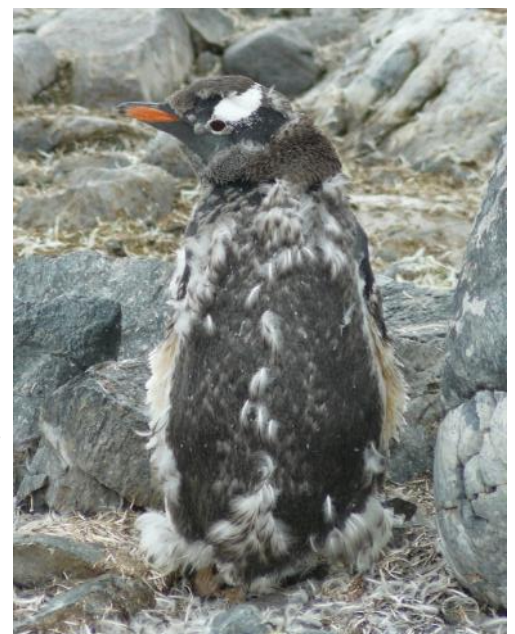


Left: *Litoria peroni*. Photo courtesy of Tim Johnson



Above left: Young male Elephant Seal. **Above right:** Waddell Seal. **Right:** Moulting Gentoo Penguin. **Left:** These are the only two terrestrial plants in the Antarctic as well as mosses and lichens. *Deschampsia* (Grass) and *Colobanthus* (forb).

Photos courtesy of Belinda Pellow



ECA Photo Gallery



2nd Place

Above: Narrow-nosed Planigale at Naree. **Below:** Bridled Nail-tail Wallaby at Scotia Wildlife Sanctuary. Photo Courtesy of Andrew Lothian



Above: Brahminy Kite. Photo Courtesy of David Milledge

Below: Little Corellas at Zenith Beach, Port Stephens. Photo courtesy of Tim Johnson



3rd Place



Left: *Xanthorrhoea johnsonii*. Photo courtesy of Chantelle Doyle

Right: Pagoda Daisies (*Leucochrysum graminifolium*) on Newnes Plateau. Photo courtesy of Tim Johnson

