13th July 2021

Portfolio Committee No. 7 – Planning and Environment

Friday 11 June 2021

Inquiry into the health and wellbeing of kangaroos and other macropods in New South Wales.

Bush Heritage Australia response to Supplementary questions

1. Given your comment that "using the best available science, we have to make really hard decisions in relationship to the control of kangaroos", can you explain the reproduction rates of kangaroos using the best available science and how you think that this rate of reproduction is problematic for the environment?

Marsupial reproductive systems are acutely adapted to the Australian landscape, the boom and bust nature of our natural cycles and the low nutrient availability that emanates from our generally poor soils (Shaw, 2006). When nutrient and water availability is low, reproduction rates are extremely low and each female may halt reproduction entirely for several years through embryonic diapause. Conversely, when nutrient and water are readily available, population growth is achieved by a rapid increase in reproduction. Each female is capable of having an embryo in the uterus, in the pouch and a young at foot, generating 3 offspring in a single season – and generating different milk appropriate for the age of the specific offspring. This highly adaptive system is an excellent illustration of evolution and the exquisite balance between species and their environments. It is not correct to say that this is a problem for the environment.

Imbalance is generated by artificially high nutrient and water availability in agricultural landscapes that generates the consistently high rates of reproduction and rapid population growth. Coupled with the lack of natural predators, this population growth goes unchecked. Our science is focused on the function of the ecosystems we manage to ensure the well-being and population survival of all species. We measure the specific impacts of different species and the health of the ecosystems we manage and draw on the wealth of science to inform best practice population and ecosystem management techniques. Without these management actions, we have witnessed the terrible welfare outcomes of mass starvation and increased predation, not just of kangaroos but many different species across the landscape as the vegetation and natural cover is stripped from the landscape.

Reference:

Shaw, G. (2006) Reproduction. Pp. 83-107 in Marsupials (Eds. P. Armati, C. Dickman and I. Hume). Cambridge University Press, Cambridge.

2. Given you say your operations are founded in science, can you cite the research that informed your lethal management practices?

Bush Heritage does not prioritise the welfare of one species above others. We care deeply about all native species and work to support vibrant functioning landscapes that support the full range of native species that exist within these areas. Our goal is not kangaroo management but avoidance of overgrazing of the landscape overall, for the protection and welfare of all species therein. Considering the conservation impact, animal welfare issues, staff and visitor safety and well-being, and risks of the management options, Bush Heritage attempts to manage Total Grazing Pressure using consistent, long-term, strategic management across our Reserves.

Strategic management actions to control grazing impact include:

- Undertaking domestic stock and feral herbivore exclusion and control to reduce total grazing pressure;
- Eliminating access to man-made water-points to avoid artificially high macropod populations;
- Small-scale conservation fencing (where appropriate) to protect specific plant communities and cultural artifacts from foraging impacts;
- Undertaking regular reviews of the latest information on effective Population Management and deterrents of macropods including auditory and olfactory deterrents.

When the above strategic actions are not sufficient to reduce the impact of macropod grazing pressure to sustainable levels, we review further management actions to determine the most likely to achieve the desired conservation outcomes in a cost-effective and humane manner.

Review of management options available

The range of management options available to land managers around Australia are detailed below. These have been outlined here including a review of their viability/risks at the time of writing. Bush Heritage periodically reviews available management options as technologies and management techniques change and improve.

No macropod management

Other than managing total grazing pressure through de-stocking, feral herbivore management and closing artificial water points, this option leaves the macropod populations to self-regulate. This option assumes that population fluctuations and subsequent impacts on the environment are sustainable. Aside from the unacceptable impacts on vegetation structure and thus the impact on other fauna species and ecosystem function, self-regulation is likely to lag behind natural climate cycles in agricultural landscapes and in the absence of native predators. This means macropod populations will increase to an unsustainable peak, then crash to a much lower density. This has serious animal welfare implications, as starvation and death of young and old animals occurs first, and then the usually healthy mature individuals succumb and lose body condition, become moribund and eventually die. Further, many species dependent on the same habitat will suffer the same population crash, with concomitant implications for animal welfare on a larger scale.

Risks: Unacceptable ecological outcomes; unacceptable animal welfare outcomes; further damage to land management and science reputation; Human impacts (i.e. mental health and PTSD from managing animals in distress). Reputational risk in the community due to the animal welfare impacts.

Complementary management – water point management and fencing

Water-point management

We strive towards the restoration of natural water flow by decommissioning dams, bores and troughs in a staged process that protects animal welfare while restoring natural balance to the landscape.

Risks: Highly unlikely to result in reduced grazing pressure without other management interventions or collaboration with neighbouring properties; potential impacts on other water-dependent species (e.g. obligate granivores, waterbirds, amphibians).

Fencing

This management option is inclusive of small exclusion areas (<2ha), entire reserve fencing (either including or excluding macropods) or cluster fencing (fencing enclosing multiple properties and of significant scale).

Exclusion fencing relates to fencing relatively small areas of high conservation significance (e.g. threatened species or areas particularly sensitive to grazing such as natural springs) to minimize the impact of macropod grazing. This has been shown to be effective at small scales as demonstrated in exclusion plots on several reserves.

Reserve Fencing and cluster fencing: To control all herbivores on a large scale, extensive fencing of entire reserves (or part thereof) or indeed encompassing multiple properties would need to be undertaken, in combination with either: passive dispersal; trapping, sedating and removal; or active 'herding' of herbivores out of the reserve. This would reduce the herbivore population but it will not result in a self-regulating and sustainable population of macropods without ongoing Population Management of what would effectively be a captive population within the reserve. Alternatively, macropods could be completely removed from the fenced area but this is an undesirable outcome for functioning ecosystems. It would also require ongoing maintenance of fences. This method is also fundamentally contrary to the principles of landscape management that Bush Heritage seeks to practice. By allowing the movement of native animals across the boundaries of our reserves, we enhance the opportunity for our management actions to convey a benefit to the wider landscape, and build a resilient ecosystem, capable of persisting in the face of current and future threats.

Risks: Impacts of fence on other species (e.g. bird-strike, entanglement, restricts movement of migratory species e.g. emu); unacceptable ecological outcomes associated with captive population of macropods; unacceptable animal welfare outcomes associated with macropods and other species congregating along fences and experiencing greater stress or fatalities; poor alignment with BHA values and modus operandi.

Translocation (with or without fences)

This involves trapping and sedating animals, transporting them and releasing them at a recipient site. A suitable recipient site must be available which provides appropriate, secure habitat for macropods and is able to support a new or augmented population of macropods without unacceptable impacts on the natural environment, the existing macropod population, animal welfare or human activities. The recipient site must be within 20-30 minutes travel time of the capture site because sedated macropods cannot thermo-regulate and can only be transported short distances (macropods must be sedated for travel to reduce the level of stress to the animals).

Translocation may compromise the welfare of animals at the recipient site due to disturbance of the social structure of existing populations and increase in competition for food, habitat, water and

mates. This may cause animals to disperse widely exposing them to further threats (e.g. vehicles on roads, dogs).

There are several options for trapping animals including draw-string traps in fences, cannon nets at water troughs, or darting animals with tranquilisers. Draw-string traps and cannon netting can involve stress for animals until sedatives take effect. Darting requires a skilled and licenced tranquiliser gun operator to be within 30 metres of a macropod to dart it. Darting of a large number of macropods might take many months and the animals quickly become wary of people and tranquilising equipment.

Transport and release of macropods requires specialist skills and equipment, including having a wildlife veterinarian present and a padded and well-ventilated vehicle or trailer for transport. The risk of death or injury to macropods from capture myopathy or a failure to thermo-regulate is high.

Translocation methods are expensive and often result in poorer animal welfare outcomes than humane destruction. Studies have shown that translocated wildlife generally suffer from elevated mortality levels due to stress, competition, injury and capture myopathy. Simply herding animals off-site is ineffective, moves animals into potentially more dangerous environs, and has serious welfare issues, with 20-37% of animals suffering stress-related deaths.

Risks: Shifts the problem elsewhere; unacceptable animal welfare outcomes associated with herding, trapping and handling, sedation and transport of animals; unacceptable ecological and animal welfare outcomes at recipient site, takes long time to trap and relocate animals, welfare and survival of translocated animals are unknown.

Fertility control

Currently, macropod fertility control is highly invasive (requiring anaesthesia and surgical sterilisation or implant insertion) and does not have any impact on population growth for up to 2 years given the fact that contraception does not inhibit lactation for young at foot or the continued development of embryos in diapause (Portas 2019; Nave et al 2002).

Further, due to the long delay in efficacy and movement patterns of macropods, long term contraception may have undesirable impacts on areas not under Bush Heritage management, or limit population growth at a time when control is not appropriate. Further developments in contraception will be monitored and explored further for use in the future.

While fertility control of macropods may be appropriate and effective in small scale, enclosed areas, it is an expensive and invasive alternative to apply to a large number of animals and ineffective for free-ranging populations in mixed agricultural landscapes. Fertility control can be effective at reducing population growth rates in insular, small and/or captive populations but the proportion of the population that would need to be treated to achieve permanent population growth reduction in free-ranging populations is logistically and ecologically prohibitive. Existing available methods include:

- Surgical sterilisation – Tubal ligation or ovariectomy in females, or vasectomy or castration in males. Achieves permanent control in ‘closed’ populations. Requires a field surgery to be established; requires capture and possible injury to animal or handlers; high animal stress;

requires intensive monitoring post-surgery and risk of mortality from surgery (up to 10% with high levels of associated stress and pain; Tribe et al 2014); and ongoing management.

- Contraceptive implants – Hormone implants that temporarily (duration of affect varies) render females sterile. Does not ensure lifetime sterility (therefore requires repeat treatments to achieve permanent control), requires capture and associated risk of injury to animal or handlers; logistically difficult in a large area; will not lead to an immediate reduction; will require ongoing management; may lead to undesired population declines in areas where contracepted animals travel outside of Bush Heritage Reserves.

Methods under development and still in trial stage (not published or commercially available):

- Immuno-contraception - Vaccination which initiates an auto-immune response in females, rendering them sterile. Requires capture and possible injury to animal or handlers. Duration of effectiveness unknown, but at least 7 years if females are treated as juveniles.
- Chemical castration - Injection of toxin implants that cause castration of males or injection of zinc compounds causing atrophy of the testes. Permanent fertility control and apparently highly effective and economical. Requires capture and sedation, which will be logistically difficult and can be unsafe for handler and animal.
- Chemo-sterilants - Injection of chemicals that completely eliminates the primordial and primary follicles. Permanent fertility control and apparently highly effective and economical. Requires capture, which will be logistically difficult and can be unsafe for handler and animal.

Risks: No immediate decrease in population size (reduces population growth rate after 2 years, not immediate population size) and hence grazing pressure; compensatory survival of treated animals and offspring of untreated animals may further delay population decrease; ineffective for management of large free-ranging populations in open landscapes leading to unacceptable ecological outcomes. This method involves capture which can be a risk for animal welfare and human injury.

Innovative Approaches:

Deterrents such as biologically significant sounds (e.g. mimic foot-thumping behaviour) can be a useful method for preventing temporary influx macropod control but this has only been demonstrated on small scale (several hundred metres) and in the short-term. At best the macropods move away to become a problem elsewhere. The noise often impacts on other species such as birds.

Ultrasonic deterrents (such as Roo-guard®) are not effective (Bender 2003), with no difference detected in field tests with free-ranging macropods, and no change in behaviour detected in captive animals.

Experimental approaches to developing effective deterrents have been proposed by co-existence experts and we are in collaborative discussions to take this further.

References:

Bender, H. (2003) Deterrence of kangaroos from agricultural areas using ultrasonic frequencies: efficacy of a commercial device. *Wildlife Society Bulletin* 31: 1037-1046.

Nave CD1, Coulson G, Short RV, Poiani A, Shaw G, Renfree MB.(2002) Long-term fertility control in the kangaroo and the wallaby using levonorgestrel implants. Reprod Suppl. 60:71-80.

Portas, T (2019) Management of overabundant populations in Current Therapy in Medicine of Australian Mammals. DOI: 10.1071/9781486307524

Tribe, A.; Hanger, J.; McDonald, I.J.; Loader, J.; Nottidge, B.J.; McKee, J.J.; Phillips, C.J.C. A Reproductive Management Program for an Urban Population of Eastern Grey Kangaroos (Macropus giganteus). *Animals* 2014, *4*, 562-582. https://doi.org/10.3390/ani4030562

3. Given in your submission you refer to kangaroos' contribution to total grazing pressure, how does Bush Heritage measure this and how do you differentiate between other grazing animals such as rabbits and goats?

Evidence of kangaroo specific grazing pressure is derived from fenced exclusion plots, selectively excluding rabbits and other key feral herbivores as well as macropods, macropods alone and control groups. The differential data collected provides evidence of herbivory by each category of herbivore - observed impact on existing vegetation or natural recruitment (natural revegetation of native species), experimentally designed flora and fauna monitoring, and photo-point analysis.

We couple this with consistent population monitoring of competitive non-native herbivores including rabbits, deer species and stray domestic herbivores. This is achieved consistently through camera traps and rabbit warren surveys.

Additional monitoring activities are aligned to objectives outlined in each research management plan, based on the local vegetation communities and the key native species on each reserve.

4. Given you say you only use lethal control of macropods when there is "documented evidence" that the populations are unsustainable and thus threatening conservation values and animal welfare, what does this evidence typically look like and what methodology is used to come to this conclusion?

At Bush Heritage we deeply care about all native species and as such lethal control of macropods is only used when all other management techniques have been implemented, and in order to make sure all species are supported by a functioning ecosystem.

We currently use a variety of methods at different properties to estimate macropod density or activity, including vehicle-based transects, scat counts and sand pads. Walked transects, camera detections, UAV counts, thermal imaging are currently under consideration for estimating macropod abundance (Prof D. Morgan pers. Comm., TAMS, 2010).

Above our specific methods used to determine kangaroo population numbers and the impact on the landscapes we manage, we undertake comparison of contemporary macropod density against regionally and habitat relevant sustainable levels or benchmarks, ie. indicators and methods that assess the impact of macropod grazing on the vegetation and broader conservation values. Wherever possible, we work with government agencies who undertake regional estimates of macropod abundance. For example, on the reserve closest to the ACT we are guided by the research and thresholds developed by the ACT's Department of Territory and Municipal Services (TAMS, 2010). The vegetation types, climate and herbivores on that reserve are in common with those found within the ACT. Regional trends provide meaningful long-term data to assess population trends in association with rainfall and land condition at scale and may provide evidence of sustainable population levels. Regional estimates may also use different sampling methods than those we use at a reserve-scale and may sample a greater variety of habitats including land cleared for agricultural purposes.

As stated above, this is necessary but not sufficient to determine the landscape impact of overgrazing. We determine the impact of each group of herbivores on the landscape and only when evidence from exclusion plots and differential population estimates of competitive grazers (rabbits, domestic herbivores and macropods) indicates that macropod overabundance is a primary cause of resource depletion across the landscape do we undertake management actions.

Reference:

Territory and Municipal Services (TAMS), (2010) Australian Capital Territory Kangaroo Management Plan. Parks, Conservation and Lands, Department of Territory and Municipal Services, Australian Capital Territory.

5. Regarding your evidence-based management practices, what ongoing scientific evaluation is undertaken by Bush Heritage to determine if killing thousands of healthy local kangaroos each year is having the desired conservation effect?

Your assertion that we kill thousands of kangaroos each year is completely incorrect.

We focus on managing our reserves for all native species and this includes managing threats on our reserves, one of which is total grazing pressure. In addition we are continuously working to demonstrate our understanding of the impacts of grazing on the ecosystems where we work. Data from one of our reserves in South Australia was recently included in a publication to assess the impact of kangaroo and rabbit grazing on conservation reserves in western NSW and SA (Mills et al 2021). Further commentary on kangaroo management in South Australia has been included in a special edition of Ecological Management and Restoration, due to be published in 2021 (Finlayson et al 2021). Additional evidence for the impact of kangaroo grazing on ecosystems are being explored in collaboration with the University of New South Wales, and has also been published through previous work (e.g. Howland et al. 2014; 2016).

References:

Finlayson, G., Tschirner, K., McCann, J. and Appleby, M. (2021). Kangaroo management in the South Australian rangelands: impacts and challenges for conservation management. Ecological Management and Restoration. doi: 10.1111/emr.12451

Howland, B.W.A., Stojanovic, D., Gordon, I.J., Radford, J., Manning, A. and Lindenmayer, D.B. (2016) Birds of a feather flock together: Using trait-groups to understand the effect of macropod grazing on birds in grassy habitats. Biological Conservation 194, 89-99.

Howland, B.W.A., Stojanovic, D., Gordon, I.J., Manning, A. Fletcher, D. and Lindenmayer, D.B. (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.

Mills CH, Waudby H, Finlayson G, Parker D, Cameron M, Letnic M (2020) Grazing by over-abundant native herbivores jeopardizes conservation goals in semi-arid reserves. Global Ecology and Conservation 24, e01384. doi:10.1016/j.gecco.2020.e01384

6. When was the last time Bush Heritage conducted research into translocation as a viable nonlethal means of reducing populations?

We haven't conducted this research ourselves but take on board the scientific information that reports high levels of stress, injury, morbidity, mortality with capture and translocation (Tribe et al 2014; Portas 2019).

References:

Portas, T (2019) Management of overabundant populations in Current Therapy in Medicine of Australian Mammals. DOI: 10.1071/9781486307524

Tribe, A.; Hanger, J.; McDonald, I.J.; Loader, J.; Nottidge, B.J.; McKee, J.J.; Phillips, C.J.C. A Reproductive Management Program for an Urban Population of Eastern Grey Kangaroos (Macropus giganteus). *Animals* 2014, *4*, 562-582. https://doi.org/10.3390/ani4030562

7. Have you studied the impact of the shooting of kangaroos in nature reserves on kangaroo family groups and mob culture, or on the psychological welfare of the surviving kangaroos?

We record group sizes during our kangaroo counts but have not directly studied the impact of shooting on family groups. This would require a structured program that included shooting on a regular basis which is not something we would want to occur. As previously stated we deeply care about all native species and only undertake lethal management of macropods when other appropriate management techniques have been utilised but further management is needed.

We are not aware of reputable research into the psychological welfare of free-ranging wildlife and this would be impossible to determine without influencing the behaviour of the target species.

8. Given you have publicly stated that you deliberately exclude kangaroos from water sources, what are your thoughts on the assertion that it's an inherently cruel practice to exclude native animals from water sources?

Bush Heritage deeply care about the welfare of all animals and we are not prepared to sacrifice the welfare of some species to protect others – we do not want to see any animals suffer. Native species in the arid zone are highly adapted for survival in these areas of Australia, without the need for regular water from water sources such as those that are provided to domestic stock. Species such as kangaroos obtain their water from their diet through a specialised digestive system when vegetation is available. This is at greatest risk when grazing exceeds the available vegetation and areas are stripped of food (and water) and shelter for all animals. Most, if not all of our reserves occur in close proximity to neighbouring properties that maintain stock watering points, so if the need for water was extreme, the macropods would simply move to these water points.

9. Because you state that your animal welfare policies and procedures have been developed with experts in the field, universities and the RSPCA, which expert body advised you to exclude kangaroos from water sources?

Bush Heritage has an established governance structure which includes the Science and Conservation Committee of the Board. This Committee includes eminent experts in the areas of conservation science and land management, which reviews the organisational policies and procedures that are informed by management through broad consultation with experts in the fields of conservation and animal welfare.

Collectively, our advisory groups and scientific literature supports the restoration of natural water flow across the landscape for the effective conservation of the ecosystems and all native species therein. Access to artificial water points facilitates unsustainable reproduction rates, disturbs natural distribution of many species and places the ability of the landscape to support all species at risk. This is one of the best practice integrated management practices we employ to protect the health of the landscapes we manage (e.g. James et al. 1999).

Reference:

James, C.D., Landsberg, J. and Morton, S.R. (1999) Provision of watering points in the Australian arid zone: a review of effects on biota. Journal of Arid Environments 41, 87-121.

10. Do you use commercial or non-commercial shooters to shoot kangaroos on your reserves?

All contractors who operate on Bush Heritage properties are experts, act in full compliance with the National Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Non-Commercial Purposes (2008) and must comply with permit conditions relevant to each legislative region.

Non-commercial (amateur) contractors have not been employed to undertake this work.

11. How does Bush Heritage monitor the shooting, for example how often are carcasses inspected for head shots and how often are inspections undertaken to check on the welfare of at foot joeys?

Contractors must be certified under the relevant State Legislation to ensure their competency. In some State jurisdictions compliance checks are conducted by the relevant State Agency (e.g. South Australia), so locations of all individuals destroyed as part of that permit are provided and are checked by compliance officers. In NSW our Reserve managers inspect the areas following a control effort and check if there are any welfare issues.

12. What do you do with the bodies of the kangaroos that are killed on your reserves?

Any activity must comply with the conditions outlined in a permit administered by the relevant state agency. In most cases destruction permits are issued with a condition that animals are left in the place they are destroyed. Bush Heritage does not gain any financial return on the carcasses.

13. Would it be fair to say that Bush Heritage is only concerned with species that are threatened and are not interested in species that they view as 'common'?

No. Our approach to conservation is a whole of ecosystem approach, in which common species are an integral part. We are concerned with all species, the balance of interactions, processes and ecosystem function across the vast landscapes we manage.

14. How many kangaroos have you killed in the last year and where can the public find details of this?

We deeply care about all native species and thus we only undertake lethal management of kangaroos when other management techniques have not delivered the outcomes required to have functioning ecosystems in support of all species. Thus we do not cull every year. We apply for permits only when the strict conditions included here have been met. The permits dictate the maximum number allowed to be culled and we often do not reach this number. In 2020 we were granted permits for 250 animals which we did not reach, culling 227 kangaroos in 2020 in NSW.

This information would be available from the statutory authorities issuing the permits. In NSW this is DPI.

15. Given you say you acknowledge macropods can be culturally significant to First Nations peoples and that you engage with them on cultural considerations of kangaroo management, can you describe what process this engagement typically follows and how exactly you come to agreements with First Nations peoples about killing kangaroos?

Our standard practise across all of our reserves is to engage the Traditional Owners of the relevant lands in planning, identification of key conservation and cultural targets, threat assessment, management actions, monitoring and reporting measures. We have not had any negative feedback on our macropod management approaches from the Traditional Owners of the lands we manage. Where possible, we engage First Australian contractors to undertake the required population management.

All References cited in response to questions:

Bender, H. (2003) Deterrence of kangaroos from agricultural areas using ultrasonic frequencies: efficacy of a commercial device. *Wildlife Society Bulletin* 31: 1037-1046.

Finlayson, G., Tschirner, K., McCann, J. and Appleby, M. (2021). Kangaroo management in the South Australian rangelands: impacts and challenges for conservation management. Ecological Management and Restoration. doi: 10.1111/emr.12451

Howland, B.W.A., Stojanovic, D., Gordon, I.J., Radford, J., Manning, A. and Lindenmayer, D.B. (2016) Birds of a feather flock together: Using trait-groups to understand the effect of macropod grazing on birds in grassy habitats. Biological Conservation 194, 89-99.

Howland, B.W.A., Stojanovic, D., Gordon, I.J., Manning, A. Fletcher, D. and Lindenmayer, D.B. (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.

James, C.D., Landsberg, J. and Morton, S.R. (1999) Provision of watering points in the Australian arid zone: a review of effects on biota. Journal of Arid Environments 41, 87-121.

Mills CH, Waudby H, Finlayson G, Parker D, Cameron M, Letnic M (2020) Grazing by over-abundant native herbivores jeopardizes conservation goals in semi-arid reserves. Global Ecology and Conservation 24, e01384. doi:10.1016/j.gecco.2020.e01384

Natural Resource Management Ministerial Council (2008): https://www.environment.gov.au/system/files/resources/8ae26c87-fb7c-4ddc-b5df-02039cf1483e/files/code-conduct-commercial.pdf

Nave CD1, Coulson G, Short RV, Poiani A, Shaw G, Renfree MB.(2002) Long-term fertility control in the kangaroo and the wallaby using levonorgestrel implants. Reprod Suppl. 60:71-80.

NRMMC (2008) National Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Non-Commercial Purposes. Natural Resource Management Ministerial Council.

Portas, T (2019) Management of overabundant populations in Current Therapy in Medicine of Australian Mammals. DOI: 10.1071/9781486307524

Shaw, G. (2006) Reproduction. Pp. 83-107 in Marsupials (Eds. P. Armati, C. Dickman and I. Hume). Cambridge University Press, Cambridge.

Territory and Municipal Services (TAMS), (2010) Australian Capital Territory Kangaroo Management Plan. Parks, Conservation and Lands, Department of Territory and Municipal Services, Australian Capital Territory.

Tribe, A.; Hanger, J.; McDonald, I.J.; Loader, J.; Nottidge, B.J.; McKee, J.J.; Phillips, C.J.C. A Reproductive Management Program for an Urban Population of Eastern Grey Kangaroos (Macropus giganteus). *Animals* 2014, *4*, 562-582. https://doi.org/10.3390/ani4030562