

The distribution and population status of African wild dogs (*Lycaon pictus*) outside protected areas in South Africa

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At present, a single viable population of endangered African wild dogs occurs in South Africa, in the Kruger National Park. Current conservation efforts focus on reintroducing wild dogs into a series of fenced reserves, thereby creating a meta-population in which sub-populations are actively managed to conserve genetic diversity. Additional options exist for conserving wild dogs outside protected areas. We report on an attempt to assess the numbers of wild dogs remaining outside protected areas as a precursor for conservation planning and show that they form a more significant component of the national population than previously recognized. Total numbers outside protected areas in South Africa are estimated to have fluctuated between 42 and 106 animals during the period 1996–2002. Of these, 25–67 individuals were thought to be resident outside protected areas during this period, with an extent of occurrence of 43 310 km² and an area of occupancy of 17 907 km². Sightings were most frequently reported from the western border of Kruger National Park, the Limpopo Valley, and northern KwaZulu-Natal. Most wild dogs occur on game ranches with unmodified land cover and low human densities, close to source populations. Significant scope for distribution expansion exists in the Limpopo and North West Provinces. However, efforts aimed at changing landowner attitudes towards wild dogs are necessary to improve the conservation status of the species outside protected areas.

Key words: canid conservation, carnivore–human conflict, *Lycaon pictus*, meta-population, predators, private land.

INTRODUCTION

During the last 30 years there has been a great decline in the number and distribution of wild dogs across Africa, and viable populations are now probably limited to six of 34 countries in which they once occurred (Fanshawe *et al.* 1997; IUCN 2001). The most important cause of this decline is conflict with expanding human populations and habitat fragmentation (Creel & Creel 2002). Although state-sponsored persecution of wild dogs has ceased, they are still widely persecuted by landowners due to prejudice and perceived conflict with livestock (Rasmussen 1999). In addition, indirect anthropogenic mortality is caused by road deaths, and the incidental capture of wild dogs in snares set for other species (Woodroffe & Ginsberg 1999). Wild dogs occur at lower densities than competing carnivores, and are susceptible to edge effects due to their wide-ranging behaviour. Consequently larger protected

areas are required to support viable populations of wild dogs than most other carnivore species (Woodroffe & Ginsberg 1998).

In South Africa, wild dogs historically occurred from the southern coasts to the northern borders (Skinner & Smithers 1990). Increasing human populations and commercial agriculture resulted in their eradication from most of this area, and wild dogs are now limited to a single viable population (Fanshawe *et al.* 1997) in the Kruger National Park (hereafter referred to as 'Kruger'). There are no suitably protected areas of sufficient size for a second viable wild dog population in South Africa, and recent conservation efforts have concentrated on establishing a meta-population, consisting of several sub-populations within a network of small reserves (Mills *et al.* 1998). Land outside protected areas could also potentially be utilized to expand the distribution of wild dogs. Over much of northern South Africa there has been a shift to game ranching from cattle ranching, resulting in increases in the numbers of many prey species (van der Waal

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& Dekker 2000), thereby increasing the potential for conserving wild dogs and other large carnivores. A vital component of conservation planning involving wild dogs on private land is an assessment of their numbers and distribution outside of formally protected areas, which is the purpose of this study.

METHODS

Efforts have been made to document the conservation status of wild dogs on various scales: continental, national, and by individual protected areas. Fanshawe *et al.* (1991, 1997) conducted pan-African surveys, and several studies have assessed their status at a national level: Zimbabwe (Childes 1988; Rasmussen 1997); Botswana (Bulger 1990); Namibia (Hines 1990); Kenya (Jennings 1992); Zambia (Buk 1994); Ethiopia (Malcolm & Sillero-Zubiri 2002); Senegal (Sillero-Zubiri 1995) and Cameroon (Breuer 2003). In South Africa, accurate assessment of wild dog populations was pioneered by the collection of photographic records of each individual in the Kruger population (Maddock & Mills 1994). Fanshawe *et al.* (1997) and Friedmann *et al.* (2002) estimated wild dog distribution in South Africa, using the experiences of field workers, combined with museum data. Here, we report on the first study aimed specifically at assessing the number and distribution of wild dogs outside state-protected areas in South Africa.

The large size of and restricted access to the study area, and the secretive behaviour of dogs outside protected areas precluded implementation of the photographic census techniques used in Kruger. However, sightings represent an inexpensive and effective way in which the status of large carnivores can be assessed over large areas (Gros *et al.* 1996). Accordingly, sighting records from January 1996 to August 2002 were collected from the following sources:

1) Provincial conservation authorities (hereafter referred to as 'Nature Conservation'). Sighting records were obtained from Nature Conservation officers in the provinces closest to source populations of wild dogs (Limpopo, Mpumalanga, North West, Northern Cape and KwaZulu-Natal).

2) Appeals for sightings published in the English and Afrikaans media, including three national agricultural/wildlife magazines, two wildlife newsletters, and 14 local newspapers with a wide coverage. In each, a photograph of a wild dog was included to help prevent misidentification.

Interviews with ranchers from focal areas where

published records mention wild dog activity: i) Limpopo Valley (Skinner & Smithers 1990); ii) west of Kruger (Fanshawe *et al.* 1997); and iii) north of Hluhluwe-Umfolozi Park (Maddock 1999). Suspected focal areas of wild dog activity were demarcated with the assistance of Nature Conservation representatives, yielding approximate central coordinates of: i) 22°20'S; 29°40'E, ii) 24°10'S; 30°55'E; iii) 27°30'S; 31°45'E, respectively. In each demarcated area, as many ranchers as possible were interviewed over a two week period resulting in at least 50% of landowners (166) being personally interviewed over a period of six weeks (by the first author).

Interviews with people from communal land in which Nature Conservation reported wild dog presence. The head ecologist (C. Roche) of a large safari operation asked managers and staff working at the Ngala and Bongani Lodges on the western and southwestern borders of Kruger, to provide information on sightings they had made on the communal lands where they live. This provided information from large areas of communal land neighbouring Kruger (approximate central coordinates: 24°40'S; 31°10'E, and 25°20'S; 30°10'E).

Appeals for information on sightings were made at Wild dog Advisory Group – South Africa (WAG-SA) meetings and at other conservation-related meetings and symposia. In addition, field guides, field researchers, ranchers and wildlife capture teams met during field work were also asked to provide sightings.

Respondents were asked to provide as many of the following details as possible for each sighting: 1) date; 2) location; 3) land use at location of sighting; 4) number of individuals; 5) sex; 6) age (juvenile, subadult, adult), and 7) frequency of sightings. When wild dogs were reported away from areas where published records mention wild dog activity, respondents were asked for a description of the animal(s) seen to determine whether they had correctly identified the species.

All sightings were digitized using ArcInfo (version 3.2). Packs were delineated spatially, based on the largest home range area recorded in Kruger (1110 km², Reich 1981). Although the shape of home ranges are likely to vary with factors such as the availability of prey and suitable habitat, a standard circular home range was used to distinguish between different packs. Sightings were ordered by date and the distance between sequential sightings measured: those occurring within 37.5 km (the diameter of 1110 km²) of the

previous sighting were assumed to constitute the same pack. A repeat of these methods using the mean Kruger home range size (537 km², Mills & Gorman 1997) yielded a similar estimate of the number of groups, suggesting that within reasonable limits the method is insensitive to the home range area used.

Resident packs (successful colonists) were distinguished from dispersing groups (potential colonists) using group size, which was more reliably reported than age or sex. The average recorded size of dispersing groups is 2.3–3.4 for females, and 3.9–5.3 for males (McNutt 1996; Creel & Creel 2002). Wild dogs were assumed to comprise dispersing groups if ≤ 5 individuals were reported, or resident packs if ≥ 6 were reported, or if puppies or den sites were sighted. An exception was made if a group of < 6 wild dogs was sighted within a home range (as defined above) in which a 'resident pack' was sighted in the previous year. Mean group size was calculated by averaging the modal reported group size for each pack.

ArInfo was used to create two measures of wild dog geographic distribution; extent of occurrence and area of occupancy (*sensu* IUCN 2001). Extent of occurrence encompasses all known sites of occurrence, and projected sites of occurrence between sightings. This was calculated by drawing a polygon comprising the shortest continuous boundary encompassing all sightings of resident wild dogs. Area of occupancy is the area within the extent of occurrence actually occupied, and was calculated by drawing a polygon around the outermost sightings of resident dogs. Density estimates (dogs/km²) of wild dogs occurring outside state-protected areas in other countries (Cameroon, Breuer 2003; Kenya, Woodroffe 2002; Zimbabwe, Rasmussen 1997, Pole 1999) were then multiplied by the area of occupancy estimate, to provide an alternative means of estimating the numbers of wild dogs occurring outside protected areas.

A map of South Africa, excluding state-owned protected areas, north of the most southerly recorded sighting (approx. 30°30'S) was converted to grid cell format (5 km² cells), and each cell scored as follows: 0, no sightings ('absent cells'); 1, dispersing wild dogs sighted ('dispersing cells'); and 2, resident dogs sighted ('resident cells'). The grid cells were superimposed on the CSIR National Land Cover Database (Thompson 1999), and 2002 human population census data (South African Municipal Demarcation Board 2002) to provide an estimate of habitat suitability and hu-

man density for each cell. Given the wide habitat tolerance of wild dogs (Skinner & Smithers 1997), it was assumed that all habitat unmodified by human activity was potentially suitable. The original 31 land-cover categories in the CSIR land-cover database were categorized as; 'suitable', all unmodified natural habitat; 'degraded', all land categorized as degraded in the CSIR database; or 'unsuitable', all cultivated and urbanized land and water bodies. An estimate of the distance of each grid cell from the nearest source population was made by measuring the distance from the centre of each cell to the closest of three potential source populations (Kruger, Hluhluwe-Umfolozi Park and Central Kalahari Game Reserve in Botswana). The relationship between land cover, human density, distance from a source population and wild dog status was investigated using multivariate ordinal logistical regression (JMP Version 4.0.2. 2000).

Data describing land use on a fine scale (e.g. cattle *versus* game ranching) on a national level was unavailable, and this factor could not be analysed for 'absent cells'. However, land use at each sighting was recorded, and the relationship between sightings of resident *versus* dispersing wild dogs and land use was analysed using multivariate ordinal logistical regression (JMP Version 4.0.2. 2000).

The area of remaining unmodified habitat, with a human population density of ≤ 5 people/km² (modal population density of 'resident cells') north of the most southerly sighting was calculated as an estimate of the area of suitable habitat for wild dog conservation outside state-protected areas (excluding private reserves into which dogs have been reintroduced).

RESULTS

A total of 516 sightings was reported, from Nature Conservation (38.3% of sightings), WAG-SA (and other meetings, 28.6%), interviews with ranchers (23.2%), responses to publications (5.6%) and community interviews (4.3%). Resident wild dogs had an area of occupancy of 17 907 km², and an extent of occurrence of 43 310 km², with most sightings coming from the western border of Kruger in Limpopo Province ($n = 244$) and the Limpopo valley ($n = 136$, Fig. 1, Table 1). Based on spatial delineation of packs, the estimated number of wild dogs occurring outside protected areas during 1996–2002 averaged 83.6 ± 8.45 (mean \pm S.E., Table 1). Based on extrapolation from densi-

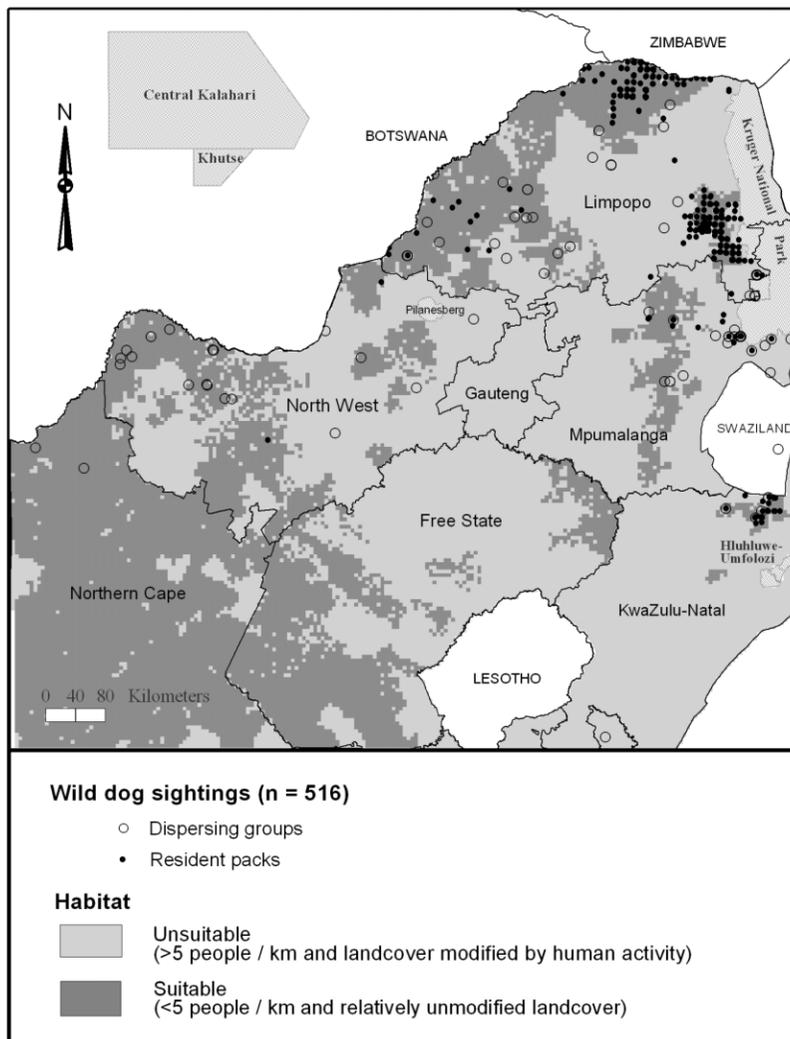


Fig. 1. Distribution of wild dogs outside protected areas in South Africa.

ties recorded outside protected areas in other countries, the estimated number of wild dogs outside protected areas in South Africa varied between 36 and 269 individuals (Table 2). The estimated number of putative resident packs and dispersing groups varied between 4–10 and 4–11, respectively, during 1996–2002, using the maximum Kruger home range to delineate (Table 1). An average of 7.3 ± 1.37 (mean \pm S.E.) sighting reports were received per resident pack, from 4.5 ± 0.69 different sources. The number of sources of sightings per pack is likely higher than this, as some sources (for example Nature conservation) were included as a single source, even though these sightings were undoubtedly

compiled from multiple sources before we were informed of them. Mean group size (6.9 ± 0.64 dogs \pm S.E.) was similar to that recorded in Kruger in the latest census (7.1 dogs: Davies 2000). The mean size of groups containing only adults and subadults was 5.0 ± 0.34 dogs.

Most sightings (77.2%) of resident wild dogs occurred on game ranches, whereas sightings of dispersing groups were spread more evenly across land-use categories ($\chi^2 = 63.7$, d.f. = 2, $P < 0.0001$, Table 3). In KwaZulu-Natal (53.1%) and on the western border of Kruger (48.7%) a significant portion of sightings were made on private wildlife conservancies, compared to 25.1% in Limpopo valley, 22% in Mpumalanga, 7.8% in

Table 1. Distribution and population status of wild dogs outside protected areas in South Africa during 1996–2002 based on delineation of packs using maximum home range size recorded in Kruger (1110 km²).

Province/region	Extent of occurrence (km ²)	Area of occupancy (km ²)	Range: dog numbers	Range: resident packs	Range: dispersing groups
KwaZulu-Natal	975	1 825	1–9	0–1	0–1
Mpumalanga	2 650	7 775	8–21	1–2	0–2
Limpopo/Kruger border	4 247	8 850	12–34	1–2	1
Limpopo River	4 900	11 525	4–33	1–4	0–2
NW Limpopo	4 025	12 225	0–27	0–2	0–4
Northern Cape	0	0	0–5	0	0–1
North West	1 110	1 110	0–22	0–1	0–4
Total	17 907	43 310	42–106	4–10	4–11

Table 2. Estimated number of dogs outside protected areas in South Africa based on adult density estimates from studies on wild dogs outside state-protected areas elsewhere and the area of occupancy observed in the present study.

Source of density estimate	Source	Density dogs/100 km ²	Extrapolated population size
Northern Cameroon	Breuer 2003	0.2	36
Laikipia District, Kenya	Woodroffe 2002	0.9	161
Save Valley Conservancy, Zimbabwe	Pole 1999	1.4	251
Northwestern Zimbabwe	Rasmussen 1997	1.5	269

northwestern Limpopo Province, and 0% in North West and Northern Cape.

There was a significant relationship between wild dog status (absent, dispersing or resident) and land cover, distance from a source population and human density ($\chi^2 = 597$, d.f. = 9, $P < 0.0001$, Table 4). There was an interaction between human density and land cover ($\chi^2 = 17.7$, d.f. = 3, $P = 0.0005$), partly because resident cells in unsuit-

able habitat had higher human densities (73.8 ± 40.1 people/km²) than resident cells in suitable habitat (13.3 ± 2.31 people/km²). There was also an interaction between human density and distance from a source population, partly due to higher human densities in dispersing cells closer to source populations ($\chi^2 = 16.4$, d.f. = 1, $P < 0.0001$).

In northern South Africa, an estimated 264 900 km² of potentially 'suitable habitat' (<5 people/km²

Table 3. Percentage of sightings made in each of six land use categories (number of sightings in brackets).

	Communal land	Sheep farming	Cattle ranching	Cattle/game	Game ranching	Other ranching
Overall						
Resident packs (420)	2.9	2.2	3.8	7.2	77.2	6.7
Dispersing groups (96)	20	10.6	15.5	9.5	32.7	11.7
By area						
KwaZulu-Natal (32)	–	–	3.1	25	53.1	18.8
Mpumalanga (46)	17.4	32.6	10.9	–	26.1	13
Limpopo						
Kruger border (244)	8.6	–	1.6	–	89.8	–
Limpopo River (136)	–	–	3.8	9.7	84.9	1.6
Northwest Limpopo (35)	–	–	58.8	5.9	32.4	2.9
North West (18)	–	15.4	23.1	15.3	46.2	–
Others (5)	20	–	20.0	–	40	20
All sightings (516)	6	4	5.8	7.5	69.5	7.2

Table 4. The relationship between the occurrence of wild dogs, land cover, human density, and distance from source populations.

	Absent cells	Dispersing cells	Resident cells
Land cover (%) ($\chi^2 = 19.6$, d.f. = 2, $P = 0.0002$)			
Suitable	74.8	80.4	91.2
Degraded	5.8	5.3	4.7
Unsuitable	19.4	14.3	4.1
Human density (people/ km²) ($\chi^2 = 21.7$, d.f. = 1, $P < 0.0001$)			
Mean \pm S.E.	47.1 \pm 2.2	77.5 \pm 44.5	19.5 \pm 4.8
Maximum	2390	2428	700
Distance from source population ($\chi^2 = 151.6$, d.f. = 1, $P < 0.0001$)			
Mean km \pm S.E.	340 \pm 1.2	187 \pm 16.1	86.6 \pm 5.0
Maximum km	795	416	298

and unmodified land cover) for wild dogs exists (Fig. 1). Northern Cape has the greatest proportion of potentially suitable habitat (115 650 km², 90.5% of provincial land area), followed by Limpopo (46 550 km², 46.3%), Free State (49 350 km², 38.5%) and North West (39 725 km², 34.4%). KwaZulu-Natal has little suitable habitat (2475 km², 3.4%), and Gauteng none.

Latest census figures indicate that 177 wild dogs occur in the 21 353 km² Kruger National park, in 21 packs (Davies 2000). Prior to the denning season in 2003, 110 wild dogs in 11 packs occurred in six sub-populations within the meta-population (Hluhluwe-Umfolozi Park, 34 individuals; Karongwe Game Reserve, 5; Madikwe Game Reserve, 22; Marakele National Park, 16; Pilanesberg National Park, 15; Venetia Limpopo Nature Reserve, 18, based on information obtained from WAG-SA), in an area of 3650 km². In total, a minimum of 363 free ranging wild dogs are estimated to occur in 39–49 packs in South Africa, with an area of occupancy of 42 910 km², or 3.51% of the country. Forty nine per cent of individuals occur in Kruger (42.9% of packs), 30.3% in the meta-population (22.4% of packs), and 20.9% outside protected areas (34.7% of packs based on spatial delineation using the maximum Kruger home range area).

DISCUSSION

The collection and analysis of sighting data proved to be a useful technique for estimating the distribution of wild dogs over large areas. Wild dogs are gregarious, diurnal and move over large areas, and thus sighting data may be less affected by biases related to varying sightability between habitat

types than for more secretive species such as cheetah (*Acinonyx jubatus*) (Gros 1998) or cougar (*Felis concolor*) (Pike *et al.* 1999). Blank areas on the distribution map do not necessarily mean that no wild dogs occur there, simply that no sightings were reported. However, when wild dogs were seen in an area, sightings were frequently reported by multiple sources. Consequently, although dispersing groups undoubtedly pass through blank areas on the distribution map, resident packs probably do not occur far beyond the limits of the distribution presented.

Population estimates derived from these sightings data are more speculative, and dependent on the validity of several assumptions made. For example, the assumption that all sightings within the diameter of a maximum Kruger home range area from the previous sighting constituted a single pack may be conservative for a number of reasons. First, pack ranges overlap (Creel & Creel 2002) and dogs observed near the boundary of their home range may have been two packs but counted as one. Second, fences between ranches may limit movement and thus result in smaller home ranges than those used to delineate between packs (Hofmeyr 2000). Third, the presence of lions (*Panthera leo*) is seen as an important factor for large home ranges in wild dogs (Mills & Gorman 1997) and in game ranching areas lions are scarce (Lindsey 2003). On the other hand, home ranges are largest where there are few other wild dogs to impede movement (Fuller *et al.* 1992), as is the case outside state-protected areas. Cheetahs utilize larger areas where they are persecuted (Marker 2002) and the

same is probably true for wild dogs. Finally, overlap between home ranges of neighbouring packs is likely to be less in discontinuous natural habitat, as is the case outside protected areas in South Africa.

The population estimates derived from spatial delineation of packs fell towards the lower end of the range of estimates based on extrapolation from density estimates from outside protected areas elsewhere. The higher density estimates are from two large privately owned game reserves in Zimbabwe, and are likely to be too high for wild dogs in the fragmented, unprotected landscape outside state-protected areas in South Africa. Conversely, the lower population estimates are derived from densities observed in northern Kenya and northern Cameroon in areas with a mosaic of land uses and varying degrees of protection, and are likely to represent closer approximations to the situation outside state-protected areas in South Africa.

The distribution of wild dogs outside state-protected areas in South Africa is wider than that suggested by Fanshawe *et al.* (1997) and Friedmann *et al.* (2002). Friedmann *et al.* (2002) estimated an extent of occurrence of 20 000 km², and an area of occupancy of >2001 km², compared to our estimates of 43 310 km² and 17 907 km², respectively. Sighting reports were received from several areas not mentioned by Fanshawe *et al.* (1997), including the southern and southwestern periphery of Kruger, Mpumalanga Highveld, northwestern Limpopo and North West Province.

Despite relatively widespread sightings of dispersing groups, the occurrence of resident wild dogs is limited primarily to areas close to source populations. Dispersal greatly increases mortality risk in wild dogs (Creel & Creel 2002), and survival rates are likely to decrease with distance from a source population. High human densities surround much of northern and southern Kruger, as well as the Hluhluwe-Umfolozi Park, and provide an immediate barrier to dispersal. Coupled with a paucity of source populations and negative attitudes among landowners, this may explain why large areas of apparently suitable habitat (e.g. northwestern Limpopo Province) have not been successfully re-colonized. Given landowner cooperation, the translocation of wild dogs to areas of suitable habitat would greatly assist range expansion.

Most wild dogs outside protected areas occur

on game ranches, where natural vegetation is typically intact and prey populations are actively protected. By contrast, few sightings were reported on communally owned property, probably as a result of depleted prey populations (Bigalke 2000). Approximately 13% of South Africa is composed of game ranches (Falkena 2000), and in some areas ranches have cooperated to form large conservancies, suggesting that significant potential for wild dog conservation exists outside protected areas. However, this potential is reduced by persecution and habitat fragmentation. Few large blocks of unmodified habitat exist outside protected areas, and correspondingly, ~9% of sightings of resident wild dogs occurred in unsuitable habitat, with livestock-based land uses.

Wild dogs outside state-protected areas are limited largely to areas with low human population densities, as with other carnivore species (e.g. cougars, Pike *et al.* 1999). During data collection, five known cases of wild dog persecution were reported, resulting in the death of at least 20 individuals. In spite of this, our data suggest that they are able to survive in human-modified landscapes. Resident packs occur at higher human densities (mode 5.0 people/km²; mean 20 people/km²; range 1.5–150 people/km²) than the critical density above which extinction is predicted (0.7 people/km²), and within the range of mean densities at which other large carnivores have been extirpated (e.g. wolves *Canis lupus* 13.5 people/km²; lions 26.0 people/km², Woodroffe 2000). Nonetheless, persecution probably limits distribution expansion outside state-protected areas, and reducing human-related mortality must be a focus of conservation efforts.

The best prospects for range expansion are probably in northwestern Limpopo Province, and in northeastern North West Province, where large areas of contiguous suitable habitat persist, with low human densities and large prey populations due to a prevalence of game ranching (van der Waal & Dekker 2000). Cheetahs, lions, leopards (*Panthera pardus*) and spotted hyaenas (*Crocuta crocuta*) occur in these areas, suggesting that prevailing conditions are conducive to large carnivore conservation (Friedmann *et al.* 2002). However, ranchers in northern Limpopo Province are largely negative towards wild dogs, and without efforts to increase tolerance of wild dogs among ranchers, range expansion is unlikely to occur (Lindsey 2003).

There is some potential for range expansion in

the Eastern Cape through translocation of wild dogs into Addo Elephant National Park, or the growing number of private nature reserves in the region. By contrast, the Northern Cape and Free State are probably less suitable for wild dogs, due to the prevalence of small stock farming in these areas and as reflected by the absence of resident wild dogs in the Kgalagadi Transfrontier Park. In Northern Cape and western North West Provinces, wild dogs were typically sighted on livestock ranches where prey densities are probably low. Reduced prey availability is associated with increased transience in carnivore populations (Fuller & Sievert 2001) and this may contribute to the absence of resident packs in these areas.

In Limpopo, North West, Mpumalanga, and KwaZulu-Natal there is 88 750 km² of potentially suitable habitat (unmodified land with <5 people/km²) available for wild dog conservation outside state-protected areas. The population size that could be conserved in this area lies between 178 individuals in ~18 packs, given densities equal to those observed outside protected areas in Cameroon (Breuer 2003), and 799 individuals in ~80 packs, given densities equal to those outside protected areas in Kenya (Woodroffe 2002). This compares with an average of 83.7 individuals in 15 resident packs and dispersing groups estimated to have occurred in these provinces during 1996–2002. To start to fulfil this potential, a shift in conservation policy involving wild dogs is required. Recent management efforts involving dogs outside state parks have aimed to reduce conflict by removing dogs from ranchland. Nature Conservation removed part or all of packs from ranchland west of Kruger in Limpopo in 1999, Limpopo valley in 1997, 1999 and 2001 and Mpumalanga in 1998 and 1999. Conservation efforts should rather focus on resolving conflict and conserving naturally occurring wild dogs *in situ*. This might be achieved by increasing tolerance through education programmes aimed at instilling a conservation ethic among ranchers, and highlighting potential ecotourism benefits associated with wild dogs (Lindsey 2003).

In conclusion, despite being cited as one of six countries with a viable population (Fanshawe *et al.* 1997), wild dog numbers are precariously low in South Africa, with an area of occupancy covering less than 4% of the country. There is, however, significant potential for land outside protected areas to contribute towards distribution expansion, despite the present persecution of wild dogs in these

areas. Ongoing efforts are thus important to reduce the negative attitudes of landowners through developing the ecotourism benefits that wild dogs can attract to private land (Lindsey 2003).

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