Indigenous land use and conservation in the Anangu lands of central Australia

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Introduction

The relationship between Indigenous Australians, land and wildlife is a special one, intimately connected to maintenance of culture, religion, lore, health and well-being. Indigenous Australians have been hunter-gatherers for at least 40–60 000 years, using a great variety of wild species of plants and animals for a diverse range of purposes (Mulvaney and Kamminga 1999). Today, however, traditional modes of management have broken down, many native wildlife species have declined or are locally or nationally extinct, and opportunities for sustainable use of wildlife are curtailed by regulation or impeded by complex and overlapping jurisdictions. New approaches are needed that support Indigenous re-engagement with wildlife management, integrate Western science with Indigenous knowledge to assist in management, allow for sustainable use, and encourage regional coordination in wildlife management.

This chapter examines aspects of, and obstacles to, Indigenous wildlife management in Australia, focused on management by the Anangu people in central Australia. It first sets the scene by outlining the historical context of Indigenous wildlife management, introducing the Anangu and highlighting relevant aspects of the policy environment for wildlife management. It then delineates and explores the concept of Regional Adaptive Wildlife Management Plans, an approach that could encourage regional cooperation and facilitate the blending of traditional practice with western science to ensure sustainable use of wildlife and the economic benefits it can bring. It goes on to explore application of this approach in detail using as an example Angas Downs, a pastoral property south west of Alice Springs owned by the Anangu people. Finally, issues for the future of regional Indigenous wildlife management are discussed.

Historical context of Indigenous wildlife management

Indigenous use of wildlife traditionally existed within a framework of customary law, in which peoples’ moral responsibility to look after their country returned food, water and other necessities (Rose 1984). Indigenous traditional law (or ‘lore’) such as the Tjukurpa in Pitjantjatjara, a central Australian language, is based on totemism, taboos and prescribed responsibilities for the land (Collins et al. 1996). Importantly, Indigenous law applied constraints on access. Semi-nomadic units moved freely over their own land but did not trespass on sacred sites or other lands without due reason or permission.

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They sought to secure supplies of particular food resources and influenced arid ecosystems prior to British settlement particularly by hunting, burning, manipulation of waters, and dispersal of plant propagules. (Morton et al. 2011) Restricted access affected what, where and when hunting and gathering occurred and by whom. For instance, hunting of the red kangaroo (*Macropus rufus*) in central Australia was forbidden near totemic sites for the species (Newsome 1980). These restrictions resembled English game laws and protected species which might otherwise have been overhunted (Grey (1841) cited by Blainey (1982)). Bill Gammage (Gammage 2011) has reviewed descriptions of the landscape before and after settlement and compiled how Aboriginal people managed the land in a systematic and complex manner, including limiting access to sites with special attributes.

With British colonisation and settlement of the Australian rangelands beginning in the 1800s, landuse and management significantly changed with major consequences for wildlife. The sacredness of places was disregarded, waterholes were drained by livestock, and grazing animals exploited native plants for distant markets. Vegetation was used as a food for exotic grazing animals – first sheep, then cattle, also horses and camels – some of which roamed wild. The process continued after the creation of the Australian Commonwealth in 1901. Many species of native animals disappeared from much of the Australian rangelands. For instance, changes in pastures brought extinction or rarity to smaller members of the kangaroo family (*Bettongia lesueur*, *Lagorchestes conspicillatus*, *Onychogalea lunata*) through removal of long grass used for shelter (Newsome 1980), and the impact of rabbits and exotic predators in the form of foxes and cats. By contrast, the supply of water troughs and bores in the pastoral country, control of dingoes, and the establishment of short grass communities from livestock grazing benefited the larger red and grey kangaroo populations (*Macropus* spp).

Changes in wildlife distribution and abundance are evident on Aboriginal lands as elsewhere. However, on Aboriginal lands in central Australia, even the larger game species are less common than they are thought to have been previously, and hunting may well have contributed to the lower numbers (Wilson et al. 2010). The availability of new technologies and altered economic and social circumstances are contributing to changes in Indigenous wildlife use throughout the world. Guns, motor vehicles, motor boats, chainsaws, shovels and metal digging sticks have made hunting and gathering more efficient and have increased geographic range, mobility and opportunity. In central Australia today, Indigenous people continue to regularly use the wild animal and plants that remain, although their traditional management regimes have broken down and landuse and management has substantially changed.

**Anangu of central Australia**

The Anangu of central Australia are the Ngaanyatjarra Pitjantjatjara Yankunytjatjara speaking people southwest of Alice Springs. They are

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2 Pitjantjatjara words spelt with the aid of an underlining are known as retroflex words and are pronounced by curling the tongue back slightly in the mouth (Goddard 1996).
members of a social system referred to as the Western Desert cultural block. They speak a range of dialects — including Ngannyatjarra, Ngaatjatjarra, Manjintjatjarra, Pitjantjatjara and Pintupi. Their population is estimated at between 5 and 6 thousand people and they can be found from Halls Creek and Balgo in the north of Western Australia (WA) through Imanpa and Angas Downs in Northern Territory (NT) to Oodnadatta and Yalata in South Australia (SA).

The communities in this cross-border region share these language and cultural ties irrespective of the State/Territory borders that are a legacy of the colonies that preceded the Australian states. They have different time zones and are subject to all manner of differing State/Territory legislation, notwithstanding that the Australian Government has the constitutional power to make laws in respect of Aboriginal people. The Australian Government also has a direct involvement in the region through its responsibility for the management of the Indigenous-owned Uluru-Kata Tjuta National Park (also known as Ayers Rock).

The benefits of Indigenous land management and sustainable wildlife use

Land management has a high priority in Indigenous eyes. Senior Indigenous spokespeople regard caring for country as integral to their cultural and social well-being (Davies et al. 1999). The many social benefits resulting from involving Indigenous Australians in natural resource management are well documented, including improved school engagement and educational outcomes, motivation and job-readiness (Hunt et al. 2009). ‘Being-on-country’ for reasons that are a priority to Indigenous people could play a greater role in reversing some of the causes of community dysfunction – contact with the criminal justice system, domestic violence, low educational achievement, high unemployment, poor health and substance abuse. Active involvement in wildlife management can reconnect people to the land and sea, and communities and individuals to the values of Indigenous law and customs. Being involved in land and wildlife management engenders a sense of pride, ownership and responsibility among Indigenous people. Wildlife management also provides a framework for maintenance and passage of Indigenous culture and ecological knowledge to younger generations. It can provide economic development opportunities and create jobs in a sector that is important to Indigenous people, and underpins tourism and bushfood enterprises, thus tackling the poor Indigenous employment statistics. Stories about the land, sea and wildlife also underpin many of the paintings in the highly successful Indigenous art industry.

There are flow-on health benefits from Indigenous involvement in wildlife management. It improves health and well-being through increased physical activity and increased reliance on bushfoods, which increase the number of food species available to supplement the diet and replace processed foods. Research confirms the benefits of this relationship. Burgess et al (2009) report that participation by Indigenous people in land management brings significant health benefits, including a reduction in obesity, blood pressure, diabetes, and kidney and cardiovascular disease.
Research to explore the options for greater involvement of Indigenous people in regional natural resource decision-making and management is needed. If science and Indigenous wildlife management work together, Indigenous capability to manage land and wildlife resources will be improved. This could lead to Indigenous groups holding more decision-making powers over wildlife management.

Addressing Indigenous disadvantage

In 2009 the Australian Government produced a report entitled “Closing the Gap on Indigenous Disadvantage” (Australian Government 2009). It noted the need for a strong focus to address the marked disadvantage of remote Indigenous communities in levels of health, education, life expectancy and living conditions compared to non-Indigenous Australians. $6.3 billion was committed to ‘Closing the Gap’ programs through the Council of Australian Governments (COAG) from 2008–2014. Expenditure under the Government’s commitment to ‘Closing the Gap’ is focused on improving literacy, numeracy, infant mortality, health outcomes and overall life expectancy (Macklin 2008). No mention of land or resource management to reflect the priority that it has in Indigenous eyes. The Australian Government program that addresses these topics the Indigenous Protected Area (IPA) Program is relatively small.

An Indigenous Protected Area is an area of Indigenous-owned land or sea where traditional owners have entered into an agreement with the Australian Government to promote biodiversity and cultural resource conservation. Indigenous Protected Areas protect Australia’s biodiversity while providing training and employment for Aboriginal people on their own country. The Program to support IPAs is part of the Caring for our Country (CfoC) program (administered by Department of Sustainability, Environment, Water, Population and Communities (SEWPAC)). The CfoC program also funds the employment of Indigenous Working on Country Rangers through the Working on Country Program (SWEPAC 2008). Indigenous Rangers are employed to undertake land and cultural management activities on their country in order to protect and conserve. IPAs currently cover more than 23 million hectares. They are part of Australia’s network of protected areas, the National Reserve System, covering more than 89 million hectares (SEWPAC 2011).

Australia’s protected areas are all managed at least in part according to one of six international classes developed by the World Conservation Union (IUCN 2011). These range from strict nature conservation areas, through national parks incorporating recreation and tourism, to multi-use reserves allowing limited consumption of resources for personal and commercial use. Many Indigenous Protected Areas are managed as Category VI (Protected Area with sustainable use of natural resources). This category is defined as an:

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\text{Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs} \quad (\text{IUCN 1994}).
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A review of the IPA Program (Gilligan 2006) found that it contributes significantly to conservation goals in a cost effective manner and has considerable potential to support broader government objectives to deliver
social, health and economic benefits in a manner particularly constructive for Indigenous communities. Nonetheless, it is our view that the IPA program could have a stronger emphasis on sustainable use, particularly the management and productive use of land to supply indigenous communities with food and resources.

The Closing the Gap report (Australian Government 2009) noted that crucial to success is ensuring that local people are actively involved in the design, delivery, and control of these services. Likewise, strong local involvement is critical for effective implementation of the land management components of ‘Closing the Gap’ that are part of the IPA Program (SEWPAC 2010).

Regional coordination of wildlife management

Coordinated land and wildlife management and service delivery across regional landscapes could consolidate the benefits outlined above. It is needed to address common threats such as feral animals and wildfire and in obtaining benefits from opportunities such as the emerging carbon market. In central Australia regions of common interest cross state borders. The Ngaanyatjarra Pitjantjatjara Yankunytjatjara (NPY) Anangu lands in Error! Reference source not found. cover 350 000km² lie in three states.

Fig 1: Location of Anangu Lands

Changing the administrative and legal responsibilities that underpin these externally imposed jurisdictions and borders would be a very time-consuming and costly legal exercise. It would nevertheless make considerable sense for Anangu Lands and these communities of interest to be more strongly coordinated and active than they currently are. The Ngaanyatjarra Pitjantjatjara Yankunytjatjara Women’s Council (NPYWC) which began in 1980 is an example of a cross-border organisation that is effective in
advancing its goals of ‘relieving the poverty, sickness, destitution, distress, suffering, misfortune or helplessness’ of Anangu. It grew out of a perception by Anangu women that they needed to collaborate at the regional scale. We believe the same is true for natural resource management and sustainable use of wildlife. One way to achieve better regional coordination is through development of a Regional Wildlife Adaptive Management Plans (RWAMP) (Wilson and Woodrow 2009). The principles of a RWAMP plan are outlined below, before exploration of the practical application of such a plan at Angas Downs IPA.

However, such an approach is currently being inhibited by the different land tenure and service delivery arrangements that operate in different jurisdictions. In the case of the Anangu lands, this involves three state jurisdictions and the Australian Government. Regional management of a single species, high profile pest such as camel is proving slow, complex and costly to effect. A National Feral Camel Action Plan was published in 2009 and $19million of Australian Government funding committed to implement control under the Australian Feral Camel Management Project (see www.feralcamels.com.au - Ninti One Ltd 2011), but by 2012 there is still much to be done to reduce camel populations. Even within jurisdictions, Indigenous involvement in wildlife management is impeded by complex and costly processes (Cooney and Edwards 2009).

**Regional Wildlife Adaptive Management Plans**

The objective of a RWAMP (as set out in Wilson & Woodrow 2009) is to outline options for Indigenous management and sustainable use of wildlife resources in a culturally appropriate manner, so that species provide for the needs and aspirations of the Indigenous community. The RWAMP describes the resource base and its cultural and biodiversity values in order to define management targets and enable monitoring.

Effective sustainable management of *kuka* (game meat) and *mirka* (plant food) should be based on monitoring and the collation of data regarding species presence, distribution, habitat associations, ecological requirements and status. Indigenous knowledge and experience are integral to this process. Western technology and science can inform and supplement information gathering and enable analytical and decision-making processes.

Resource management strategies and actions identify techniques for proactive management of preferred native wildlife species, and consider how their populations may be increased in a manner consistent with biodiversity conservation priorities. Strategies included in RWAMPs can include establishing land use and protected area management zones, managing feral animals and weeds, restoring and maintaining water supplies and other infrastructure, fire management, and large scale species reintroduction projects. Some of the relevant strategies are explained in more detail below.

**Cultural mapping**

Cultural mapping is a key component of RWAMPs and central to the Indigenous desire to ensure their culture is not lost. It also ensures the continued use, support and reinvigoration of traditional ecological knowledge.
(TEK), which is combined in RWAMPs with scientific knowledge to underpin biodiversity conservation and sustainable use. Collecting family group genealogy is also important as it identifies people who speak for important locations and who can take responsibility for places and maintain customary land management practices.

**Land use zones**

A RWAMP identifies maps and describes land use/management zones. Defining land use zones is crucial to enable sensitive management for sustainable use, and requires extensive consultation with and agreement by the Community. Definition of these zones is based on cultural mapping and local and scientific knowledge of the landscape.

Language names help identify the broad land use/management zones. Examples in Pitjantjatjara are shown below.

1. **Miil-miil: sacred/cultural zones**

   Miil-miil are sacred and cultural sites to which access is limited. These sites can also have major conservation significance, both intrinsically and because they have lower hunting pressure and other disturbances. There are issues of cultural confidentiality that need to be addressed in documenting special sites. Some aspects and indeed the location of sacred sites is restricted information. The dilemma is how to document them, and manage them without destroying their cultural significance.

2. **Atuny Ngura: protected places**

   Places which have particular biodiversity significance are designated as Atuny Ngura – ‘protected places’ or species management areas. They are hotspots for biological conservation of threatened species. They can be sites for multi-species conservation. For example, in the APY Lands, remnant populations of Waru (*Petrogale lateralis* black-footed rock-wallabies), Nganamara (*Leipoa ocellata* mallee fowl) and Tjakura (*Egernia kintorei* great desert skink), are subject to strategic predator control plans, particularly for feral foxes.

3. **Kuka atamananyi: resource use zones**

   RWAMP nominate resource use/harvest zones, for which sustainable use management plans are developed for hunting and gathering bush foods such as Malu (*Petrogale lateralis* black-footed rock-wallabies), Kalaya (*Dromaius novaehollandiae* emu), Kipara (*Ardeotis australis* bustard), wattle (*Acacia* spp.) seed, Mangata (*Santulum acuminatum* quandong), and Kampurarpa (*Solanum* sp. bush tomatoes). Within these areas, controls and regulations upon access and vehicle movements are developed in consultation with communities and help from wildlife scientists, together with recommended harvesting regimes, rates of take and other management prescriptions.

   Consultation with Anangu aims to identify known hot spots and preferred habitat for Malu, Kalaya and Kipara. In these areas, traditional owners encourage conservation management.
Kuka atamananyi are consistent with the IUCN category VI guidelines for Managed Resource Protected Areas, and are complemented by the nominated refuge areas, Atuny Ngura, where hunting does not occur.

4: Visitor management zones

Visitor management zones provide access and recreational activities for visitors as well as opportunities for visitors to contribute to the regional economy. The visitor management areas also consider safety of travellers in remote and extreme environments and the protection of cultural sites. A system of permits and the provision of maps are key aspects of visitor management.

As for Kuka atamananyi, Visitor Management Zones are consistent with the IUCN category VI guidelines for Managed Resource Protected Area, ensuring the environment is protected for the benefit of all people.

Visitor Management Zones are particularly important as there is unmet demand for quality Indigenous experiences and nature based experiences in Australia (Tourism Australia 2008), providing tourism as a key means to support ongoing development in these remote communities.

Increasing preferred species

RWAMP strategies may include methods to increase populations of preferred species as a resource to be used. The key strategies include controlling predation (both human and by dingoes and foxes), and provision of water, shelter, and quality food. Some species, such as Kalaya (emu), benefit from cleaning out of soaks and rock holes and access to bores, providing damage from camels is minimal. There may be added benefit from fox baiting in such areas, but this would need to be based on minimising threats to non-target species, including from a possible increase in cat and rabbit activity. Increases in Malu (red kangaroo) could be served by considering possible "refuge" zones from subsistence harvest.

It could be worth establishing predator exclusion fenced areas for protecting wildlife, such as the wildlife sanctuaries that exist at Watarrka National Park and Uluru-Kata Tjuta National Park. It could also be worth establishing a predator free breeding facility to promote survival and subsequent release, as is being done on Angas Downs IPA (see below). Such facilities require dedicated resources for ongoing diligent monitoring and maintenance. Such initiatives would benefit from striving for some short-term successes with commoner species such as emus, before going on to more threatened species such as kipara and mala, so that participants can get a more immediate sense of satisfaction to balance the longer term habitat management initiatives.

Developing wildlife enterprises

The RWAMP outlines options for sustainable use of wildlife resources in a culturally appropriate manner so that species provide for the needs and aspirations of the Indigenous community. Opportunities can be developed to sell wildlife-based products and services such as food, tourism, art and
carbon offsets/alternative energy to the wider community and the market economy.

Training

A major theme of RWAMPs are to emphasise Indigenous priorities in regard to maintenance of the *Tjukurpa*, land and wildlife resources. In practical terms this means land and wildlife management should have a higher profile in training and education and the lands themselves should be regarded as major training resources. There are opportunities for stronger collaboration between teaching institutions, government agencies and the private sector, including tour operators, the pastoral and mining industry to deliver training. Training and support for the land related enterprise opportunities identified above will help lay the basis for maintaining Indigenous culture, creating employment opportunities, and improving health and welfare.

Angas Downs IPA – a case study in application of RWAMP principles

Angas Downs IPA can be considered a case study of sustainable use of wild resources to assist address Indigenous need. Its current management plan (Wilson et al 2005) reflects RWAMP principles, and there is scope for further integration of these principles in future iterations. Angas Downs is a 320 500ha (>3 200sq km) pastoral lease located 300km south-west of Alice Springs, Northern Territory (NT), and 135km from Uluru National Park (Ayers Rock). It is a biologically and culturally rich area in the Finke Bioregion of the NT.

The Angas Downs lease was first taken up by William Liddle in 1927. He and his Aboriginal descendants ran sheep then cattle until the 1990s. As with many pastoral enterprises during the 1980s and 1990s, Angas Downs struggled financially and was eventually taken over by a mortgagee. In 1994 the lease for Angas Downs was purchased by the Imanpa Development Association Inc. of the nearby Imanpa (Indigenous) Community. It is managed by their company Lisanote Pty Ltd. In 2009, Angas Downs was declared an IPA after a Management Plan was developed in 2005 in consultation with the local community, with funding provided by the Australian Government IPA Program (under the Caring for our Country Program) (SEWPAC 2010). The plan sought to adhere to the principles of IUCN Category VI Protected Areas, and remains a planning resource for members of the Imanpa Community.

Angas Downs is important to Anangu because it has significant *Tjukurpa* (Indigenous law and customary knowledge) places and sacred sites where ceremonies continue to occur. The acquisition and management of the land is a community-based initiative that seeks to balance conserving and restoring natural systems with deriving benefits from commercial use.

In the past the property was damaged by poor land management practices, cattle and feral animals. Today it provides employment and income for the community, creates learning and training opportunities, and improves Indigenous health (through exercise and diet). It reconnects Anangu to the land and culture, instilling a sense of pride.
Angas Downs IPA Plan of Management

The Angas Downs IPA Plan of Management (PoM) (Wilson et al. 2005) outlines the natural and cultural resource base, land management operations, sustainable development opportunities, training and education and collaborative partnerships for management of the property. The goals of the plan are ambitious and comprehensive.

The objective of the PoM is to manage land and wildlife resources in order to maintain Anangu culture, conserve biodiversity and enable sustainable production in support of human communities and economic development. To achieve this, it has two strategies: first, blending the Tjukurpa (Anangu law and customary knowledge) with Piranypa (white people’s) non-Anangu scientific knowledge to improve wildlife habitat, enhance landscapes, and increase the numbers of wildlife preferred as bush tucker; and second, improving health and well being of communities and maintaining culture through tourism and other enterprise development centred on land management.

The PoM details priorities for environmental restoration and activities to restore and protect biodiversity, including bush foods. Activities include:

- water management: restoring and maintaining water points, erecting fences around key water and cultural sites to keep out large feral animals (Fig 2)
- reducing the density of feral animal populations: including camels, horses and cattle
- reducing the impact and spread of weeds
- restoring patch burning and reducing fire hazard
- re-establishing and protecting threatened or significant species: including:
  a. building a 266 km² feral herbivore free wildlife enclosure
  b. establishing a native animal breeding compound, initially for emu
  c. establishing a native plant nursery, initially for quandong
- managing a small sustainable cattle production operation restricted to a 250km² zone.

A key feature of the PoM and the associated funding provided by the IPA program is the provision of ongoing scientific support to monitor landscape and ecosystem health and wildlife populations. The plan enables scientists to work with Indigenous communities to help them manage their land and wildlife through sustainable use, and sound monitoring and surveying underpin all of this work.
Monitoring and surveys

Mapping of cultural sites and knowledge

There is ongoing mapping of cultural sites on Angas Downs IPA, using a combination of Ranger CyberTracker surveys (see below) and photographic/voice/video records (Fig 3). Elders from the Imanpa community record stories about the land and special places. Files are being entered into the Ara Irititja Anangu cultural database, a purpose-built computer archive that digitally stores repatriated materials and other contemporary items. Significantly, in June 2010, Indigenous rock paintings and engravings were rediscovered at Puna Kura Kura waterhole and elsewhere in the Liddle Hills in August 2011.

Fig 2: Wilpia Soak before and after fencing and rehabilitation. Photo: G. Wilson.
Fig 3: Anangu rangers locating and documenting rock art on Angas Downs

**CyberTracker**

CyberTracker is a software program built for field monitoring and data capture using hand-held PDAs (Personal Digital Assistants), which have Global Positioning System (GPS) capability. The program uses lists of icons and photos, making it easier to use by non-literate people. It is used widely across Indigenous Ranger groups in Australia and allows Indigenous knowledge to be effectively captured and combined with science to monitor environmental factors.

CyberTracker information is collected by Angas Downs Rangers using a tailored system involving collection of information on feral management, fauna, rare plants, weeds, fire, hunting etc over specific survey routes. The data are collated and mapped every few months.

CyberTracker surveys are providing evidence of species presence/absence in different areas and habitats of Angas Downs. More complex density and population measurements are made with aerial surveys.
Aerial surveys

Aerial surveys are a cost effective way of assessing populations over large areas quickly. Much of Angas Downs does not have road access, and aerial surveys can monitor trends both of feral animals, in the context of operations to reduce physical environmental damage, and of preferred animal species such as kangaroos, in the context of strategies to increase their numbers.

Fixed wing aerial surveys are conducted over Angas Downs and surrounding landscape annually. Ten transects are placed 7.5 km apart running east-west across the width of the property. The lines are flown using a fixed-wing Cessna 182 aircraft flown at a ground speed of 185 km h\(^{-1}\) (100 kts), and a height of 76 m (250 ft) above ground level.

Observers count kangaroos, camels, horses and cattle. Sampling intensity is approximately 5% of the total 4000km\(^2\) survey area. A correction for habitat is applied to the kangaroo data (Caughley et al. 1976).

Aerial surveys enhance the Anangu Rangers’ knowledge of the density and distribution of surveyed animals. This helps them manage landscapes where these animals exist to either encourage populations or control them.

Based on 2010 surveys, kangaroo populations were estimated at 2900 ±1000 for the property. This is assumed to be a good population base from which it is hoped numbers will increase, aided by restrictions on hunting, reduced grazing competition from feral animals, and provision of reliable water supplies.

Camel populations were estimated at 600 ± 350. Camel numbers were higher than expected on Angas Downs, despite likely population dispersion due to high rainfall during 2010. Camel population management is a priority for Angas Downs’ management.

Track based monitoring

Tracking plots on sandy substrate areas are set up on Angas Downs, each approximately 2ha (100m x 200m), using the methodology described by Southgate and Moseby (2008). Rangers find and record all evidence of animal tracks, scats and other traces within the plot area. Age of the sign and abundance are also recorded. This method enables rangers to identify where animals and ferals are occurring without intensive intrusive animal trapping.

Lizard and small mammal trapping

Pitfall and funnel trapping is used to survey for small mammals and reptiles on Angas Downs. ‘Drift fence’ barriers direct foraging animals towards traps (funnel traps or 20L buckets dug into the soil). Surveys during 2010-11 identified 39 reptile species, six small mammal species and four amphibian species, many of which had not previously been listed on Angas Downs’ species lists.

Photo points

Photo points are established around the property as reference points enabling comparison landscape health through time. At each photo point, Angas Downs Rangers erected two steel posts five metres apart. The two posts are
for aligning the photos. Rangers take photos at each photo point every two to three months and collate the images in a photographic journal.

**Landscape Function Analysis**

Landscape Functional Analysis (LFA) is a field based method of assessing soil and site conditions and vegetation cover (Tongway and Hindley 2004). LFA assesses how the landscape regulates resources (water and nutrients) — whether they are being lost or recycled within the landscape, and hence how healthy or unhealthy a landscape is, and how it is functioning. On Angas Downs, there are 28 LFA transects at selected photo points and other areas of interest. Each patch/interpatch type is assessed for eleven easily identified soil surface properties. Training is ongoing for the Rangers, but illiteracy is inhibiting the transferring and uptake of this knowledge. Inclusion of the method on a Cybertracker system could increase LFA capacity building.

**Water quality**

In 2010, measurement of total dissolved solids suspended in water across the IPA showed Anangu that some watering points and troughs on Angas Downs exceeded the acceptable health level for stock and animals (using total dissolved solid guidelines set out by ANZECC (Australian and New Zealand Environment Conservation Council) 2000)). Further testing after flushing and cleaning troughs indicated that regular cleaning is sufficient to provide adequate water quality for stock and wildlife. Rangers now regularly clean and maintain water points across the property for wildlife.

**Feral animal and weed control**

There is a clear need for feral animal and weed control in Australia’s remote regions. Herbivores such as feral camels, horses and cattle can pose major threats to biodiversity. Rabbits can also do substantial damage. However, in many communities rabbit management is more complex than straightforward pest control, as rabbits can be a very important food source. Predators can also pose threats and require control programs.

On Angas Downs, mustering of feral cattle and horses for sale is ongoing. Camels are shot on an opportunistic basis, when they are seen, with an annual take of between 70 and 100 camels.

Weed control is limited to spraying of couch grass (*Cynodon dactylon*) in high conservation areas and poisoning of Athol pine (*Tamarix aphylla*) in isolated sites.

**Fire management**

Angas Downs Rangers have completed a course in Indigenous fire management run with neighbouring Rangers at Uluru National Park and Docker River. They are re-instating traditional mosaic burning (Fig 4). Cool burns at the right time of the year reduce fire damage to the dominant overstory and create a mosaic of vegetation ages (Fig 5). Under the PoM, the aim is to reduce the risk of large wildfires and to increase the heterogeneity of habitats and niche ecosystems.
**Fig 4.** Angas Downs Ranger Paul Pumpjack igniting a small patch burn

**Fig 5.** Cool burns trickle around fire sensitive mulga (*Acacia aneura*) and reduce risk of large hot wildfires on Angas Downs.

**Reintroduction of Kuka Iritija**

Angas Downs Rangers have begun the training for reintroduction of wildlife now locally extinct – *Kuka Iritija* (animals from before). Doing so should have benefits for biodiversity conservation, assist development of Ranger skills, reinforce community knowledge and pride in wildlife, and be an asset for ecotourism. It has the potential to strengthen culture and self-esteem which were lost following disappearance of totemic animals for which people are responsible. Cats and foxes continue to threaten native mammals, and might well cause more extinctions in the future (Johnson 2006). On current trends, without remedial action it is likely that critical weight range species (Burbidge and McKenzie 1989) will continue to disappear in remote Australia.
A breeding and release program for emus (Dromaius novaehollandiae) is currently being implemented. Emus are classified as Vulnerable in the Northern Territory, and were once more numerous on Angas Downs. While there are other species that are considerably more threatened, emus were chosen as an initial species for a number of reasons. Emus are a keystone species in the propagation of a number of plants. They play a vital role in dispersing seeds and their decline can be associated with a decline in Quandong trees. The Quandong fruit is an important food source and the wood and seeds are wanted to produce artefacts, art and jewellery for sale at the local Mt Ebenezer Roadhouse Art Gallery (which is also owned by the Imanpa community and Lisanote Pty Ltd). Rearing emus is providing training opportunities for rangers in working intensively with animals. Emus are relatively easy to rear, and the program is likely to be successful and provide motivation for more difficult efforts. Having wild emus visible in the wildlife enclosure will be a significant attraction for proposed tourism ventures on Angas Downs; thus helping to ensure long term economic development for the community. Emus are also an important healthier food alternative to processed foods.

The goal is for emu eggs to be hatched, with birds reared to juvenile age and then released, initially into a feral-free wildlife enclosure, and eventually onto the property as a whole.

Once emu are re-established, the Rangers will apply their new skills to reintroducing other more difficult to raise species such as bustard or plains Turkey (Ardeotis australis) mala (a small hare wallaby, Lagorchestes hirsutus) (extinct in the wild NT), brush-tail bettong (Bettongia penicillata) (extinct in the wild NT), Greater Bilby (Macrotis lagotis) (vulnerable NT), and brush-tail possum (Trichosurus vulpecula) (endangered NT) (Department of Natural Resources, Environment, the Arts and Sport, NT 2007). Advice, support and benefit from prior experience is available from a range of previous and continuing reintroduction projects including the Mala enclosures at nearby Watarrka National Park and Uluru-Kata Tjuta National Park and the Arid Recovery Project at Roxby Downs, South Australia.

Sustainable hunting

Under current management arrangements, Angas Downs activity is governed by the 2005 Plan of Management, the Rangers and their manager, and there is very little hunting of native species. In 1962, between 208 and 260 red kangaroos were harvested on Angas Downs per year for community consumption (Rose 1965). Firearms were more readily available in the 1960’s than today. Today, however, the resident kangaroo population does not support a harvest at these rates (pers. comm. P. Coombs (Anangu Elder), Imanpa Community 2010). The enthusiasm and demand for kangaroo in the local community remains strong and frozen kangaroo tails are favoured items in the store. The tails come from pastoral lands elsewhere in Australia where kangaroo populations are higher.

Training

The Rangers are receiving training in Conservation and Land Management from Charles Darwin University and in 2011 attained a Vocational Education
and Training (VET) Certificate II. Progress beyond that level will depend on higher standards of literacy and numeracy.

Enterprise development

Tourism

There is unmet demand for Indigenous tourism (Tourism Australia 2008; Director of National Parks 2010), and Angas Downs’ prime location on the main roads between Uluru-Kata Tjuta, Watarka (Kings Canyon), and Alice Springs provides a strategic advantage for attracting some of the hundreds of thousands of tourists visiting the region and indeed crossing the property each year to stop, experience and learn. The ‘Red Centre Way’ is a promotional campaign that seeks to link these sites. Angas Downs has natural beauty and wildlife viewing opportunities. Tourists seek contact with Indigenous people and their culture, and also look for wilderness experiences as a break from urban lifestyles.

The Indigenous owners of Angas Downs have long hoped to develop an Indigenous tourism business on Angas Downs. The IPA Plan of Management allows for the development of a wildlife sanctuary, a four-wheel-drive route to the north of the property for tag along tours, and short half day cultural tours at important sites.

The desire to grow tourism was reinforced in 2010 at a ‘Stepping Stones’ workshop on Angas Downs with Anangu from Imanpa and Docker River. Other aspirations developed at this workshop included setting up small campgrounds where guides would meet groups to tell stories and share the history of the property.

In the long term, the community hopes to build a tourism complex on the property, taking advantage of the restored environment and ensuring ongoing economic viability of the property. In the interim, they are developing a small Indigenous tour business for tourists to learn about the IPA and the traditional ecological knowledge and culture of the people. Successful tour trials with school, university and mini tour groups have already demonstrated the potential of tourism on the property.

Carbon

The Indigenous owners of Angas Downs have expressed interest in exploring the opportunity of managing their land for production of carbon offsets. Income from participating in either a voluntary system such as the Carbon Farming Initiative in Australia or the introduction of a compliance based Carbon Trading Scheme could help to improve funding for land and conservation management on Angas Downs and provide more local jobs.

Offsets could be obtained by altering current land management practices: to reduce carbon emissions by reducing the number of livestock (cattle and camels) and managing burning practices to reduce green house gas emitted by wildfires; to sequester carbon into increased native vegetation; and to sequester carbon into better managed soils.

Research is required on the potential of these opportunities and the risks associated with participating in a carbon enterprise. Collaborating with
scientists and universities will be integral in shaping the potential of Angas Downs with respect to carbon trading asset and describing the risk of such an enterprise in the coming years.

Discussion and conclusions

Notwithstanding large investments being made to address health, social and legal issues affecting Indigenous Australians, support for sustainable use of land and wildlife is rarely given the priority by funding programs that reflects the central focus that land and wildlife has for Indigenous communities. In remote areas, employment in land management roles is often one of the few meaningful work prospects available for Indigenous people.

Sustainable land management and wildlife use presents an opportunity for greater employment and a framework for Government Indigenous policy. Through greater support from funding and scientists, these opportunities encourage sustainable use of resources found on Indigenous land by supplying products for both market based enterprises such as tourism and new industries (e.g. carbon economy), and for subsistence through harvesting of animals and plants.

Development of a RWAMP – integrating scientific support with Indigenous ecological knowledge such as which is being successfully implemented on Angas Downs IPA – will ensure Indigenous people continue to hunt wildlife, while increasing the wildlife population base from which they take their resources. It will also help build resilience in Indigenous communities through economic development, culture maintenance and improvements to Indigenous health and living arrangements.

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