Submission
Eastern Grey Kangaroos
Draft Controlled Native Species Management Plan 2017

submitted 23/03/2017
via email at environment@act.gov.au

The 2017 Draft Kangaroo Management Plan (KMP17) [1] builds on the 2010 ACT Kangaroo Management Plan (KMP10) [2].

My submission has two parts. The first part concerns comments on KMP17, the second part concerns comments on KMP17, KMP10 and on correspondence with and from the Conservator.

I have commented last year on KMP10 in a letter to the Conservator of Flora and Fauna, sent through the Animal Protectors Alliance (25/08/2016, attachment 1). I take the opportunity here to comment on the reply from the Conservator (06/09/2016, attachment 2) in the context of commenting on KMP17 and KMP10.

Comments on KMP17

No evaluation of culling
The Draft Kangaroo Management Plan 2017 is disappointing in lacking any evaluation of outcomes of the kangaroo culling campaigns in ACT nature reserves and adjacent lands against objectives of KMP10. After sustained culling over eight annual campaigns since 2009, surely enough time has lapsed to establish whether or not reductions in kangaroo densities has resulted in improved populations of reptile species purportedly threatened by kangaroo overgrazing.

No independent support for culling
The draft management plan lists eight studies that have been carried out after publication of KMP10, all are summarized to be supportive of kangaroo culling. It appears that all eight studies have been carried out by researchers with connections to the ANU-UC centred wildlife research group. While I do not want to denigrate the quality of research in these studies, their prevailing message permeates the "ecullogy" culture of the ANU-UC group. This group would be more convincing in its "need-for-culling" message if they could show support for their stance through published research carried out by workers that are clearly independent of the ANU-UC group.

Drivers for culling
It does not take much of an in-depth reading of KMP17 to come across three main drivers for ongoing kangaroo culling by the ACT Government:

- pressure from ACT farmers to reduce kangaroo grazing;
- pressure from drivers to reduce kangaroo collisions;
- government pressure on horse paddock contractor(s) to reduce kangaroo grazing.

Pressure from farmers is understandable, it can be relieved by re-establishing a compensation mechanism as used to be in operation up to the early 1990's.

Pressure from drivers, though flatly denied in the report as a motive for culling [1] (p 24, 26, 57, 58), is unmistakable. Drivers are a large and diversified group, swinging voters amongst them are likely to carry considerable, if not crucial, political weight.

Newly emerging pressure in KMP17 by the ACT government on horse paddocks contractor(s) to arrange for kangaroo culling is deeply disappointing. There is no need for contractor(s) to have to rely for their income on supply of pasture. Horse paddocks contractors can be renumerated appropriately for their services just like any other government contractor. To portray them as having to rely, as farmers do, on supply of pasture in the horse paddocks seems an ill-conceived move by the ACT Government.

Ultimately this move may well backfire on horse owners. Owning a horse is a life style choice. The Canberra community rightly expects horse owners to carry the upkeep of their horses. Most horse owners are likely to do so! It is unjust for the ACT government to make it appear as if kangaroos have to be culled just to placate horse owners wishing to maximize

pasture on government horse paddocks. Surely the government has trouble in arguing that kangaroos need to be culled in order to protect threatened reptiles from overgrazing in government paddocks trampled by horses.

This is not a sinecure. The numbers of kangaroos slated for culling on horse paddocks do far outweigh the numbers of horses on those paddocks. I have had some experience with an attempted culling in the Rose Cottage horse paddocks during the 2015 culling campaign, where 500 adult kangaroos were earmarked for culling in paddocks that may have a carrying capacity of 30 horses but carried no more than 15 at the time. This meant that 33 adult kangaroos were slated for culling for each and everyone of the 15 horses on the Rose Cottage horse paddocks. The massacre would not stop there. Substantial numbers of pouch young were also to be butchered and substantial numbers of abandoned young at foot would have to starve [3] (pp 98-105). KMP17 tries to dismiss the many post-cull observations of abandoned young at foot with repeated remarks about the "myth of a 'ghost' population" (pp 34, 44). One astute observer recently commented in the Canberra Times [4] upon the common sighting of abandoned young kangaroos, quite possibly referring to the aftermath of the 2016 massacre at Mount Mugga Mugga and Isaacs Ridge [1] (p 44) where an incredible 818 adult kangaroos were culled. Having horses in my own family, I very much doubt that such out-of-proportion, barbaric, culling practices of adult, young at foot and pouch young alike, would be the wish of the majority of horse owners.

What is not beyond doubt is the underhand way that the 2015 cull in the Rose Cottage horse paddocks was contemplated and carried out by the ACT Government. This cull was unannounced and occurred in unmarked paddocks adjacent to the Wanniassa Hills Nature Reserve, with the well-announced cull in the reserve obviously intended to act as a disguise. Canberrans present in the horse paddocks, where they had every right to be and to feel safe, being unaware of the unannounced cull in those very paddocks, rightly would feel ambushed by their own government. Even more disturbing is the revelation that culling in the Rose Cottage horse paddocks happened without an appropriate licence, as documented in detail in Frankie Seymour's "Warm and Wild" blog [3] (p 2, 22-31, 40, 42, 52).

No positive protection measures for reptiles

KMP17 is described as a "controlled native species management plan" [1] (p 6) for Eastern Grey Kangaroos (EGK). It is highly disappointing that neither KMP17, nor KMP10, contemplate the far less intrusive option of providing protective facilities for reptile species purportedly threatened by kangaroo grazing. In the Wanniassa Hills Nature Reserve one can find plenty of roof tiles, apparently left-overs from Howland et al.'s 2014 study [13] on relationships between EGK densities and grass structure and between grass structure and abundance, richness, diversity and occurrence of reptiles. If provision of roof tiles proved effective in counting reptiles purportedly threatened by kangaroo grazing, then they surely will function as an effective protection for these reptiles.

The ACT government will have to justify its choice of wholesome slaughter of kangaroo mobs over the simple execution of unintrusive protection measures for reptiles purportedly threatened by kangaroo grazing.

Comments on KMP17, KMP10 and on correspondence with the Conservator

The reply by the Conservator (06/09/2016, attachment 2) to my letter commenting on KMP10 (25/08/2016, attachment 1) is disappointing in failing to address many of the issues raised. Geological and climate science issues are notably ignored in the Conservator's reply, as they are in KMP17 and KMP10, suggesting that expertise in these fields may be in short supply within the Conservator's department.

I respond hereinafter to the reply by the Conservator, following the order of issues raised in my letter.

Basic deficiencies

The Conservator does not reply to my argument that KMP10 suffers from fundamental deficiencies in the scientific base underlying the plan, apparent in particular in:

- minimal input from geology;
- no input from climate science;
- no forward planning for climate change;
- no mechanism to evaluate culling outcomes against KMP10 objectives.

Outdated kangaroo counting methods

The Conservator addresses at some length various kangaroo counting methods used within the department, but skirts around fundamental issues that these methods are of last century's vintage, come with acknowledged inaccuracies and have no recourse to re-evaluation of observations.

It is interesting and encouraging that the Conservator's department has been involved during 2013 in trials using drones for kangaroo counting. No further information is provided however. This begs the questions:

- have there been follow-up drone trials and if not why?
- has a video record been obtained, and if so?
- has the video record been ground-truthed?
- has the video record been analysed with image-recognition software?
- have kangaroos been located from the video record in terms of ground coordinates and in terms of the various differentiated vegetation zones?

Systematically inflated kangaroo densities

The Conservator does not address the not-inconsequential issue that use of a 2-D projected map surface instead of a 3-D topographic surface leads to systematic under-determination of actual areal extents and therefore to systematic over-determination of kangaroo densities.

The Conservator's opinion *"The statement that ACT Government ecologists 'reject the lower count results' referenced to figures 5-7 in 'Calculation of numbers to cull' is a misunderstanding of those figures"* appears itself to be a misunderstanding of the document referred to. My original remarks relate to the 2014 version of the *"Calculation of the number*

of kangaroos to cull" [5], not the current, quite different, version of the document on the ACT EPSDD Environments website [6]. Each of figures 5-7 in the 2014 document features a low count open dot with the legend *"This Count Method Used in 2012 Underestimated EGK/ha"*. It logically follows from the legends that these open dot low counts were rejected!

Non-representative kangaroo carrying capacities
The Conservator does not address my argument that KMP10 relies heavily on Dr Fletcher's field observations for his PhD study [7] which were carried out across the 2002-2003 El Niño event and that kangaroo carrying capacities determined across such a serious drought event are unlikely to be representative.

Inappropriate extrapolation of kangaroo carrying capacities
The Conservator does not address my argument that the conclusions from Dr Fletcher's (2006) PhD studies on optimal kangaroo densities are applied in KMP10 to the entirety of Canberra's nature reserves, without any check on appropriateness regarding the specific geology of individual reserves.

Questionable relationship between kangaroo densities and dragon densities
The Conservator skirts around the similarity between trends in EGK abundances shown in two KMP10 graphs [2] (pp 36-37, figures 3.1, 3.2) and long-term trends in the Southern Oscillation Index across El Niño and La Nina cycles. The Conservator states *"The ACT Government is not aware of scientific evidence that evolution of EGK's and Grassland Earless Dragons reflect El Nino cycles"*. In doing so, the Conservator dismisses both the graphical evidence of KMP10 and the trend analysis of the Southern Oscillation Index as presented in my letter and also preempts graphical evidence from KPM17 [1] (p 10, figure 1) and repeated statements therein that kangaroo numbers *"illustrate natural variation due to seasonal conditions"* [1] (pp 10, 16, 31, 49).

The Conservator's statement that *"the Googong population would not have been crashing when the Belconnen and Majura ones were increasing"* is not backed up by relevant graphs shown in KMP10. Figure 3.2 (p 37) shows for Googong for the 1995 to 2005 period a very substantial increase in EGK numbers (~1998 to 2001) followed by a very substantial decrease (~2002 to 2005). The same graph shows absence of data for Belconnen for the same period. Figure 3.1 (p 36) shows a substantial increase in EGK numbers at Majura for the period 2005 to 2010, but no statistically relevant increase over the period 2002 to 2005. Notably KMP17 [1] (figure 1, p 10) shows substantial fluctuations for EGK populations nationwide as well as for all commercially harvested kangaroo species combined that are directly comparable to the hereinabove described fluctuations in the EGK populations at Googong, with the KMP17 figure showing substantial increases during 1997 to 2001, followed by substantial decreases during 2001 to 2003 and a next succession of increases during 2010 to 2013.

The Conservator also states *"As for the Grassland Earless Dragons, El Nino on its own does not explain the large difference in abundance between Jerrabomberra and Majura in 2006"*. This is not borne out by evidence presented in KMP10. Grassland Earless Dragons (GED) data for Majura (Figure 3.1 p 36) relate to an obscure indicator, fractional "catch rates", not

abundances. No data are presented in KMP10 for GED abundance in Jerrabomberra.

The Conservator's statement *"I do not agree with your speculation that 'the arbitrariness of the culling process likely leads to a genetically lesser population than derived through natural "survival of the fittest" processes'. Based on evidence form NSW it is likely that the flow of kangaroos between culled and unculled populations is sufficient to maintain genetic integrity"* seems to take Darwinism lightly. For how long genetic integrity of Eastern Grey Kangaroos can be maintained in the face of systematic onslaughts and fast progressing climate change remains to be seen. As a geologist I am well aware of past and present extinctions of species and I do not share the optimism expressed by the Conservator.

Unwanted consequences

The Conservator does not address my argument that *"Yet maximizing biomass in ACT nature reserves will maximize grass pollen content in the urban fringes over spring and summer [7], inconveniencing hay fever sufferers and potentially endangering asthma sufferers."*

The unfortunate occurrence during a freak thunderstorm in Melbourne last November of 8 deaths and more than 2000 acute asthma attacks requiring paramedic attention, attributed to humidity-induced expansion of pollen and subsequent fragmentation and dispersion [8], should serve as a wake-up call to exercise all measures possible to minimize biomass in Canberra's urban fringes [9] [10]. The more so as Canberra suffered last spring its highest pollen counts ever [11] [12].

Alternative to culling

I thank the Conservator for her information regarding previous operation of a kangaroo compensation scheme for rural landholders

"*Regarding your suggestion for an alternative to the culling of kangaroos on rural properties, you would be interested that the ACT Government previously operated a landholder compensation scheme. In the context of increasing rural kangaroo abundance, in the early 1990s the ACT Government found it necessary to replace that arrangement with culling licenses. That decision was independently validated in 1997 in a review by the (then) Kangaroo Advisory Committee. "*

I welcome your opinion

"Most of the 81 private landholders who culled kangaroos under licence in the ACT last year would probably prefer to be paid than to cull",

but take issue with your opinion

"but few people would support the imposition of that cost on ratepayers."

for the following reasons:

- I suggested in my letter four avenues toward cost neutrality for a compensation scheme;
- In addition to rural landholders, horse paddocks contractors and horse paddocks user groups also should be included in a compensation scheme;
- Support, or otherwise, among Canberrans for a compensation scheme should be tested.

References

[1] (http://www.environment.act.gov.au/__data/assets/pdf_file/0009/1029717/DraftControlledNativeSpeciesManagementPlan.pdf).

[2] (http://www.environment.act.gov.au/__data/assets/pdf_file/0020/902423/Kangaroo_Management_Plan_complete_for_web.pdf).

[3] (https://warmandwildblog.wordpress.com/55-2/dossier-kangaroo-shooting-on-the-rose-cottage-horse-paddocks/?preview_id 301&preview_nonce 8aefa6e7ef).

[4] Canberra Times Comment 15/03/2017 "Roo numbers down but what is befalling remnant populations? ".

[5] (http://www.fotpin.org.au/kangaroos/Calculation_of_the_number_of_kangaroos_to_cull_2014.pdf).

[6] (http://www.environment.act.gov.au/__data/assets/pdf_file/0004/576715/Calculation-of-the-number-of-kangaroos-to-cull.pdf).

[7] (http://www.canberra.edu.au/researchrepository/items/8376efb7-f1b7-1b76-74d8-14604c15865a/1/).

[8] (http://www.abc.net.au/news/2016-11-22/what-is-thunderstorm-asthma/8044920).

[9] (http://www.abc.net.au/news/2016-11-26/we-couldve-seen-thunderstorm-asthma-coming-and-ways-to-prepare/8058682).

[10] (http://www.abc.net.au/news/2017-02-01/thunderstorm-asthma-in-melbourne-not-understood-review-finds/8230834).

[11] (http://www.canberrapollen.com.au/).

[12] (http://www.anu.edu.au/news/all-news/canberra-pollen-levels-hit-record-highs).

[13] (Howland B, Stojanovic D, Gordon IJ, Manning AD, Fletcher D, et al. (2014) Eaten Out of House and Home: Impacts of Grazing on Ground-Dwelling Reptiles in Australian Grasslands and Grassy Woodlands. PLoS ONE 9(12): e105966. doi:10.1371/journal.pone.0105966).

Attachment 1

Letter to the Conservator commenting on KMP10, sent through the Animal Protectors Alliance (25/08/2016).

A.P.A.
Animal Protectors Alliance

Dr Annie Lane
Conservator of Flora and Fauna
Environment and Planning Directorate
GPO Box 158
Canberra ACT 2601

Dear Dr Lane,

The ACT Government has been carrying out an annual cull of Eastern Grey Kangaroos in ACT nature reserves since 2009. It aims to do so in accordance with, and justified by, the ACT Kangaroo Management Plan 2010 (KMP). I have recently scrutinised the KMP from the vantage point of a field-oriented geologist with fifty years of experience in academic and government research. I like to raise with you several serious concerns regarding scientific evidence, or lack thereof, underlying the KMP.

Basic deficiencies
The KMP appears to be intended as a scientific document exploring the ecological issues of kangaroo management. Ecology is, by definition, a science that brings together the physical, chemical and life sciences that are essential for the study of ecosystems: zoology, botany, geology, chemistry, physics, hydrology, meteorology and climate science. Yet the plan has minimal input from geology and virtually no input from climate science. There is no forward planning for climate change, yet pervasive effects of a changing climate are readily upon us.

There is, further, no mechanism to evaluate culling outcomes against the plan's objectives – a fundamental deficiency progressively diminishing timeliness of the KMP and justification for the annual kangaroo cull.

Outdated kangaroo counting methods
The plethora of kangaroo counting methods that underlie the KMP are of a past century vintage and come with acknowledged, substantial, inaccuracies and no recourse to re-examination.

In contrast, newly developed drone and image recognition technologies [1] allow for innovative counting methods which can be highly automated using easily storable and retrievable digital records, offering far greater accuracy and consistency than obtainable with the currently used, outdated, counting methods. Drone-provided kangaroo distributions can be draped over satellite-provided hyper-spectral images and so detail kangaroo densities (infra-red) versus vegetational states (hyper-spectral). Successive recordings can be used to illustrate changes in kangaroo densities and vegetational impacts over time and all recordings can be re-analysed using the latest, state-of-the-art, implementations of processing software.

Systematically inflated kangaroo densities
Following Fletcher (2006), KMP kangaroo densities are calculated based on map-projected, **2D-surface**, areal extents. This may be appropriate for native grassland ecosystems on flat alluvial planes, but not so for the majority of Canberra's nature reserves whose substantial topography requires determination of their proper, **3D-surface**, areal extent. Inappropriate use of map-projected (2D) areal extents leads to *systematic under-determination of actual (3D) areal extents*, substantially so in rough terrain, resulting in *substantial, systematic, over-determination of densities*. This unjustified, unscientific, working practice can easily be re-mediated. Any graphical information system (GIS) of standing will have an option to determine 3D-surface areal extent from digital elevation models (DEM). DEM's of substantial accuracy are freely or at low cost available from Geoscience Australia (eg "1 second" DEM of ~30 meter resolution [2] and 25 meter and 5 meter grid models).

Kangaroo densities are further inflated by a tendency of Parks and Conservation ecologists to reject the lower count results from amongst the myriad of currently applied, outdated, counting methods [3].

Non-representative kangaroo carrying capacities
The KMP relies heavily on Dr Fletcher's PhD research (Fletcher 2006) whose field observations were conducted across the 2002-2003 El Niño event. Although this event was characterised by only a weak to moderate Southern Oscillation Index, it had a very strong

impact on Australia with a major drought from March 2002 to January 2003 [4]. It beggars belief that kangaroo carrying capacities determined across such a serious drought event can somehow be portrayed as being long term representative.

Inappropriate extrapolation of kangaroo carrying capacities

Conclusions from Dr Fletcher's (2006) PhD studies on optimal kangaroo densities are applied to the entirety of Canberra's nature reserves, without any check on appropriateness regarding the specific geology of individual reserves.

Dr Fletcher's PhD studies were carried out in Silurian granites (Murrumbidgee Batholith: Gudgenby, Tidbinbilla) and in Ordovician metamorphics (Googong). However, Canberra's nature reserves consist nearly entirely of Silurian volcanics. Their structure and stratigraphy differ considerably from the areas studied by Dr Fletcher, with the possible exception of alluvial planes and fans that have been derived from Silurian granites or Silurian volcanics. The majority of Canberra's nature reserves however, are not alluvial flats – most showing considerable topography with exposed Silurian volcanic rock successions. Their kangaroo carrying capacities should be determined from site specific studies, not by blanket extrapolation of purported optimal kangaroo densities that were determined from different geological and topographical environments.

Management protocols developed for native grassland ecosystems are applied to the entirety of Canberra's nature reserves. Yet only one in four of Canberra's nature reserves is classified as native grassland, representing in areal extent just 10% of all reserves with the caveat that reserves not classified as native grassland also may contain substantial areas of native grassland.

Questionable relationship between kangaroo densities and dragon densities

Graphical evidence (KMP figures 3.1 and 3.2, pp 36-37) on evolution of kangaroo populations versus minor reptile populations over the past two decades is presented and interpreted with apparent ideological bias, failing to present alternative, entirely viable, interpretations.

The KMP figures show prominent inflections in kangaroo densities at Googong and Majura for the years 1997/1998, 2002/2003 and 2006/2007, corresponding with strong (1997/1998) and weak (2002/2003, 2006/2007) El Niño events [4]. Yet any relationship with El Niño cycles is ignored in the KMP and the graphs are interpreted instead in terms of negative interaction between increasing kangaroo populations and minor reptile populations.

The data presented in the KMP figures are open to different interpretation as highlighted in Figures 1 and 2. Figure 1 demonstrates remarkably consistent correspondence between the evolution of Eastern Grey Kangaroo populations (Googong and Belconnen) and the *trend* of the Southern Oscillation Index [5], used as an indicator of "El Niño and La Niña strengths". Figure 2 likewise demonstrates that the Eastern Grey Kangaroo population at Googong as well as the Grassland Earless Dragon population at Majura correspond closely with the *trend* of the Southern Oscillation Index. Evolution of the latter two populations seemingly reflect El Niño cycles rather than the negative interaction between these kangaroo and dragon populations purported in the KMP.

Fluctuation of kangaroo populations with El Niño cycles has considerable implications for Parks and Conservation's policy of ongoing annual culls. Culling of kangaroos during their natural regeneration cycle prior to an El Niño event pre-empts their natural demise during and after an El Niño event. Yet, the arbitrariness of the culling process likely leads to a genetically lesser population than derived through the natural "survival of the fittest" process.

Unwanted consequences

Following Fletcher (2006) a main aim of the KMP is to maximize grass biomass, purporting the discredited idea that greater biomass equates with greater biodiversity [6]. Yet maximizing biomass in ACT nature reserves will maximize grass pollen content in the urban fringes over spring and summer [7], inconveniencing hay fever sufferers and potentially endangering asthma sufferers.

Systematic culling of kangaroo populations in nature reserves and paddocks on urban fringes increases grass biomass and consequently increases grassfire and bushfire risks. It also reduces potential to use kangaroo mobs as firebreak agents. Yet, the ACT's north-south trending geological structures and prevailing east-west winds offer ideal conditions for experiments channelling kangaroo grazing toward north-south trending grasslands, aiming to establish and maintain north-south aligned firebreaks.

Alternative to culling

The KMP cites provision of grazing relief for rural landowners and horse paddock users as a major factor guiding Eastern Grey Kangaroo culling in Canberra's nature reserves - a controversial justification for culling of a nationally protected, iconic, species.

As one of many alternatives to culling, the ACT government can avoid controversy, and gain kudos, by financially compensating farmers and horse paddock users for losses sustained in maintaining kangaroo populations on their lands.

Such practices have recently been introduced in the Netherlands for return of the wolf, have been operating for the past two decades within the European Union where governments are compensating their farmers for losses sustained by re-introducing wolf and bear populations, and have been operating long term in North America [8].

In the ACT context, compensation funds may be sourced from:

- The *culling budget*, no longer required;
- The *tourism budget*, in recognising the major tourism attraction of maintaining readily visible kangaroo populations in nature reserves on urban fringes;
- The *emergency services budget*, in recognising highly efficient, free, lawn mowing by kangaroo populations, which may be guided toward grazing of natural fire breaks. Preferential grazing of mainly north-south aligned geological structures in many of Canberra's nature reserves would make for good firebreaks against mainly east-west wind driven fires;
- The *health services budget*, in recognising relief for asthma and hay fever sufferers from reduction in grass pollen content resulting from unimpeded kangaroo grazing in reserves and paddocks on urban fringes.

References

[1] Drones with heat-tracking camera used to monitor koala populations, developed at Queensland University of Technology. (http://www.abc.net.au/news/2015-02-24/drones-to-help-threatened-species-koalas-qut/6256558)

[2] One (1) Second Digital Elevation Model maintained by Geoscience Australia (http://www.ga.gov.au/metadata-gateway/metadata/record/gcat_72759).

[3] Calculation of the numbers of kangaroos to cull. See figures 5-7. (http://www.environment.act.gov.au/cpr/conservation-research/research).

[4] El Niño - detailed Australian analysis (http://www.bom.gov.au/climate/enso/enlist/).

[5] Southern Oscillation Index with 121 months moving window average (Giorgiopg2 2012) (https://commons.wikimedia.org/wiki/File:Soi.svg).

[6] Documentation from Regional Friends of Wildlife to the Office of the Commissioner for Sustainability and Environment (19/12/2013), Attachment G, pp 144-147. https://warmandwildblog.files.wordpress.com/2016/05/regional-friends-of-wildlife-submission-2013.pdf.

[7] "Hay fever misery prediction: some to get off lightly, others to suffer". Newbigin and Haberle, 08/10/2014, The Conversation. (https://theconversation.com/hay-fever-misery-prediction-some-to-get-off-lightly-others-to-suffer-32378).

[8] Dutch farmers will be compensated for losses due to re-introduction of the wolf (https://www.government.nl/latest/news/2014/03/27/wolf-legally-protected-compensation-for-damage). The European Commission proposed a compensation scheme for wolf and bear damage operating in 1999 http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/damage_2.pdf). Minnesota has a comparable compensation scheme for wildlife damage operating since 1977 (http://www.mda.state.mn.us/grants/disaster/wolf.aspx) as have other states in North America (http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1826&context=icwdm_usdanwrc).

Yours sincerely,

Animal Protectors Alliance scientific collaborator
25/08/2016

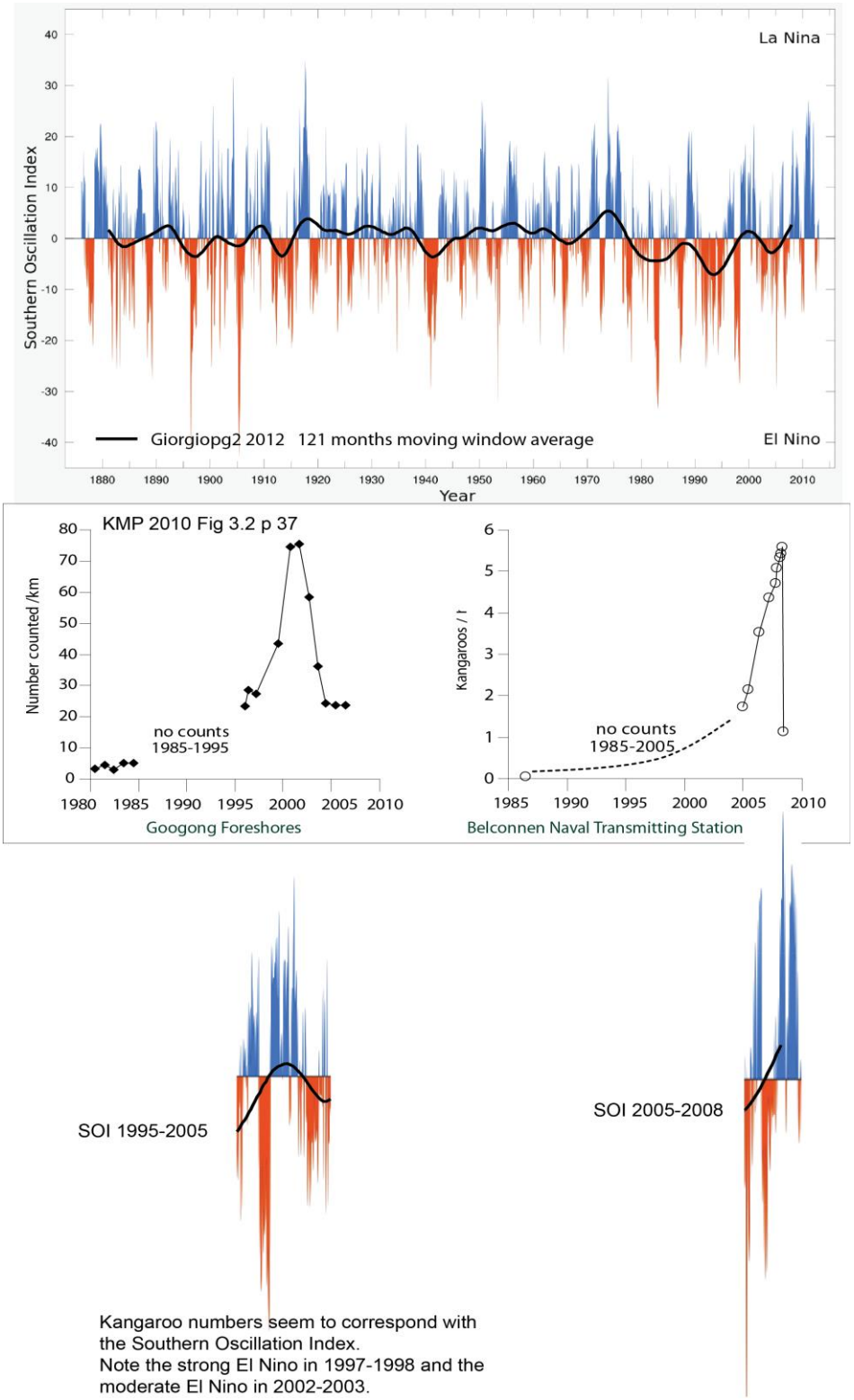

Figure 1 Reworked representation of KMP figure 3.2 (KMP pp 37) demonstrating inflection points in evolution of kangaroo populations coinciding with the 1997/98 and 2002/03 El Niño events and general correspondence between the evolution of kangaroo populations and the **trend** of the Southern Oscillation Index.

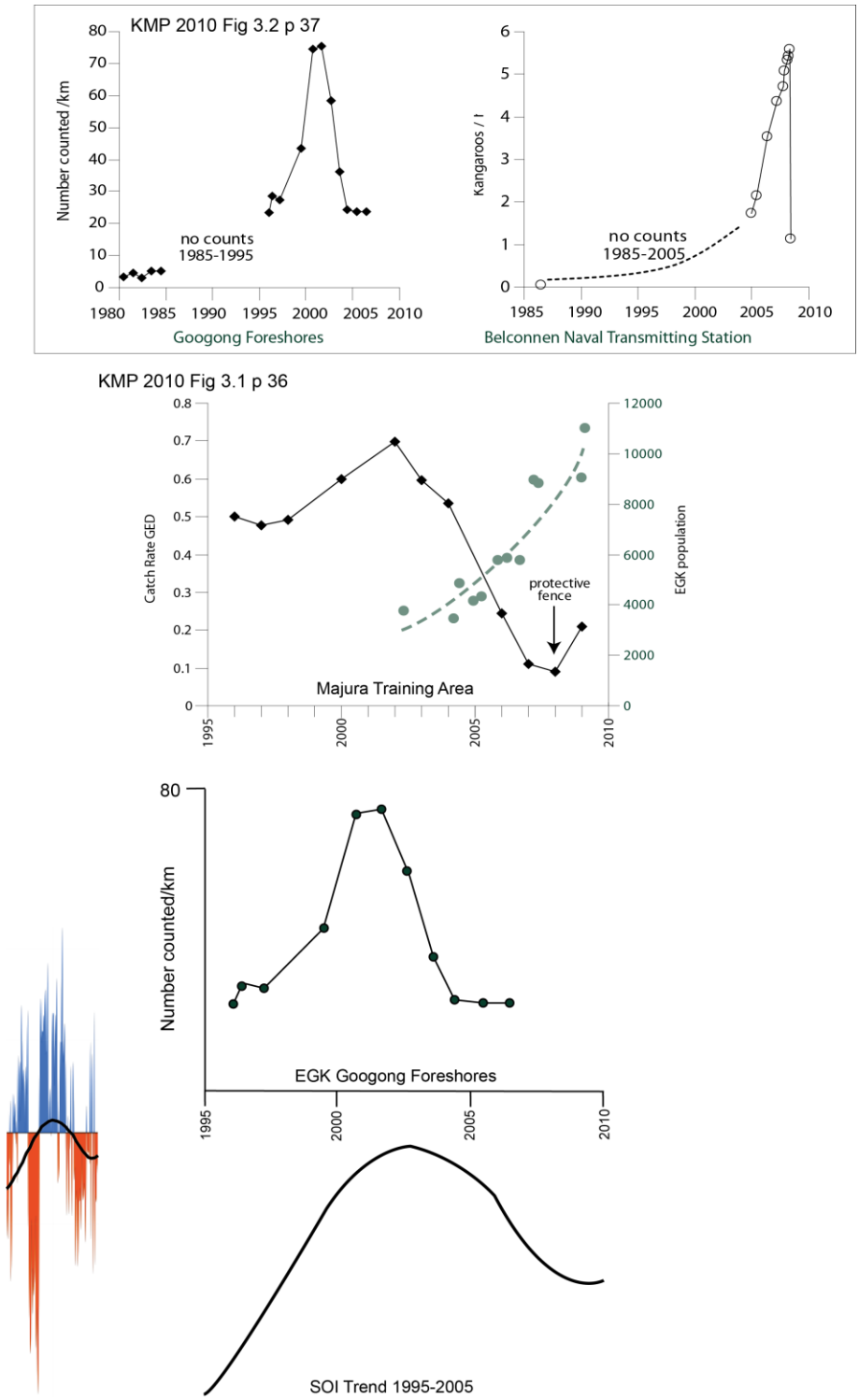

Figure 2 Reworked representation of KMP figures 3.1 and 3.2 (KMP pp 37, 38) demonstrating correspondence between the Eastern Grey Kangaroo population at Googong, the Grassland Earless Dragon population at Majura and the **trend** of the Southern Oscillation Index. Such correspondence contradicts the negative interaction between kangaroo populations and dragon populations implied in the KMP.

Attachment 2

Reply by the Conservator (06/09/2016)

ACT Government
Environment and Planning

Animal Protectors Alliance Scientific Collaborator

Thank you for your long letter dated 25 August 2016 for the Animal Protectors Alliance about the management of Eastern Grey Kangaroos (EGKs) and the ACT Kangaroo Management Plan (KMP), and for the large volume of supplementary material you referenced.

The KMP is an ACT Government policy document that contains references to scientific evidence, rather than being a *'scientific document exploring the ecological issues'*. It was written to make it more accessible and less of a scientific document, e.g. by the removal of error bars from all of the charts. After the final document was released following a period of public consultation, the KMP was recommended by Prof Graeme Coulson, a leading kangaroo scientist, as a model for all wildlife policy documents. He also commented that every important paper had been considered. As a policy document, its attention to science is commendable.

Your letter states that your scientific scrutiny of the KMP found *'serious concerns regarding scientific evidence'*. There follows a series of statements about kangaroo counts under the headings *'Outdated kangaroo counting methods'* and *'Systematically inflated kangaroo densities'*. Kangaroo counts are central to the conservation culling program and you have given the topic prominence in your letter. This is where I will begin evaluating your claim that the science is deficient.

I can inform you that:

- There are various kangaroo counting methods used in the ACT and the most appropriate method is chosen for each site. Methods are outlined in Appendix 1 of the KMP. The most used kangaroo counting method in the ACT is Walked Line Transect Distance Sampling (WLT). Far from being *'outdated'* and of *'past century vintage'* Distance Sampling is thought to be the most widely used method in the world for estimating abundance of mobile organisms. The method is subject to continual and ongoing development. For example:

- (i) the latest text book on the method was published only last year by Springer: Buckland *et al.* (2015) *Distance Sampling: methods and applications*;
- (ii) the latest paper that validates the accuracy of the method when applied to EGKs was also published last year, Glass *et al.* (2015) Precision, accuracy and bias of walked line-transect distance sampling to estimate eastern grey kangaroo population size. *Wildlife Research* **42** 633–641;
- (iii) more than 1,300 papers are listed at the Distance homepage; and
- (iv) hundreds of scientists are active members of the Distance Google Group.

- Due to the varied sites where ACT counts are conducted, different methods are needed for efficiency, e.g. it would be silly to apply more expensive WLT to a small site where a head count of kangaroos can easily be validated. Rather than a '*plethora*' of methods '*with acknowledged substantial inaccuracies and no recourse to re-examination*', a minimal number of standard ecological methods has been used and they have been tested against each other. For example, a trial was carried out in 2014 on sites where more than one count method was possible. A comparison was done of WLT, pellet counts and total counts (aka head counts) across six sites with widely different kangaroo density. The trial showed that the difference between methods was neither significant nor consistent, i.e. there are only small random differences between the results from the different methods. The chief differences are logistics and cost.

- Before any new kangaroo counting method could be accepted it must be shown to produce repeatable results and must have been validated against methods known to be reliable. Your belief in the superiority of a kangaroo counting method based on analysis of imagery recorded from aerial drones has not been scientifically demonstrated. However, the attractions of such a method explain why ACT Government ecologists were involved in one of the first trials of drones for kangaroo counting in 2013. We would be happy to receive scientific support for your belief that drone based methods would prove superior to ground based methods.

- Regarding the other two counting methods that are attributed to Mr Mjadwesch, the results of the Mjadwesch field count method were presented to the ACT Civil and Administrative Tribunal in 2013. They were found to be incorrect by the Tribunal and in comparison with counts using recognised methods. Neither the Mjadwesch field count method nor his GIS method is recognised in the ecological literature. None of the three alternative count methods advocated in your documentation has scientific support at this time.

- In 2014, the ACT Government had the counts and methods reviewed by independent experts, Kurahaupo Consulting. That review supported the government counting methods and culling advice.

- The statement that ACT Government ecologists *'reject the lower count results'* referenced to figures 5-7 in *'Calculation of the Number to Cull'* is a misunderstanding of those figures. The figures show that kangaroo populations grow, that culling has not threatened the persistence of kangaroo populations on those sites and that culling has been conservative. There has been no *'rejection'* of low count results.

In summary, I do have confidence in the scientific veracity of the ACT Government kangaroo counts.

'Unwanted consequences'

Our expectation is that heterogeneous pasture structure is advantageous for biodiversity of pasture frequenting organisms and that heterogeneity depends on (among other things) intermediate herbage mass, with extremes of high and low herbage mass being relatively structurally homogeneous.

Rather than respond comprehensively to all of your claims about scientific deficiencies in ACT management of kangaroos, which would take many pages, I have placed some brief notes on the next page. In general I am satisfied that both the conservation and rural culling programs are adequately justified scientifically.

Regarding your suggestion for an alternative to the culling of kangaroos on rural properties, you would be interested that the ACT previously operated a landholder compensation scheme. In the context of increasing rural kangaroo abundance, in the early 1990s the ACT Government found it necessary to replace that arrangement with culling licences. That decision was independently validated in 1997 in a review by the (then) Kangaroo Advisory Committee. Most of the 81 private landholders who culled kangaroos under licence in the ACT last year would probably prefer to be paid than to cull but few people would support the imposition of that cost on ratepayers.

The ACT Government does publically release information about kangaroo management. On the Directorate's web site you will find a digital copy of the full Kangaroo Management Plan and facts sheet on the effects of kangaroo grazing on biodiversity that lists the recent research papers. I also attach an information sheet that has recently been revised that explains the procedure to calculate the number of Eastern Grey Kangaroos that are culled in each reserve.

Thank you for your letter.

Dr Annie Lane

Conservator of Flora and Fauna

6 September 2016

BRIEF ADDITIONAL RESPONSES

Definition of ecology

Ecology is defined in the most widely prescribed university text book on ecology, Krebs, C. J. (2009). *Ecology: The Experimental Analysis of Distribution & Abundance.* as '*the scientific study of the relationships that determine distribution and abundance of living organisms*'.

Non representative kangaroo carrying capacities

As stated in the documents referenced in the letter such as '*Calculation of the number to Cull*', the target densities (carrying capacities) are subject to revision. In some cases they appear after a few years' experience, as you imply, to probably be too low. In other cases they appear to be too high. They will be reviewed at an appropriate time.

The presumption underlying your comment (made repeatedly by other animal rights activists) is that if target densities were higher, fewer kangaroos would be culled. In fact, the reverse is true; if the target density is increased we will have to shoot more kangaroos per year, not fewer.

Inappropriate extrapolation of kangaroo carrying capacities

The model in the thesis and the culling are both based on plant growth and herbage mass of pasture. The major influences on these, according to studies by NSW Agriculture and many others, are weather factors and pasture type.

Few of the forty urban reserves and planned reserves included in Canberra Nature Park are culled. The culling has been focussed on endangered grassy ecosystems.

Questionable relationship between kangaroo densities and dragon densities

The KMP does not make statements about evolution of kangaroos. The ACT Government is not aware of scientific evidence that the evolution of EGKs and Grassland Earless Dragons reflect *El Nino* cycles.

The drought years and wet years at Belconnen, Majura and Googong are common to all three sites. If it was just rainfall or *El Nino* that determined kangaroo population growth, the Googong population would not have been crashing when the Belconnen and Majura ones were increasing. As for Grassland Earless Dragons, *El Nino* on its own does not explain the large differences in abundance between Jerrabomberra and Majura in 2006.

I do not agree with your speculation that '*the arbitrariness of the culling process likely leads to a genetically lesser population than derived through the natural "survival of the fittest" processes.* Based on evidence from NSW it is likely that the flow of kangaroos between culled and unculled populations is more than sufficient to maintain genetic integrity.

Dear Madam/Sir,

Please find attached my submission to the Eastern Grey Kangaroos Draft Controlled Native Management Species Plan 2017.

I will appreciate your acknowledgement of receipt.

With kind regards,