

## REVIEW

# The importance of conservancies for enhancing the value of game ranch land for large mammal conservation in southern Africa

P. A. Lindsey<sup>1,2</sup>, S. S. Romañach<sup>2</sup> & H. T. Davies-Mostert<sup>3</sup>

<sup>1</sup> Mammal Research Institute, University of Pretoria, Pretoria, South Africa

<sup>2</sup> African Wildlife Conservation Fund, 10564 NW 57th St Doral FL 33178, USA

<sup>3</sup> Department of Zoology, University of Oxford, Oxford, UK

## Keywords

ecotourism; communities; fences; land reform; predators; private land; trophy hunting.

## Correspondence

Peter A. Lindsey, Mammal Research Institute, University of Pretoria, Pretoria 0002, South Africa.

Email: palindsey@gmail.com

Editor: Steven Le Comber

Received 12 August 2008; revised 26 September 2008; accepted 10 October 2008

doi:10.1111/j.1469-7998.2008.00529.x

## Abstract

Legislative changes during recent decades resulted in a massive shift away from livestock towards game ranching in southern Africa, resulting in significant increases in the abundance and distribution of many wildlife species. However, there are problems associated with game ranching from a conservation perspective, including persecution of predators, overstocking, introductions of exotic species and genetic manipulation of 'hunnable' species. We suggest here that most of these problems could be overcome through promoting the formation of conservancies, where adjacent ranches remove internal fencing to form larger collaborative wildlife areas. Larger areas permit the reintroduction of the full range of indigenous mammals, tending to result in a land-use shift from high-offtake, low-value consumptive utilization towards higher value forms of hunting and ecotourism. Under these land-use conditions, ranchers tend to be more tolerant of predators and often actively reintroduce them. Freedom of movement for wildlife populations increases resilience to environmental shocks. The collaborative management agreements typical of conservancies tend to align more closely with conservation objectives than on single ranches. Fortuitously, there are financial advantages associated with conservancies: land-use options in conservancies are more profitable and there are economies of scale associated with cooperative management. Land within conservancies is likely to appreciate in value and attract external investment. In addition, conservancies are more conducive to developing partnerships with indigenous communities and investors and may thus increase the political and social sustainability of game ranching. However, ranchers are fiercely independent and may be resistant to removing fences due to the perception that they may relinquish control over their land and wildlife. Strategies are required to overcome such reluctance and promote the formation of conservancies to enhance the conservation value of game ranch land.

## Introduction

During the 19th and 20th centuries, wildlife populations in southern Africa were decimated by outbreaks of bovine pleuropneumonia (1850) and rinderpest (1896) and by over-hunting by European explorer-hunters and settlers (Bond *et al.*, 2004). Early colonial administrations responded to declining wildlife populations by establishing protectionist legislation that centralized control over wildlife, and limited commercial and subsistence use (Murombedzi, 2003; Bond *et al.*, 2004). These policies were effective at slowing unsustainable hunting, but made wildlife a financial burden for landowners by preventing them from deriving income from hunting to compensate for costs associated with human–

wildlife conflict (Murombedzi, 2003; Bond *et al.*, 2004). Under these conditions, wildlife populations continued to wane due to a mixture of persecution, competition with livestock, benign neglect and bush-meat poaching (Lindsey, Romañach & Davies-Mostert, in press). Population declines were exacerbated in some areas by state-efforts to eradicate wildlife in tsetse fly *Glossina fuscipes* control programmes (Murombedzi, 2003; Bond *et al.*, 2004).

During 1960–1970s, legislative changes occurred in several southern African countries, granting varying degrees of user rights over wildlife to landowners. These changes (occurring in Namibia in 1967, Zimbabwe in 1960 and 1975 and South Africa at varying times depending on the province) enabled landowners to utilize wildlife occurring on

their land for hunting and live capture and trade (Bond *et al.*, 2004). Wildlife was transformed from a burden to an asset for landowners and there was a rapid shift from livestock to game ranching across large areas of southern Africa. For example, there are *c.* 91 000 and 205 000 km<sup>2</sup> of game ranches in Namibia (extrapolated from Krug, 2001) and South Africa [National Agricultural Marketing Council (NAMC), 2006], respectively. There were also ~27 000 km<sup>2</sup> of game ranches in Zimbabwe in early 2000, before the land seizures (Bond *et al.*, 2004). The land-use shift effectively increased the area of land used for wildlife production by 1.86, 4.1 and 1.88, times for Namibia (protected area network – 106 160 km<sup>2</sup>), South Africa (66 190 km<sup>2</sup>) (NAMC, 2006) and Zimbabwe (30 810 km<sup>2</sup>), respectively. Smaller game ranching industries are also developing in Botswana and Zambia (Lindsey *et al.*, 2006).

The shift to game ranching resulted in significant benefits for wildlife conservation. A sizeable market for live wild animals developed as game ranchers purchased animals for reintroduction. In South Africa, for example, 198 541 wild animals were traded during 1991–2004 (Damm, 2005). The effect of these reintroductions was an increase in the abundance and distribution of wildlife on private land. In Zimbabwe, wildlife populations increased by 300% during 1984–2000 (Bond *et al.*, 2004) and in Namibia, wildlife populations on private land increased in number by 70% and in diversity by 44% during 1967–1995 (Barnes & de Jager, 1996). Reintroductions by game ranchers facilitated the recovery of several endangered species such as black wildebeest *Connochaetes gnu*, bontebok *Damaliscus pygargus dorcas*, mountain zebra *Equus zebra* and white rhinoceros *Ceratotherium simum* (Flack, 2003). The shift to game ranching also permitted conservation of large tracts of indigenous vegetation, ongoing protection for watersheds and the commencement of recovery of land degraded by overstocking of livestock (Child, 1988; Bond *et al.*, 2004). Management for large mammals, an ‘umbrella assemblage’, has resulted in the effective conservation of a wide diversity of species from other taxa.

The transition to game ranching was not entirely positive for conservation, however. There has been remarkably little monitoring of the ecological impacts of game ranching or of land-use trends within the industry. Subsequently, there is a dearth of information with which to guide policy and the game ranching industry has developed with inadequate regulation. One result of this has been the translocation of wildlife with little regard to historic distributions or genetic considerations (Hamman, Vrahimis & Blom, 2003). Exotic species such as fallow deer *Dama dama*, barbary sheep *Ammotragus lervia*, red lechwe *Kobus leche* and invasive species such as Eurasian boar *Sus scrofa* have been introduced widely onto game ranches. Furthermore, species endemic to southern Africa are routinely introduced beyond their historic distribution (e.g. black wildebeest in Namibia and blesbok *Damaliscus pygargus phillipsi* in the semi-arid Lowveld areas of South Africa) (Lindsey *et al.*, 2006). Ranchers have manipulated the genetics of some species to create aberrant colour variants, and in some cases cross-

bred species to create new varieties of hunting trophies (Hamman *et al.*, 2003). Ethically questionable hunting practices occur on game ranches, including ‘canned’ hunting (where animals are shot in enclosures with no chance of escape) and ‘put and take’ hunting (where trophy animals are released onto a ranch immediately before a forthcoming hunt, Lindsey *et al.*, 2006).

Inappropriate regulation has also compromised the conservation value of game ranches. Perhaps the most notable example is the legal requirement for ranches in South Africa, Namibia and Botswana to be surrounded by perimeter game fencing for landowners to acquire the right to utilize wildlife consumptively (Bond *et al.*, 2004; Barnett & Patterson, 2006). The effect has been the division of large areas into small, fenced pockets. In South Africa, for example, the average size of game ranches is only 8.2–49.2 km<sup>2</sup> (depending on the province, Bothma, 2002). On small fenced game ranches, natural movement of wildlife is limited, wildlife populations are small and susceptible to inbreeding and there is a tendency for natural ecological processes (such as predation, immigration and emigration) to be prevented, with the effect that intensive management (through culls, augmentations and reintroductions) is required in their place. Fenced game ranches are often overstocked, resulting in ecological degradation similar to that common on livestock ranches (Bond *et al.*, 2004). Predators are considered to compete with landowners for prey that could be sold to hunters and are widely persecuted (Lindsey, du Toit & Mills, 2005).

Strategies for improving the conservation value of game ranching essentially include developing either improved regulatory measures or incentives to encourage land uses more conducive to conservation objectives. New legislation was introduced recently in South Africa concerning threatened and protected species, which should help to regulate translocation, improve quota setting and limit unethical hunting practices (DEAT, 2006). However, we believe that greater gains could be achieved through promoting ‘conservation-friendly’ forms of land use on game ranches. Specifically, promoting the formation of conservancies would align game ranching more closely with conservation objectives. Conservancies are formed when neighbouring landowners remove internal fencing and create larger, cooperatively managed wildlife areas surrounded by a single perimeter fence (Bond *et al.*, 2004).

Despite the scale and potential significance of game ranching to conservation efforts in southern Africa, surprisingly little published information exists on the topic. Most published information is limited to comparisons of the economic and financial viability of wildlife versus livestock ranching (Taylor & Walker, 1978; Cumming, 1991; Jansen, Child & Bond, 1992; Barnes & de Jager, 1996) or on the scale of the industry (van der Waal & Dekker, 2000; Krug, 2001). Furthermore, while some studies have addressed the conservation of certain species (notably predators) on ranch land (Marker, Mills & Macdonald, 2003; Lindsey *et al.*, 2005), relatively little information is available on the general conservation value of ranch land, on problems associated with game ranching from a conservation perspective or on the importance of conservancies (Bond *et al.*, 2004). In this

paper, we provide a preliminary review of the ecological and financial benefits associated with conservancies versus isolated game ranches.

## Ecological benefits of conservancies

The ecological benefits outlined below apply specifically to the model of conservancies characteristic of South Africa and Zimbabwe, namely a wildlife area comprised of multiple ranches with all internal fencing and livestock removed, with an external perimeter fence. In Namibia, some commercial 'conservancies' consist of sets of ranches with a perimeter game fence, with internal game fencing removed, but with livestock and cattle fencing retained. While the latter model may confer some of the benefits associated with 'purer' conservancy forms, several of the ecological problems associated with fenced game and livestock ranches persist (e.g. overgrazing, reduced wildlife mobility, persecution of predators, etc.).

### Larger areas permit the reintroduction of complete faunal assemblages

Conservancies are likely to encompass a wider diversity of habitats than the component ranches, and thus permit the reintroduction and effective conservation of a greater species than is the case on smaller fenced ranches. In addition, several large mammal species require areas larger than the average game ranch. A minimum area of 65–147 km<sup>2</sup> is required for the reintroduction of a single pack of African wild dogs *Lycaon pictus*, for example (Lindsey, du Toit & Mills, 2004). The reintroduction of other large species such as lions *Panthera leo* and elephants *Loxodonta africana* onto private land is also generally only possible when neighbouring ranches are combined to create larger areas.

### Conservancies encourage land uses more conducive to conservation

On small, fenced game ranches, the absence of large charismatic species generally limits land uses to low-value 'plains game' trophy hunting and *biltong* (meat) hunting, and live capture and sale (Lindsey, 2006). Landowners practicing those forms of hunting typically remove a significant proportion of the sustainable yield of ungulate populations annually. Under these conditions, predators compete directly with landowners and are rarely tolerated (Lindsey *et al.*, 2005). In some areas, attitudes of game ranchers towards carnivores are even more negative than those of livestock ranchers because everything predators consume on game ranches is perceived to impose costs (Marker *et al.*, 2003).

On conservancies, by contrast, where larger areas permit the reintroduction of the larger and more charismatic species, land uses tend to shift to ecotourism and higher value trophy hunting, with off-take generally limited to 2–5% of male populations (Falkena, 2003; Lindsey, Roulet

& Romañach, 2007; Lindsey *et al.*, in press). Under these conditions, predators contribute positively to ecotourism and trophy hunting revenues and are often actively reintroduced. Lions and wild dogs, for example, have been reintroduced into at least 22 and nine private reserves in South Africa, respectively (L. Hunter, pers. comm.; Gusset *et al.*, 2008). Similarly, cheetahs have been reintroduced into at least 70 game reserves in South Africa, many of which are privately owned (K. Marnewick, pers. comm.).

### Removal of internal fencing increases ecological resilience

Most game ranches occur in semi-arid areas that are poorly suited to agriculture or livestock ranching (Bond *et al.*, 2004). Small fenced ranches in such areas are susceptible to high spatial variability in rainfall (du Toit, 1998), as highlighted by data from the 320 km<sup>2</sup> Venetia Limpopo Nature Reserve in northern South Africa (Fig. 1). Before the formation of the reserve (which is a conservancy), the area consisted of 22 fenced ranches, several of which would have experienced one or more severe droughts during the period 2001–2006, had internal fencing been present to prevent wildlife from moving to exploit patchy primary productivity. The removal of internal fencing in conservancies also increases resilience to other forms of disturbance, including fires and floods. Finally, pooled wildlife populations in conservancies avoid problems associated with small population sizes such as genetic and demographic stochasticity that may occur on isolated fenced ranches (Caughley, 1994).

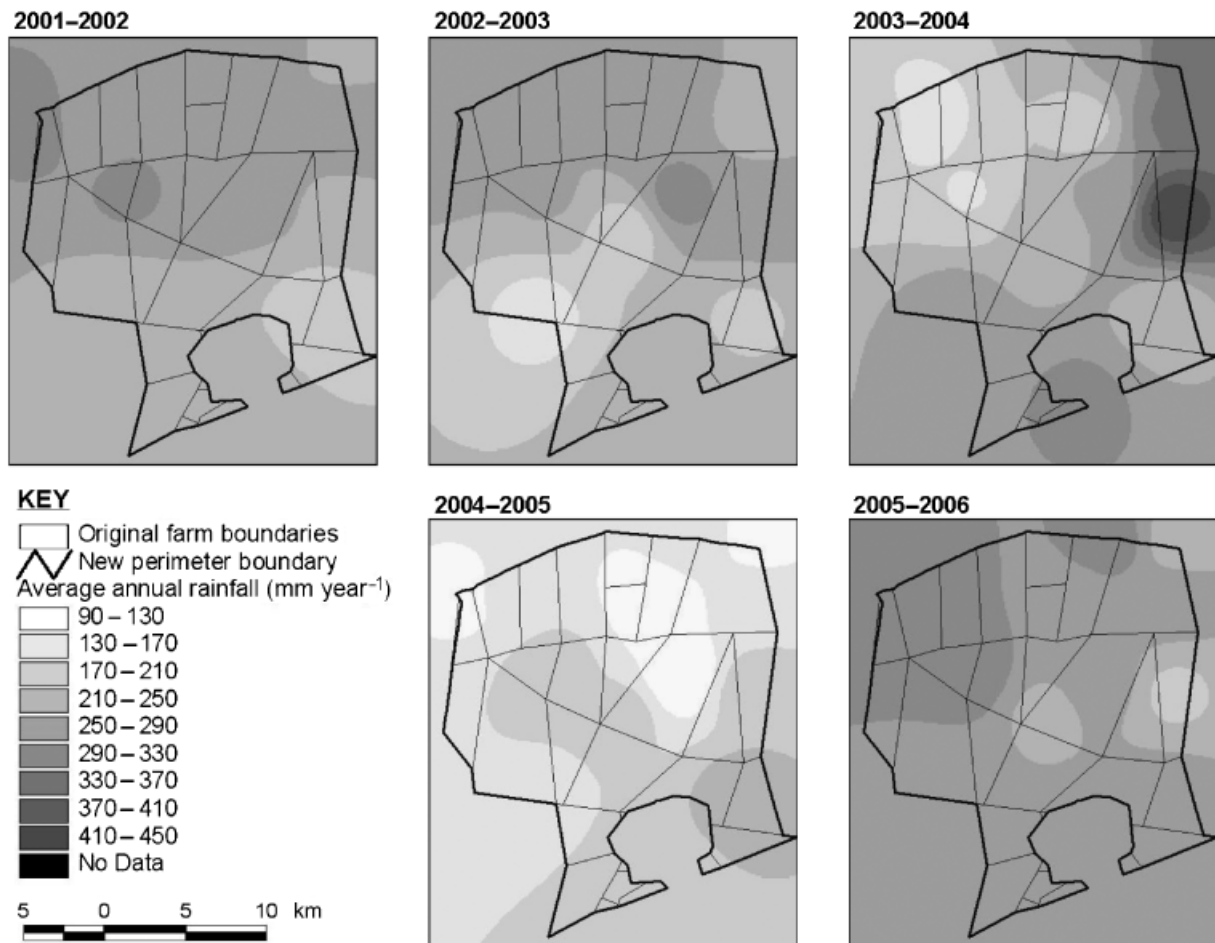
Ecological resilience, larger population sizes and the presence of the full spectrum of mammal species combine to permit the recovery of natural ecological processes in conservancies, in place of the constant management intervention that is required on small fenced ranches.

### Alignment of management with conservation objectives

Wildlife management within conservancies is generally guided by cooperative-agreements among landowners, which typically introduce minimum standards of management, aligned with conservation objectives. These standards reduce the frequency of undesirable and sometimes whimsical actions of individuals, such as persecution of predators, introduction of exotics or genetic manipulation of wildlife.

### A case study of the conservation benefits of conservancies: Savé Valley Conservancy (SVC)

The conservation benefits resulting from conservancy formation are exemplified by the 3450 km<sup>2</sup> SVC in Zimbabwe, which is larger than all but two of Zimbabwe's national parks (Hwange and Gonarezhou) and comprises an area 9–70 times larger than the mean game ranch size



**Figure 1** Rainfall patterns on the De Beers Venetia Limpopo Nature Reserve during 2001–2006 showing the extreme annual variability in rainfall among original ranches.

in South Africa (depending on the province). Before the formation of the conservancy, the Savé Valley was characterized by ecological degradation due to overgrazing by livestock and waning wildlife populations due to competition with cattle and bush-meat poaching (Lindsey *et al.*, in press). After the 26 individual ranchers agreed to drop fences between their ranches and form a conservancy, they reintroduced 3128 individuals of 13 species (Lindsey *et al.*, 2008). The large spatial scale of the conservancy permitted reintroduction of the full complement of indigenous mammalian fauna, including elephants, rhinoceros species *Diceros bicornis*, *C. simum*, buffaloes and lions. Additionally, through a process of recovery and natural recolonization, respectively, the area now contains significant populations of vulnerable cheetahs *Acinonyx jubatus* and endangered wild dogs. The presence of the full range of mammal species has permitted high-end ecotourism (before the political instability in Zimbabwe) and low off-take, high-value trophy hunting. Under these land-use conditions, the problems typically associated with game ranching from a conservation perspective are absent, and the attitudes of

ranchers towards predators are generally positive (Lindsey *et al.*, 2005).

### Financial benefits

Fortuitously, there are compelling financial reasons for ranchers to consider forming conservancies.

### More profitable land uses

Ecotourism and trophy hunting (involving large charismatic species) are more profitable than the biltong hunting typical of fenced game ranches (Falkena, 2003). Furthermore, the type of ecotourism and trophy hunting operations possible on conservancies are likely to be more profitable than the same land uses on fenced ranches. Both hunters and photographic tourists appreciate a feeling of wilderness, dislike fencing and appreciate the opportunity to view (or hunt) a diversity of mammals (Lindsey *et al.*, 2006, 2007). Conservancies by definition have significantly less fencing than a comparable area of isolated ranches, and the presence of the

'big 5' (buffalo, leopard *Panther pardus*, lion, elephant and rhinoceros spp.), in particular, enables tourism operators in conservancies to charge more than double ranches lacking those species (average = \$277/night,  $n = 27$ , cf. \$88/night,  $n = 39$ ; P. A. Lindsey, unpubl. data). Similarly, in areas where large species are present, trophy hunting tours are priced higher than in areas where those species are absent (\$600–\$1300 daily rates in addition to high trophy fees for large game species, cf \$100–\$400 daily rates with lower trophy fees for antelope species, Lindsey, 2006).

### Economies of scale

In addition to potentially higher returns, the management costs in conservancies are likely to be lower than those experienced on an equivalent area of fenced game ranching due to economies of scale. For example, a 1000 km<sup>2</sup> conservancy surrounded by a single perimeter fence would have 221 km less fencing to maintain than the same area comprised of 20 × 50 km<sup>2</sup> ranches, resulting in a potential saving of ~US\$75 000–\$189 000 in maintenance per year (depending on the type of fencing, P. A. Lindsey, in lit.). A larger collaborative management area would also require fewer lodges, wildlife-release paddocks, water points and wildlife censuses than an equivalent area comprised of fenced ranches. Additionally, the larger wildlife populations associated with conservancies would require less management intervention to address genetic considerations, or in response to changing environmental conditions. On small ranches during drought years, for example intervention is often required to prevent ungulate die-offs, either through provision of supplementary feed or through removal of wildlife via culling or capture, which necessitates restocking when conditions improve.

### Increased land value

The formation of conservancies and the reintroduction of charismatic mammals increase the value of land and attract investors. In South Africa, properties with the big 5 have land values as much as six times more per hectare than ranches without those species (Falkena, 2003). In SVC, land values increased by 25 times in the 5 years following the formation of the conservancy due to potential earnings associated with the presence of the big 5 and prestige value associated with being part of one of (if not the) the largest private reserves in the world and a well-known conservation success story (C. Stockil, pers. comm.).

As a result of these potential benefits, we expect to observe an increasing trend towards conservancy formation in South Africa as was seen in Zimbabwe before the land seizures and as is occurring in Namibia (Bond *et al.*, 2004). In Kwa-Zulu Natal, for example, an average of four conservancies per year were developed during the last 10 years (M. Komen, South African National Association of Conservancies, pers. comm.). There are several registered conservancies under varying stages of development in

Kwa-Zulu Natal (129 conservancies), Western Cape (67) and Gauteng (57) provinces, comprising 14 657 km<sup>2</sup> (M. Komen, pers. comm.).

### Socio-political benefits

Addressing historical imbalances in land ownership and achieving participation from formerly disadvantaged communities is crucial for ensuring the continued viability of wildlife as a land use on private land in southern Africa. This was not achieved in Zimbabwe, where the recent drastic land 'reform' measures have resulted in the virtual collapse of the game ranching industry (Bond *et al.*, 2004; Lindsey *et al.*, 2008). Conservancies provide increased opportunities for previously disadvantaged communities to engage in the wildlife industry. Conservancies also provide an institutional scale appropriate for interacting with governments and community structures and are likely to have more political influence than individual ranches. Furthermore, with existing mechanisms for sharing pooled wildlife resources, privately owned conservancies can easily be expanded to incorporate community-owned land. SVC, for example, was recently expanded to include ~25 km<sup>2</sup> of communal land, and plans are in place to allocate a proportion of shares in the wildlife asset of the conservancy to local communities so that an annual dividend accrues to them from tourism activities (Lindsey *et al.*, in press). Similarly, a portion of community land will shortly be incorporated into Bubi River Conservancy in Zimbabwe. Significant success has been achieved in creating conservancies comprised solely of communal land in Namibia (Weaver & Skyer, 2003), though replicating that success in other countries would require legislative changes to devolve similar user rights over wildlife to communities as enjoyed by private landowners (Bond *et al.*, 2004).

### Impediments to the formation of conservancies and challenges to their functioning

Despite the potential financial benefits associated with including land in conservancies, there are several potential barriers to their formation and effective functioning thereafter.

A key impediment to the formation of conservancies is the lack of available information on the benefits associated with forming conservancies, or on the ecological problems associated with traditional fenced game ranches. In addition, little information is available on successful models for conservancy constitutions and collaborative wildlife management agreements to guide prospective conservancy developers. Research is urgently required to address these informational shortcomings and an effort should be made to publicize the findings to landowners and policy makers.

The start-up costs may also inhibit conservancy formation. Depending on existing infrastructure, significant expenditure may be required to construct an external perimeter fence capable of holding predators and mega-herbivores,

develop wildlife release bomas, install a conservancy security system and purchase wildlife for reintroduction, etc.

Some ranchers may be discouraged from forming or joining conservancies by the prospect of the reduced freedom associated with cooperative management agreements, and of relinquishing control by removing fences. An additional concern is that wildlife would not be shared equitably, or that animals may be lost to neighbouring ranches lacking comparable wildlife resources. Transparent and fair means of allocating quotas are required to prevent individual landowners from utilizing more than their share of the pooled wildlife resource. This is particularly true in South Africa, where ranches are small and the home ranges of many species may encompass multiple properties. A fair means of acknowledging and compensating for differential investments in wildlife made before conservancy formation is also required. This was achieved in SVC, for example, by providing ranchers who had made above-average investments in wildlife before the formation of the conservancy with credits that were offset against management costs (C. Stockil, pers. comm.).

Strategies are required to ensure equal investment in management following the establishment of a conservancy to prevent freeloading. For example, in SVC, unequal investment in security by members represents a weakness in the current conservancy structure: the ranch investing the least in anti-poaching spends 43 times less than the ranch spending the most (P. A. Lindsey, unpubl. data). Because of the lack of internal fencing, ranchers with poor security (who lose many animals to poachers) still derive returns from hunting, as wildlife moves into the vacuum from adjacent properties (P. A. Lindsey, unpubl. data). This scenario could be avoided by introducing a link between investment in anti-poaching and the allocation of hunting quotas. Such challenges illustrate the importance of management agreements being adaptive so that problems can be tackled as they arise. As more conservancies develop, tested solutions will arise to the challenges associated with collaborative wildlife management. Documenting the experiences, successes and failures associated will be a crucial part of the learning process.

### Promoting conservancy formation

Efforts are required from conservationists to actively promote the formation of conservancies on private land in southern Africa. Raising awareness among ranchers and governments of the ecological, financial and social benefits of conservancies represents a crucial first step towards achieving that objective. The introduction of tax breaks for ranchers who form conservancies may be an effective means of overcoming landowner resistance. Governments may be receptive to the suggestion of tax breaks if the ecological benefits associated with conservancies are made clear to them and particularly if efforts to promote conservancy development are aligned with political land reform objectives. Alternatively, governments and/or non-governmental organizations could provide funding to assist ranchers with

the costs associated with transitioning from individual game ranches to conservancies. Conservation organizations could work to provide some kind of exploitable recognition and publicity for landowners who include their land in conservancies. Strategies such as the Ezemvelo KZN black rhino range expansion project offer potential additional incentives to land owners to form conservancies (Spencely & Barnes, 2005). Ranchers who have cooperated to form conservancies large enough for black rhino reintroduction are given custody over a founder population of rhinos and are then allowed to keep a proportion of the offspring (Spencely & Barnes, 2005). Success in developing incentives to increase the number of conservancies would significantly enhance the conservation value of private land in southern Africa.

### Potential relevance of the conservancy approach elsewhere

The southern African experience with conservation on private land, and the conservancy approach may have applicability elsewhere. For example, in North America if ranchers were to pool land resources and reintroduce charismatic indigenous fauna for tourism purposes, significant conservation gains may arise. The prospects for developing wildlife-based land uses on private land in the USA may improve if policy makers there were informed of the importance of devolving user rights over wildlife to landowners, given that ownership of wildlife is retained by the state there (Lindsey *et al.*, in press). Similarly, awareness of the importance of conservancies for increasing the conservation value of wildlife ranches could ensure that the problems experienced with game ranching in southern Africa are avoided.

### Conclusions

Increases in human populations, habitat fragmentation and ongoing species extinctions mean that innovative strategies are required to permit maximum gain from the remaining land available for conservation (Hayward, in press). By creating financial and ecological incentives for the restoration of complete faunal assemblages, conservancies provide a good example of such an innovation.

### References

- Barnes, J. & de Jager, J. (1996). Economic and financial incentives for wildlife use on private land in Namibia and the implications for policy. *S. Afr. J. Wildl. Res.* **26**, 37–46.
- Barnett, R. & Patterson, C. (2006). *Sport hunting in the SADC region: an overview*. Johannesburg, South Africa: TRAFFIC East/Southern Africa.
- Bond, I., Child, B., de la Harpe, D., Jones, B., Barnes, J. & Anderson, H. (2004). Private-land contribution to conservation in South Africa. In *Parks in transition*: 29–62. Child, B. (Ed.). UK: Earthscan.
- Bothma, J. (2002). Some economics of game ranching. In *Proceedings of a symposium on game ranch planning and*

- management*: 23–40. Penzhorn, B. (Ed.). South Africa: Onderstepoort.
- Caughley, G. (1994). Directions in conservation biology. *J. Anim. Ecol.* **63**, 215–244.
- Child, B. (1988). *The role of wildlife utilisation in the sustainable development of semi-arid rangelands in Zimbabwe*. DPhil thesis, University of Oxford.
- Cumming, D. (1991). Wildlife and the market place: a view from Southern Africa. In *Wildlife production: conservation and sustainable development*: 11–25. Renecker, L. & Hudson, R. (Eds). Fairbanks, USA: University of Alaska.
- Damm, G. (2005). Game sale statistics South Africa. *Afr. Indaba* **3**, 15–16.
- DEAT (2006). *Threatened and protected species regulations*. South African Department of Environmental Affairs and Tourism. Government of South Africa, Pretoria.
- Falkena, H. (2003). *Game ranch profitability in South Africa*. Rivonia: The SA Financial Sector Forum.
- Flack, P. (2003). Consumptive tourism - a useful conservation tool. In *Consumptive tourism – a useful conservation tool*: 155–157. Butchart, D. (Ed.). South Africa: Vision, Endangered Wildlife Trust.
- Gusset, M., Ryan, S., Hofmeyr, M., van Dyk, G., Davies-Mostert, H., Graf, A., Owen, C., Skykman, M., Macdonald, D., Monfort, S., Wildt, D., Maddock, A., Mills, M., Slotow, R. & Somers, M. (2008). Efforts going to the dogs? Evaluating attempts to re-introduce endangered wild dogs in South Africa. *J. Appl. Ecol.* **45**, 100–108.
- Hamman, K., Vrahimis, S. & Blom, H. (2003) *Can current trends in the game industry be reconciled with nature conservation?* African Indaba Yearbook
- Hayward, M. (in press). Conservation management for the past, present and future. *Biodivers. Conserv.*
- Jansen, D., Child, B. & Bond, I. (1992). *Cattle, wildlife, both or neither: results of a financial and economic survey of commercial ranches in southern Zimbabwe*. WWF Multi-species Project Paper No. 27, Harare, Zimbabwe.
- Krug, W. (2001). *Private supply of protected land in southern Africa*. Report for World Bank/OECD International Workshop on Market Creation for Biodiversity Products and Services.
- Lindsey, P. (2006). *A review of the economic contribution of the trophy hunting industry in Africa*. Safari Club International, report, 98pp.
- Lindsey, P., Alexander, R., Frank, L. & Románach, S. (2006). The potential of trophy hunting to create incentives for wildlife conservation in Africa where alternative wildlife-based land uses may not be viable. *Anim. Conserv.* **9**, 283–298.
- Lindsey, P., Alexander, R., Mills, M., Woodroffe, R. & Románach, S. (2007). Wildlife viewing preferences of visitors to protected areas in South Africa: implications for the role of ecotourism in conservation. *J. Ecotourism* **6**, 19–33.
- Lindsey, P., Románach, S. & Davies-Mostert, H. (in press). Financial drivers for predator conservation on private land in southern Africa. In *Reintroduction of top-order predators*. Hayward, M. & Somers, M. (Eds). Wiley-Blackwell, London.
- Lindsey, P., Roulet, P. & Románach, S. (2007). Economic and conservation significance of the trophy hunting industry in sub-Saharan Africa. *Biol. Conserv.* **134**, 455–469.
- Lindsey, P., du Toit, J. & Mills, M. (2004). Area and prey requirements of wild dogs *Lycaon pictus* under varying habitat conditions: implications for reintroductions. *S. Afr. J. Wildl. Res.* **34**, 77–86.
- Lindsey, P., du Toit, J. & Mills, M. (2005). Attitudes of ranchers towards African wild dogs *Lycaon pictus*: conservation implications for wild dogs on private land. *Biol. Conserv.* **125**, 113–121.
- Lindsey, P. A., du Toit, R., Pole, A. & Románach, S. (2008). Savé Valley Conservancy: a large scale experiment in cooperative wildlife management. In *Evolution and innovation in wildlife conservation in South Africa*: 163–184. Child, B., Suich, H., and Spenceley A. (Eds). IUCN, SASUSG.
- Marker, L., Mills, M. & Macdonald, M. (2003). Factors influencing perceptions of conflict and tolerance toward cheetahs on Namibian farmlands. *Conserv. Biol.* **17**, 1290–1298.
- Murombedzi, J. (2003). *Pre-colonial and colonial conservation practices in southern Africa and their legacy today*. IUCN report, available from <http://dss.ucsd.edu/~ccgibson/docs/Murombedzi%20-%20Pre-colonial%20and%20Colonial%20Origins.pdf>
- National Agricultural Marketing Council (NAMC) (2006). *Report on the investigation to identify problems for sustainable growth and development in South African wildlife ranching*. NAMC Report, 2006-03.
- Spenceley, A. & Barnes, J. (2005). *Economic analysis of rhino conservation in a land-use context within the SADC region*. Report for the SADC regional programme for rhino conservation.
- Taylor, R. & Walker, B. (1978). Comparisons of the vegetation use and herbivore biomass on a Rhodesian game and cattle ranch. *J. Appl. Ecol.* **15**, 565–581.
- du Toit, R.F. (1998). *Case study of policies that support sustainable development in Africa: the Savé Valley Conservancy, Zimbabwe*. Paper presented at Scandinavian Seminar College Workshop on: an African perspective of policies which support sustainable development, Harare.
- van der Waal, C. & Dekker, B. (2000). Game ranching in the Northern Province of South Africa. *S. Afr. J. Wildl. Res.* **30**, 151–156.
- Weaver, C. & Skyer, P. (2003). *Conservancies: integrating wildlife land-use options into the livelihood, development, and conservation strategies of Namibian communities*. The 5th World Parks Congress, 8–17 September South Africa.