2013

Parque Nacional do Limpopo
AERIAL WILDLIFE CENSUS

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Wildlife Management Services

PARQUE NACIONAL DO LIMPOPO
MOÇANBIQUE

Index

Introduction

Following on to the aerial census in October 2010 a repeat census was attempted in 2012 but the aircraft had an engine failure and crash landed on the first day of counting. Fortunately there were no casualties or serious injuries. The experience of the pilot Dave Hart probably had much to do with a successful crash landing. The census was again undertaken in September 2013 and the results are submitted in this report. Every third transect was flown covering one third of the area as done in the 2010 census. Other large reserves in the Limpopo Transfrontier Park also follow this method. All large mammal species were recorded as well as burnt areas, domestic stock, villages and any other information that could be of value.

Methodology

Unlike the previous census in 2010 when the survey started from Massingir Village and then moved to from South to North, flying transects east to west and returning, this year the team started in the north and moved southwards flying east west transects. The team was based at the Gaza Camp for the entire duration of the census. A six seater Cessna 206 G Stationair was used due to its ability to operate off relatively short unpaved runways.

Figure 1: Airfields used in LNP.

The aircraft flew at approximately 100 knots (185 km/h) and at an altitude of 250" (76 m) above ground level. Prior to the census each observer was seated comfortably in the seats and the eye line level marked on the aircraft window. By measuring the height of each eye line level from the ground in the stationary aircraft, this measurement was equated to distances from below the aircraft to 100, 200, 300 and 400 meters on either side of the centerline. Crew were Guillerme Maluleque, Eugenio Mbenzane, Adilson Mandhlate, Bill Swanepoel, Russell Best and pilot Dave Hart. Mr Chris Everatt stood in for Mr Bill Swanepoel on the last 2 days of the census. Sightings were recorded by Russell Best with the species, sector observed, number of animals and coordinates. Other observations such as human activity were also logged in the same way. This data was downloaded as text files and transferred into Microsoft Excel and then uploaded to Arcview Geographic Information Systems (GIS) for the compilation of distribution maps. Only every third transect was flown but the whole park area was covered.

Transects were 2400 meters apart and the counters only recorded animals that were within 400 meters on either side of the aircraft track. Each sighting indicated where in the quadrants the sighting was observed, i.e. from the track to 100 meters out was A, 100 to 200 m was B, C was 200 to 300 m and D from 300 to 400 m from the aircraft.

The corresponding measurement was then transcribed to a measurement equating to 100, 200, 300 and 400 meters ranging out from the aircraft. This would then give the observer a guideline when spotting an animal as to how far it was from the aircraft. Each 100 meter sector from the aircraft was recorded as A, B, C and D with A being the first 100 meters. Measurements were taken from the stationary aircraft approximating every 100 meters away. The observer would then indicate where the outward lines were according to his sighting and a line was drawn on the aircraft window and marked accordingly. This was included to calculate any bias if there was any at a later stage.
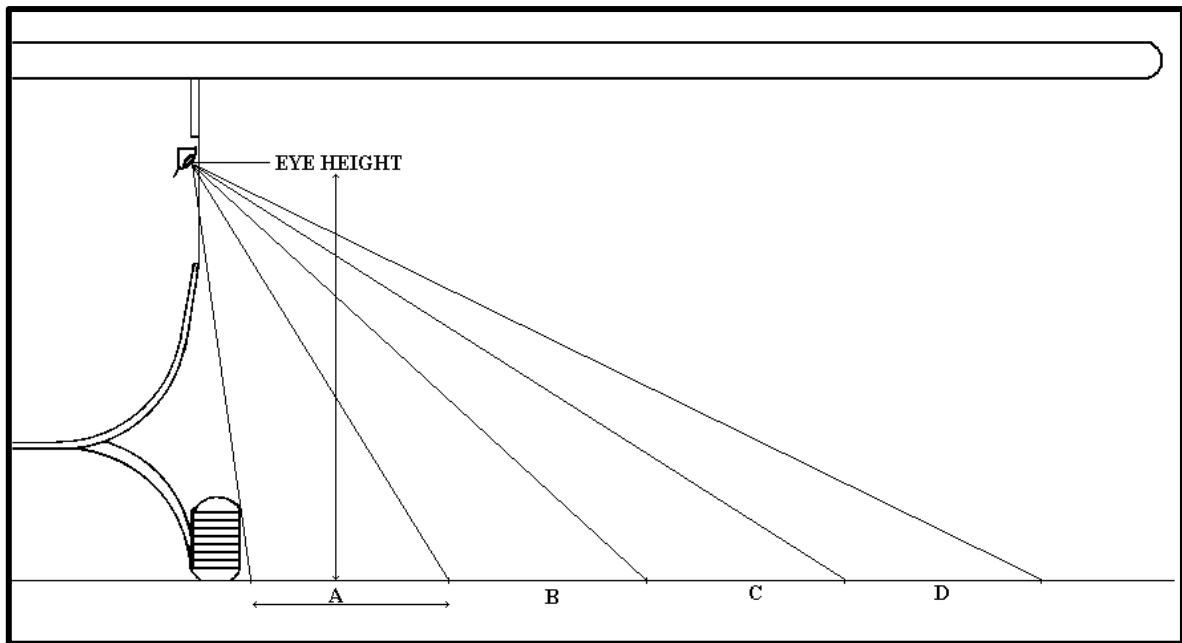

Figure 2: Observers.

Figure 3: Diagram of distance markings on aircraft.

Results

In the tables below are the results of the animals counted as well as the estimate of the possible number of animals that could be in the reserve. The density of the animals per square kilometer (Park area 11233 km^2) was also calculated as requested by the park management. Unfortunately the laptop computer and GPS were lost shortly after the census and although the data had been stored in duplicate the tracks from the GPS were lost so no "Snail Trail" is given of the flight path flown during the census.

Wildlife

SPECIES	COUNT	ESTIMATE	DENSITY *
Baboon troops	3	9	0.0008
Buffalo	314	942	0.0013
Bushbuck	1	3	0.0003
Crested Guinea Fowl Flocks	-	-	-
Crocodile	10	30	0.0027
Duiker	39	117	0.0104
Eland	1	3	0.0003
Elephant	201	603	0.0537
Giraffe	15	45	0.0040
Hippo	8	16	0.0014
Hornbill Ground	38	114	0.0101
Impala	94	282	0.0251
Jackal B.B.	-	-	-
Klipspringer	-	-	-
Kudu	111	333	0.0296
Leopard	1	3	0.0003
Nyala	107	321	0.0013
Ostrich	22	66	0.0059
Rhino White	2	6	0.0005
Sable	-	-	-
Steenbuck	4	12	0.0011
Warthog	14	42	0.0037
Waterbuck	10	30	0.0027
Wildebeest Blue	28	84	0.0075
Zebra	61	183	0.0163

Domestic Stock

SPECIES	COUNT	ESTIMATE	DENSITY *
Cattle	2036	6108	0.5438
Dog	5	15	0.0013
Goat	806	2418	0.2153
Sheep	61	183	0.0163
Carcass	26	78	0.0069

* Density is animals/flocks/troops per km2 (Park area 11233 km2)

Maps

Maps of all species counted are included below. Each symbol has the number of animals counted indicated next to the sighting. Maps for human activity are also included as well as surface water observed.. Human activity included villages, people and domestic dogs.
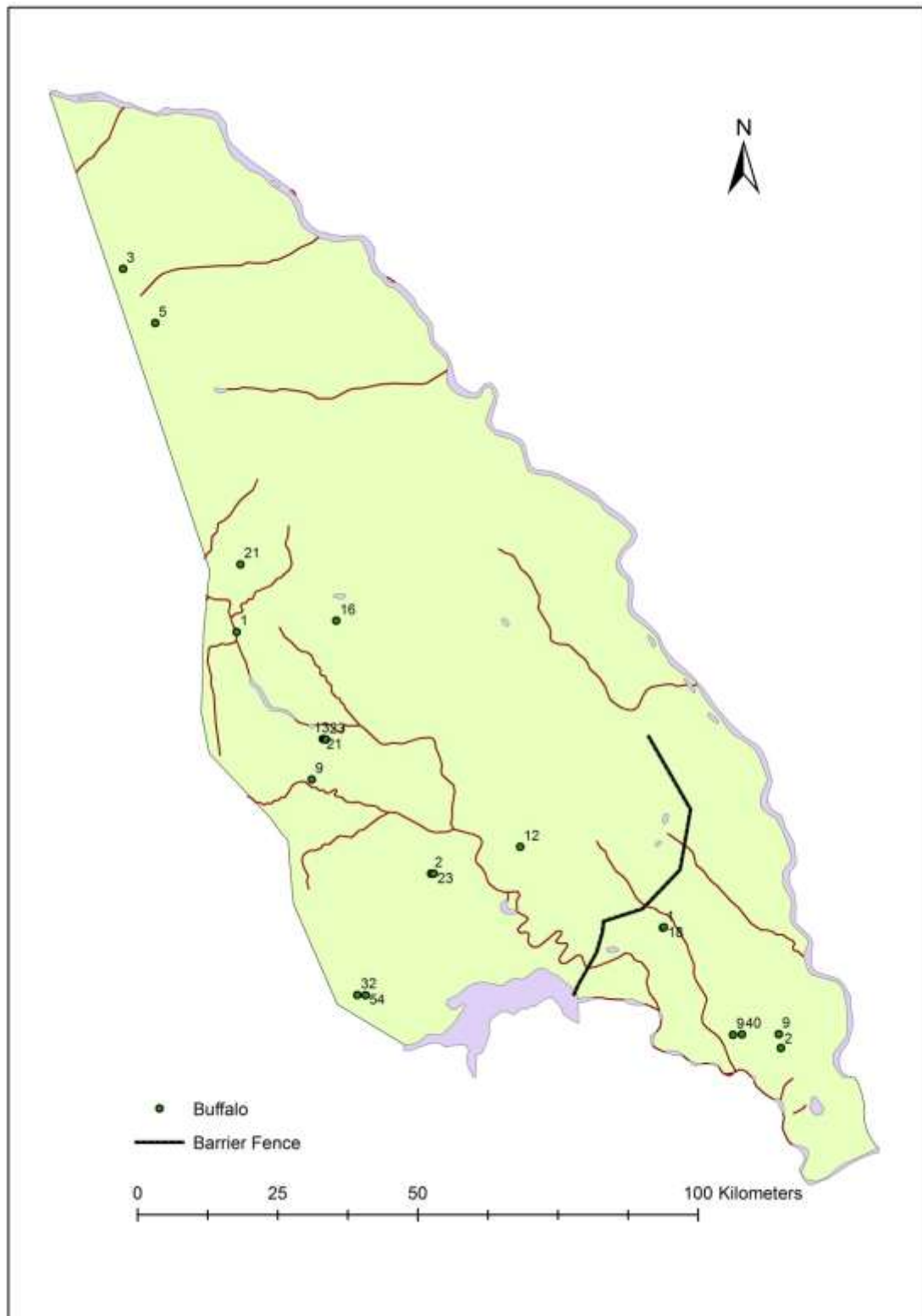

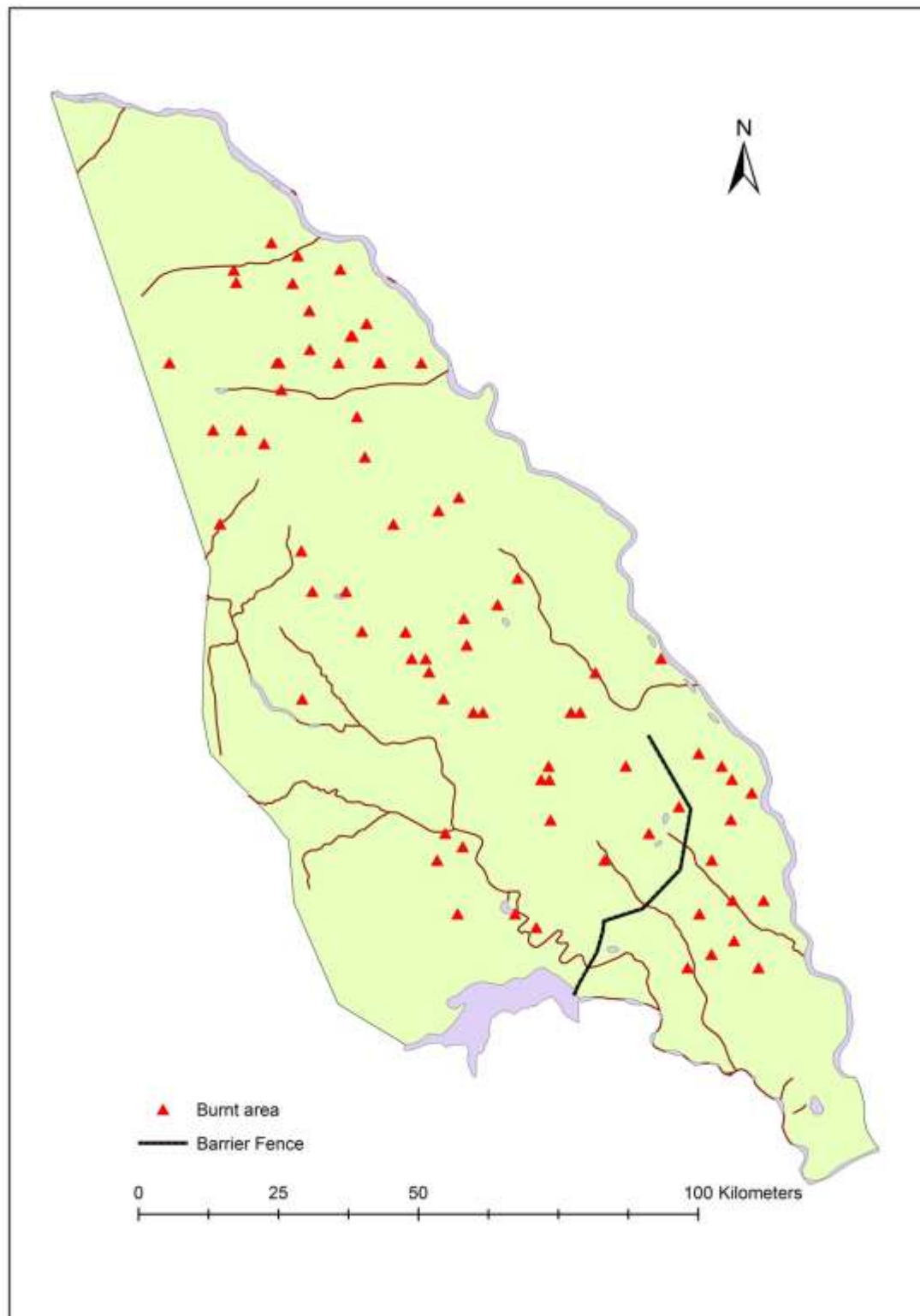**Figure 4: Baboon troops**

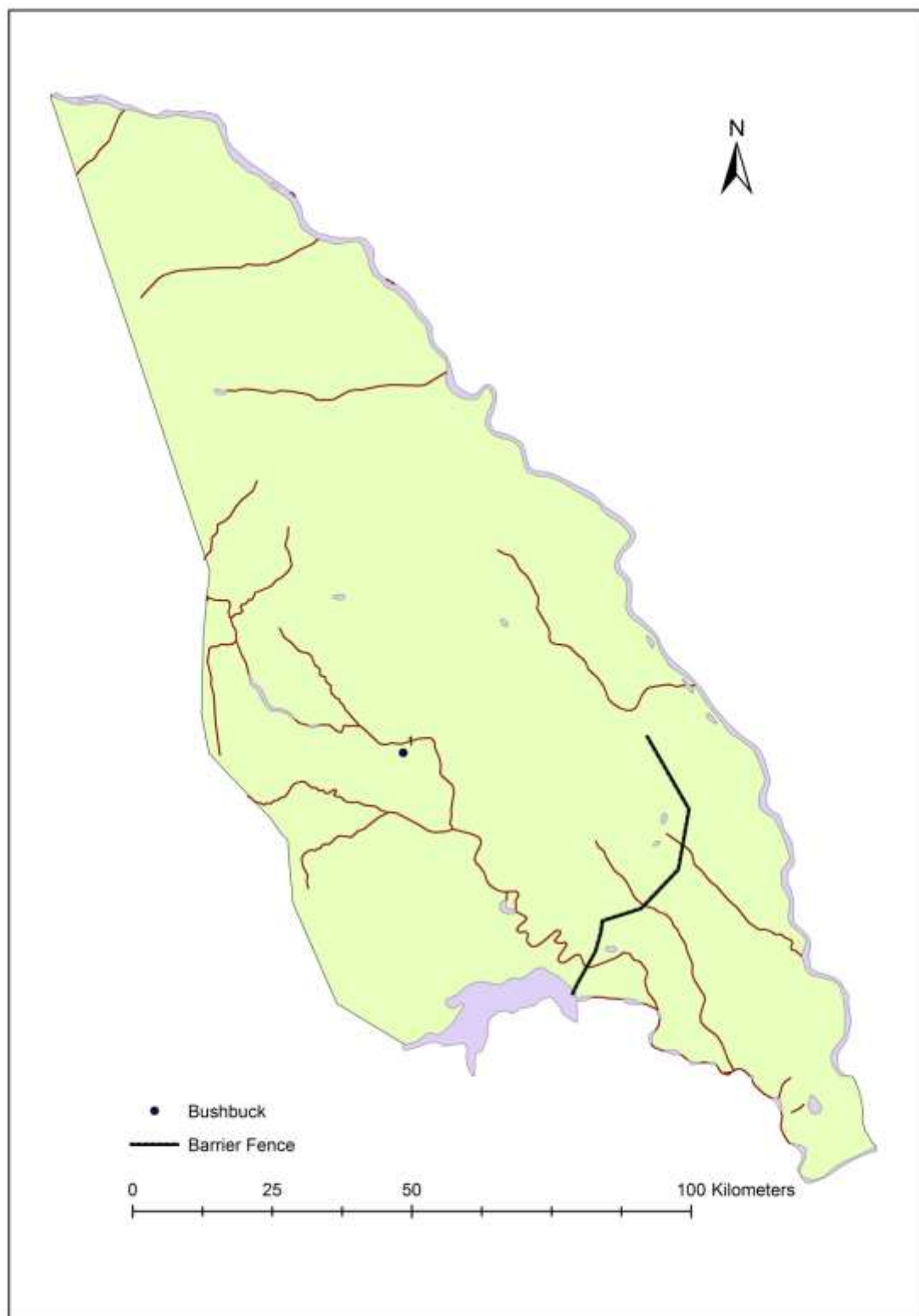**Figure 5: Buffalo**

Figure 6: Burnt area

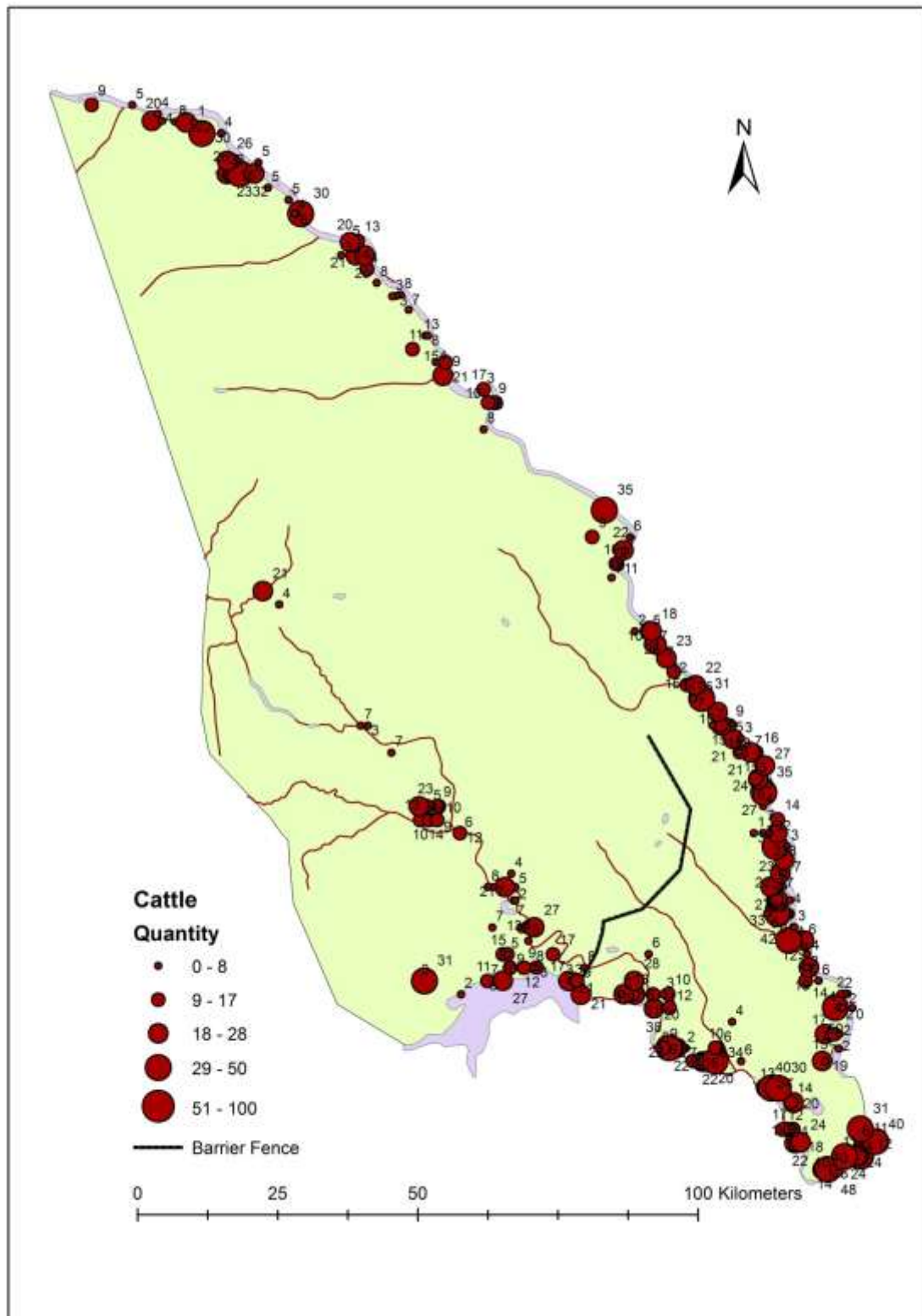**Figure 7: Bushbuck**
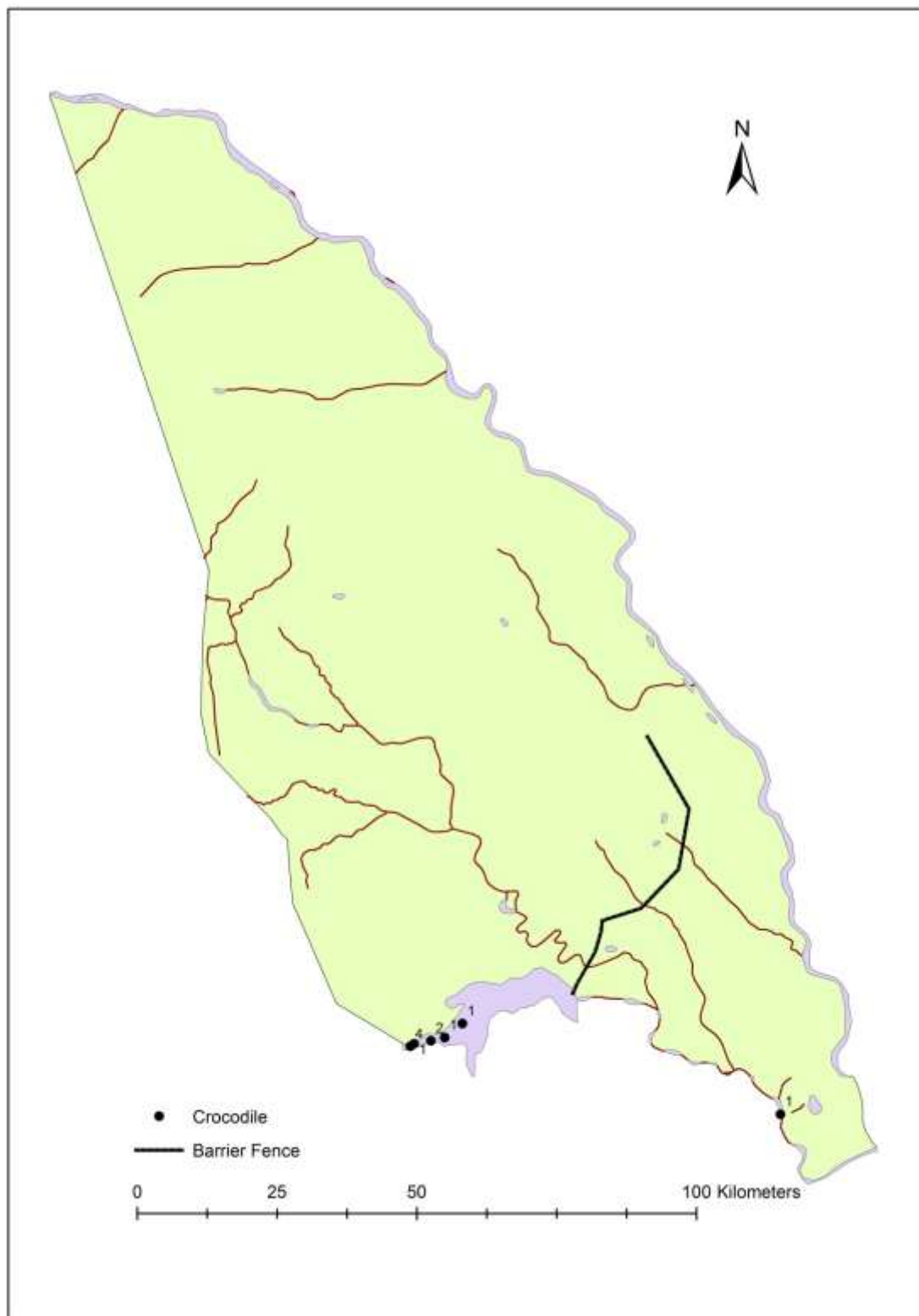
Figure 8: Carcass sightings
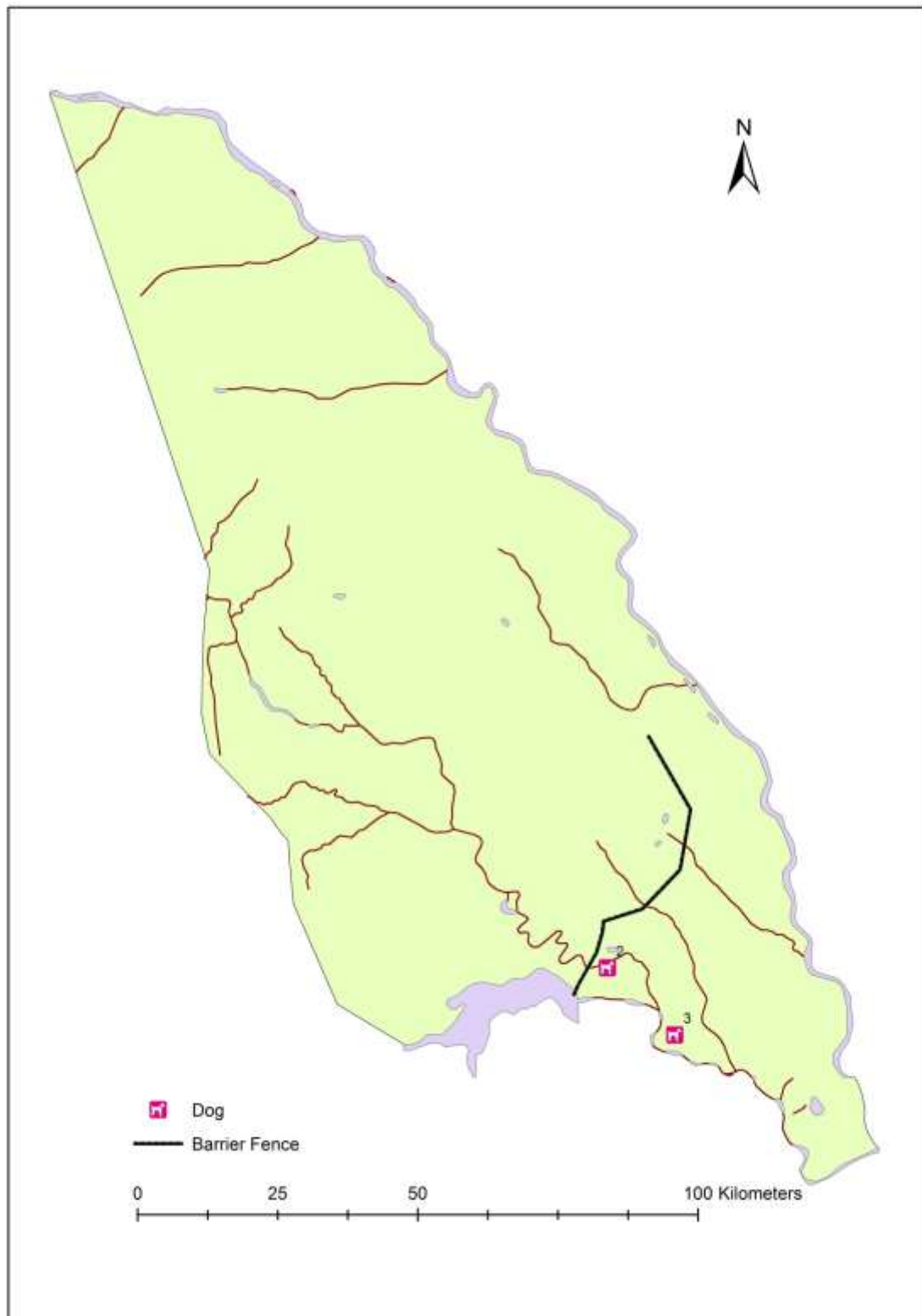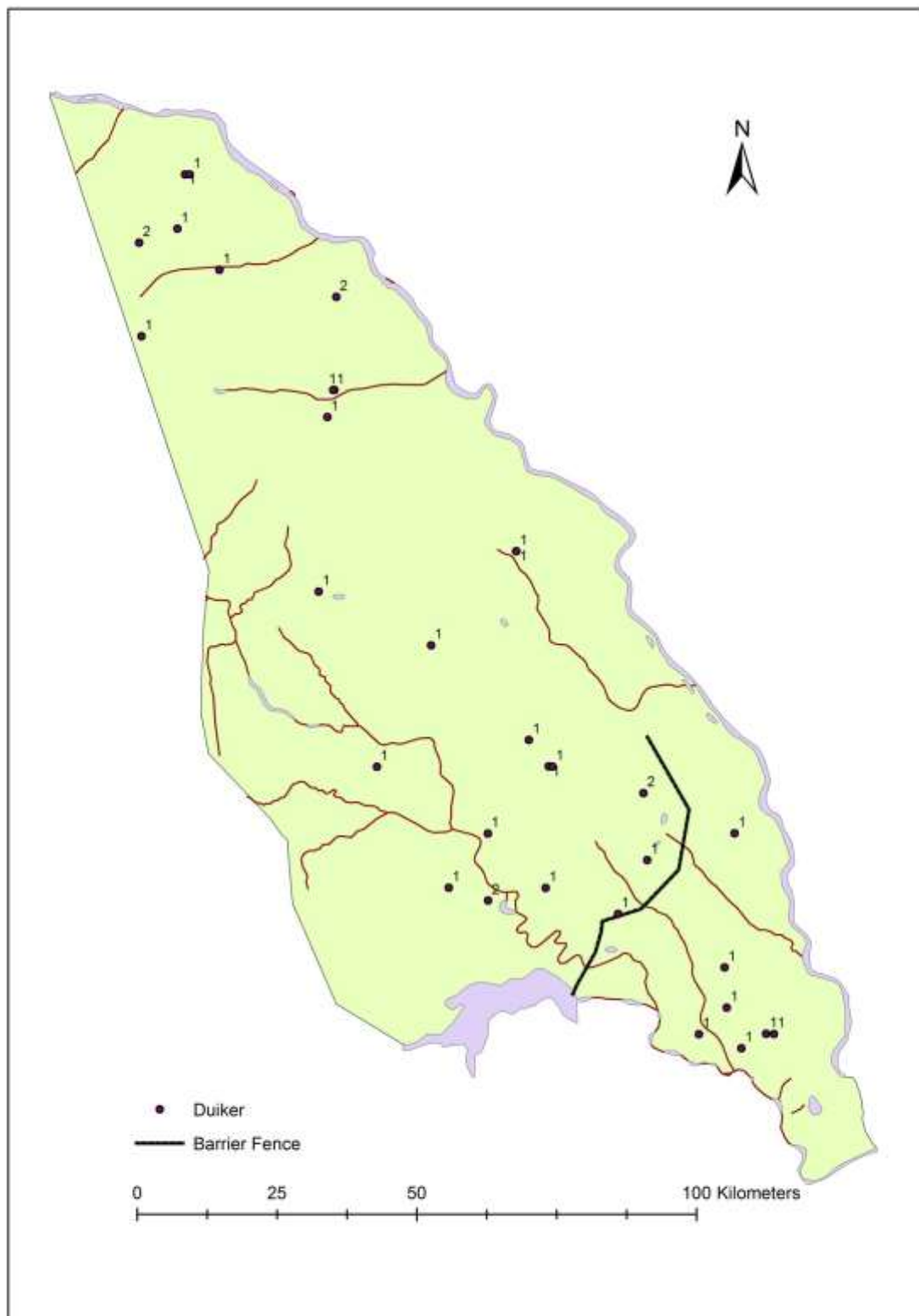
Figure 9: Cattle

Figure 10: Crocodile

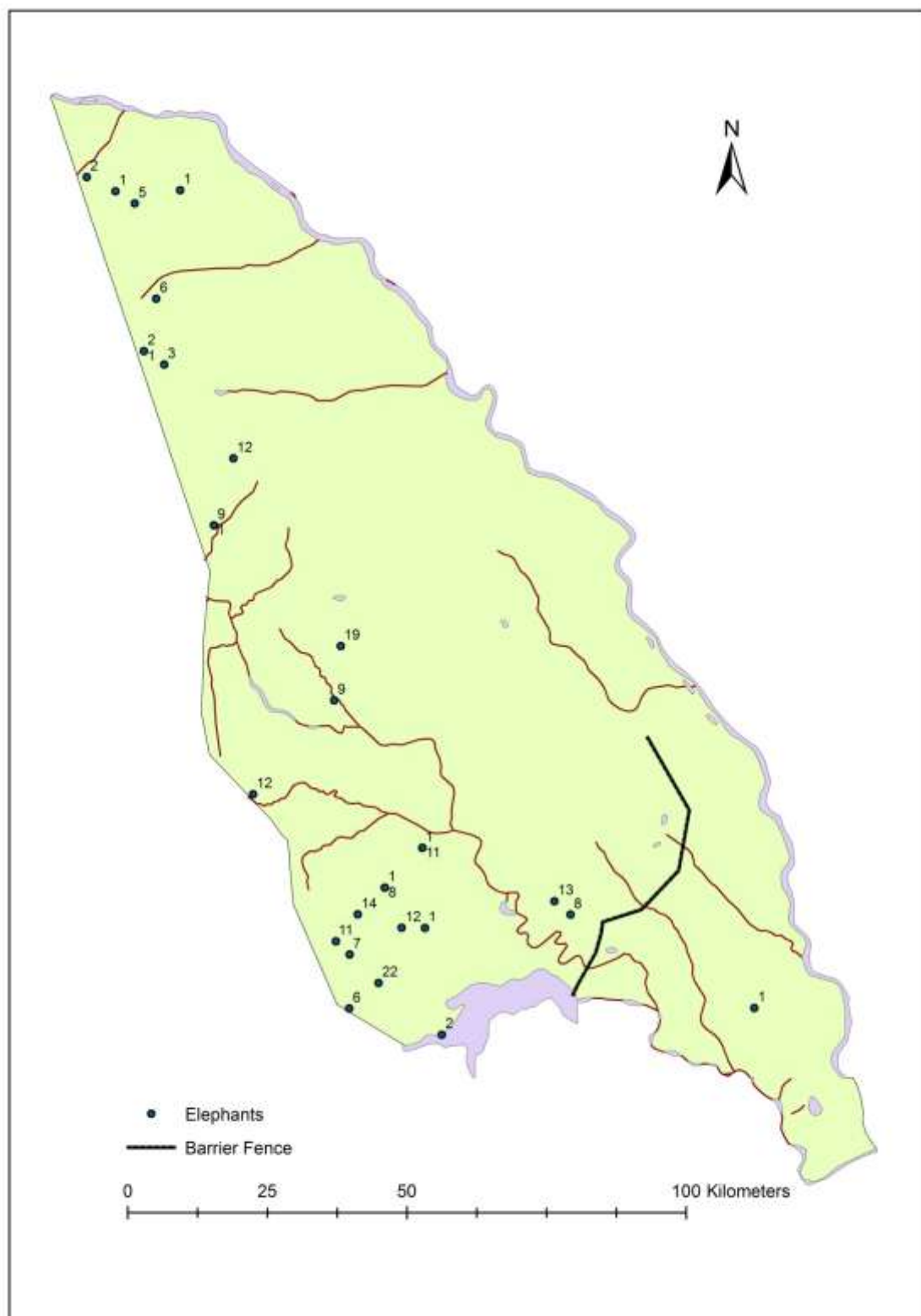Figure 11: Domestic dogs

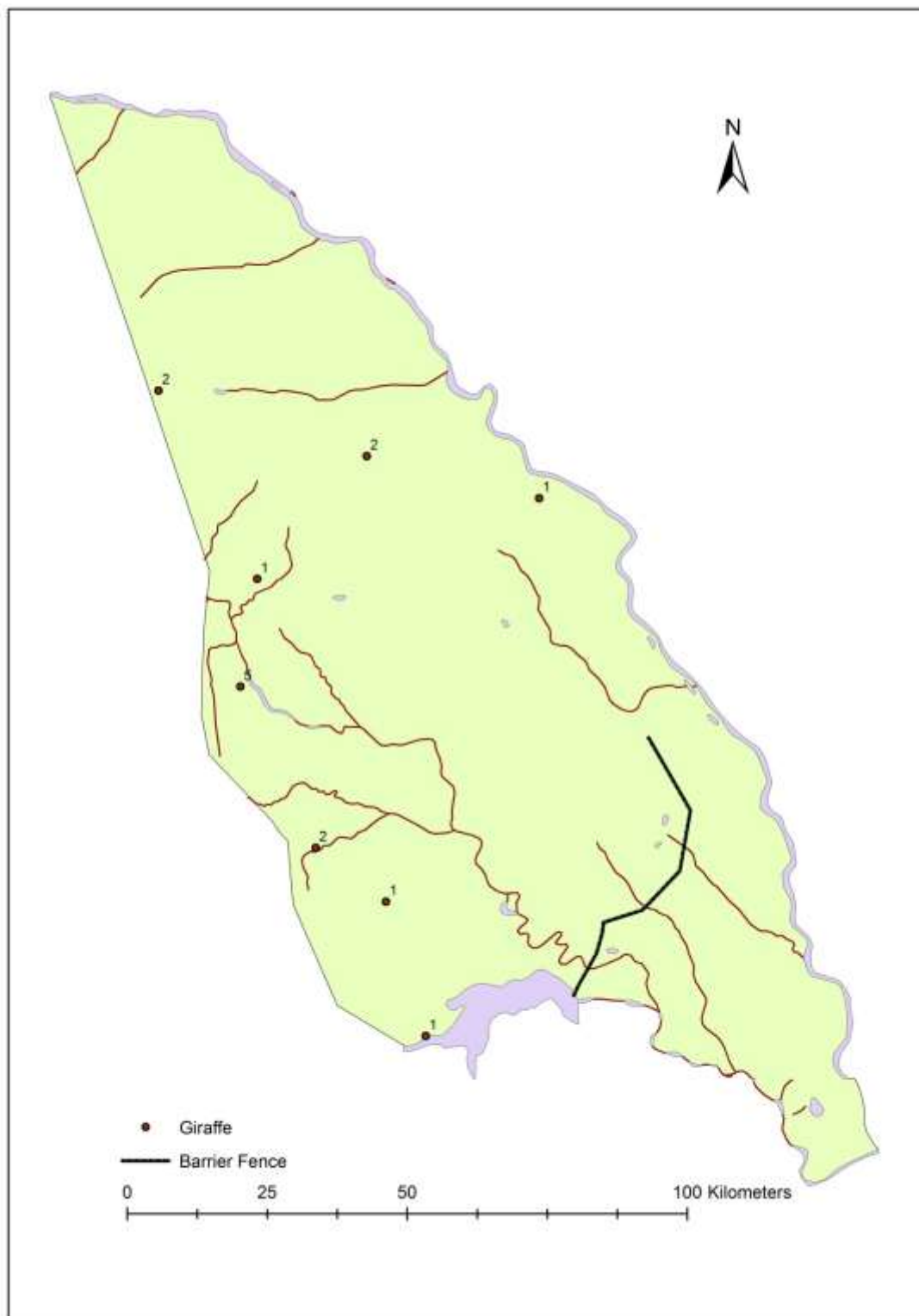**Figure 12: Duiker**
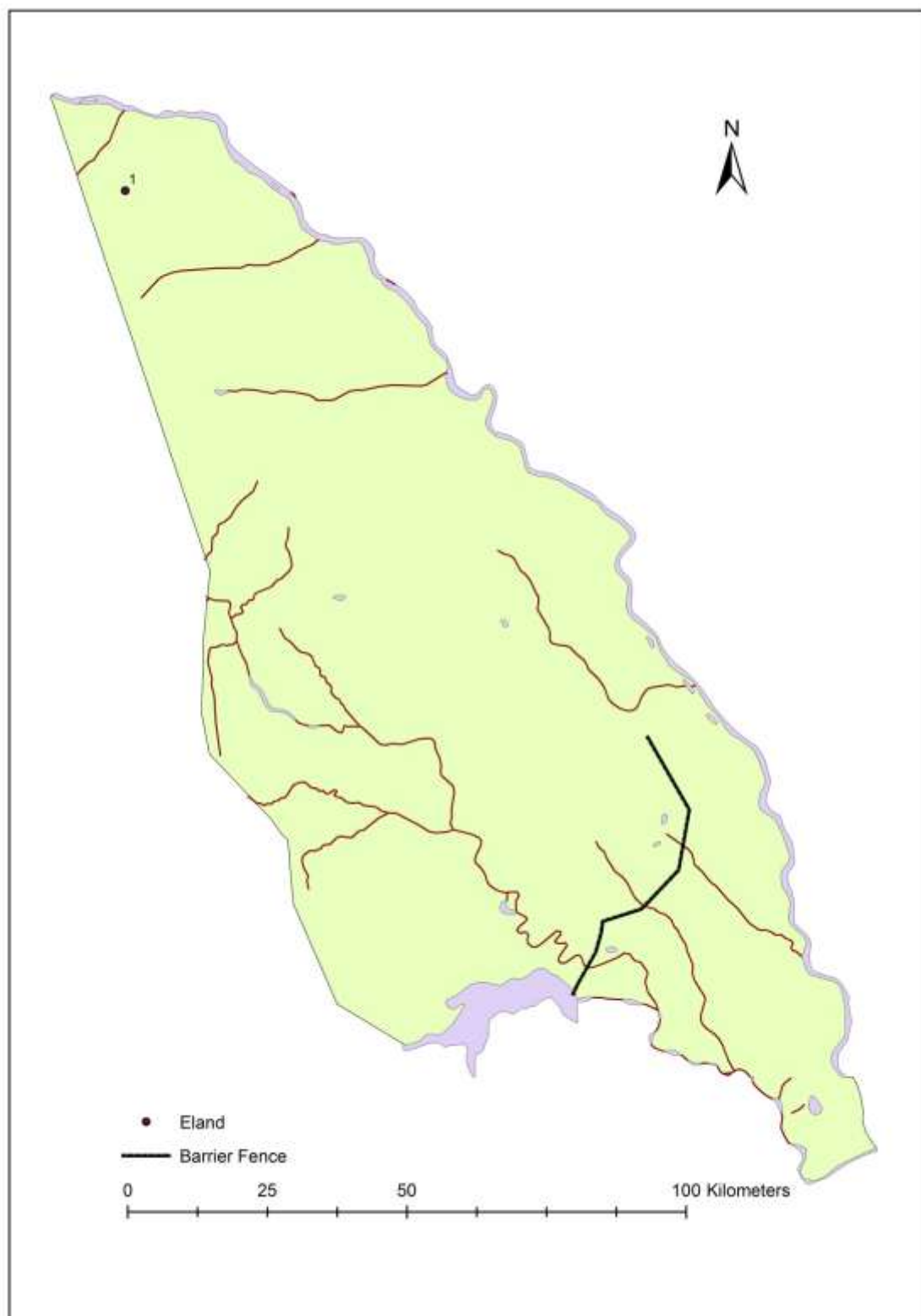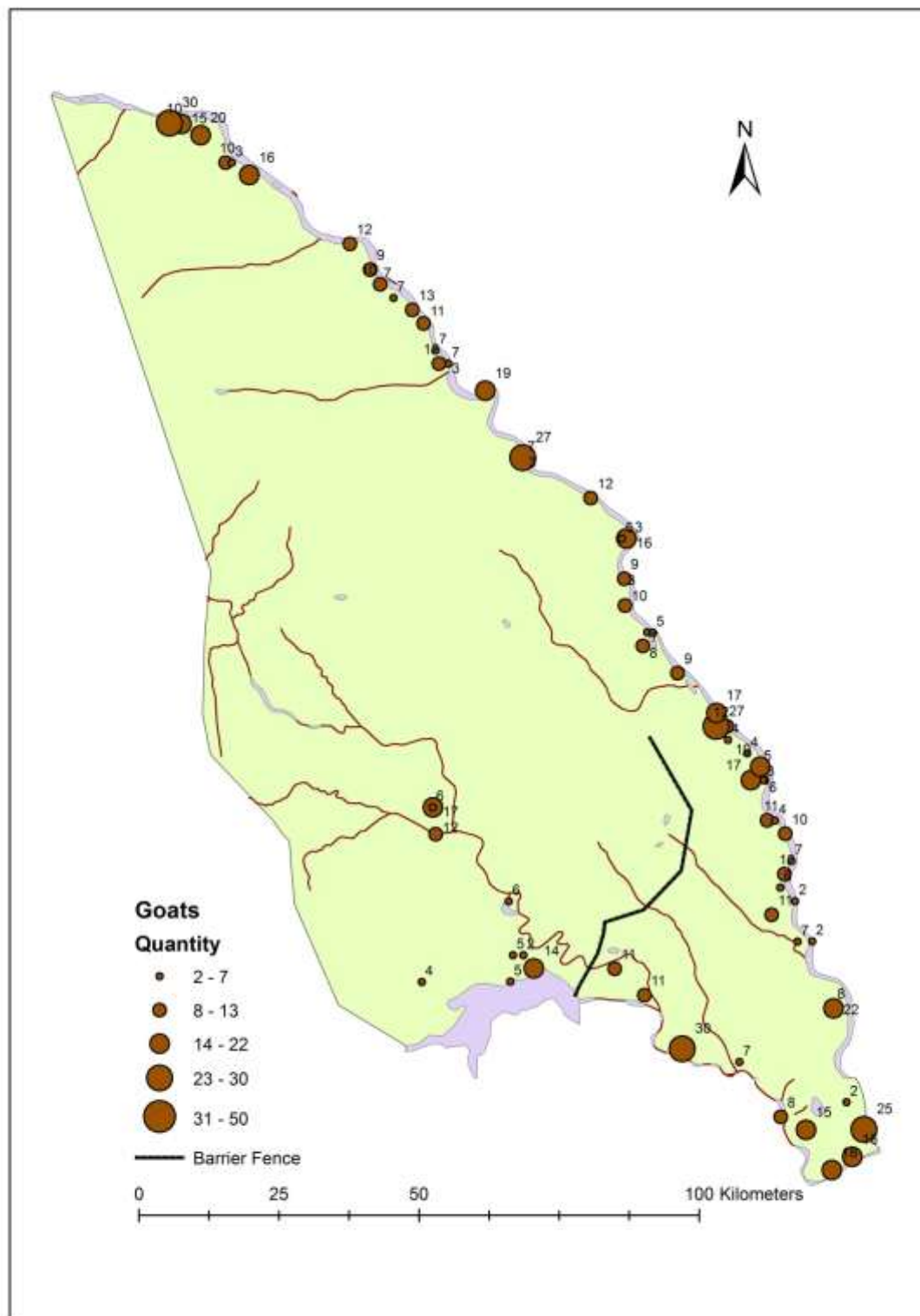
Figure 13: Eland

Figure 14: Elephant
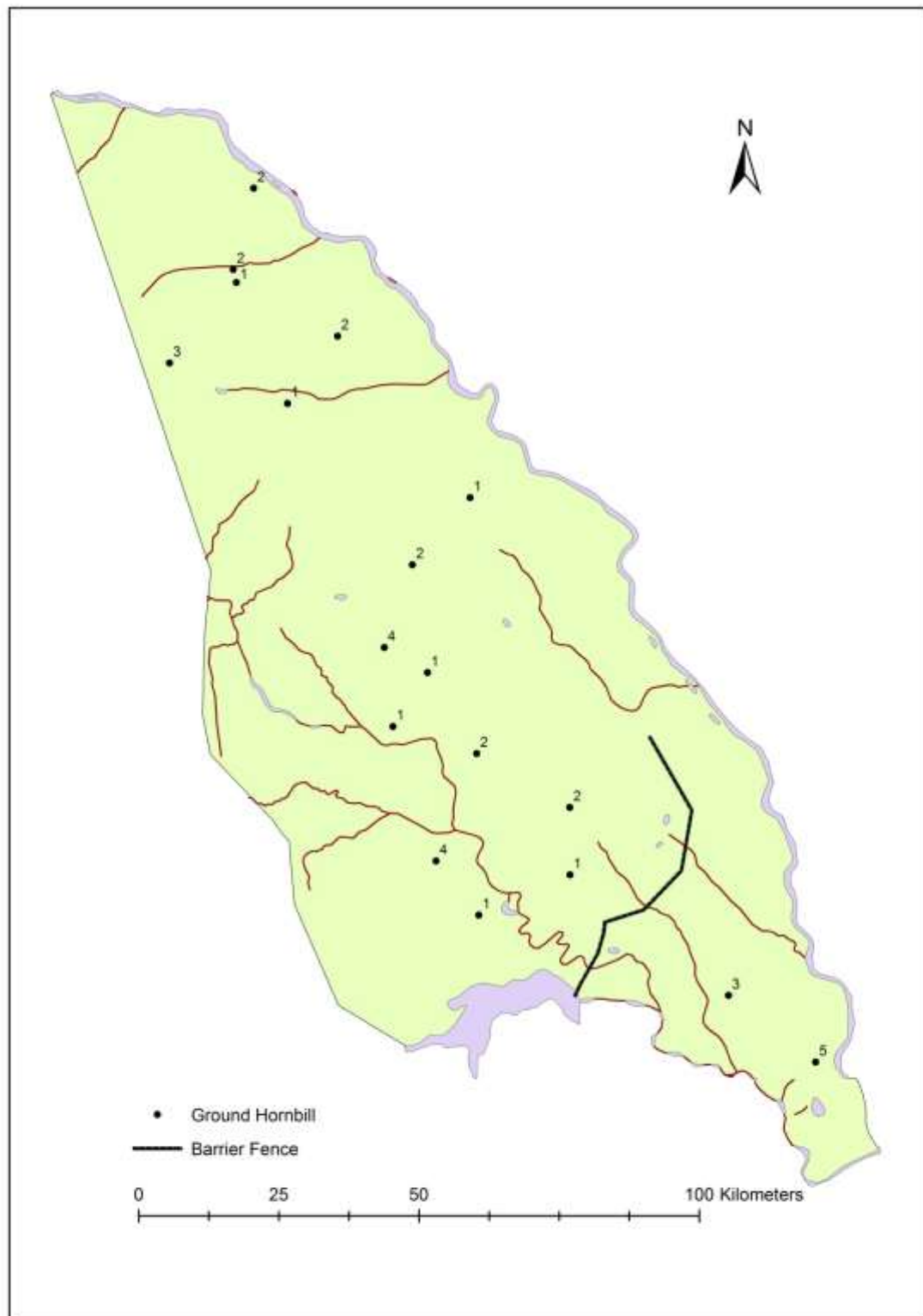
Figure 15: Giraffe
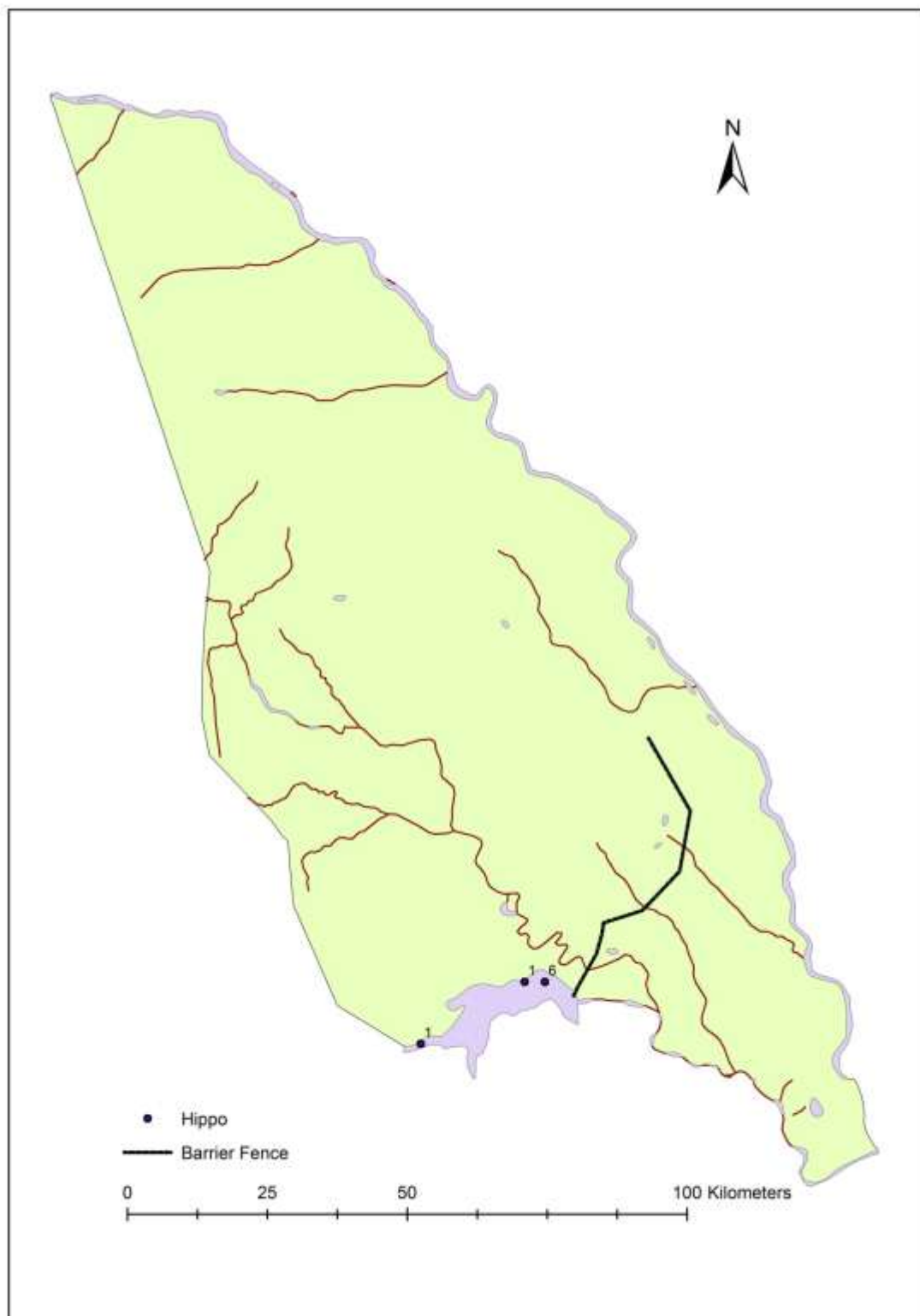
Figure 16: Goats

Figure 17: Hornbill

Figure 18: Hippopotamus

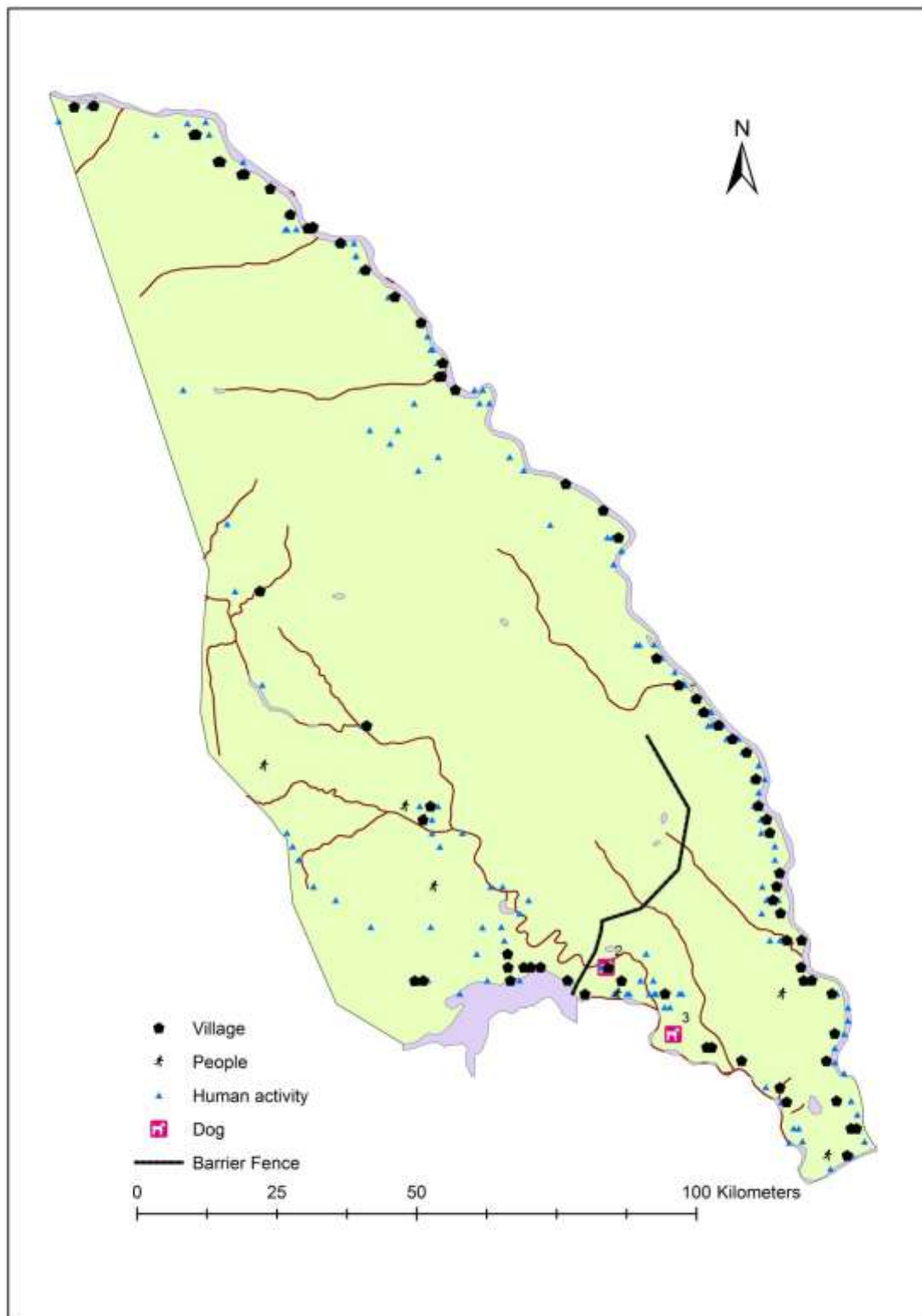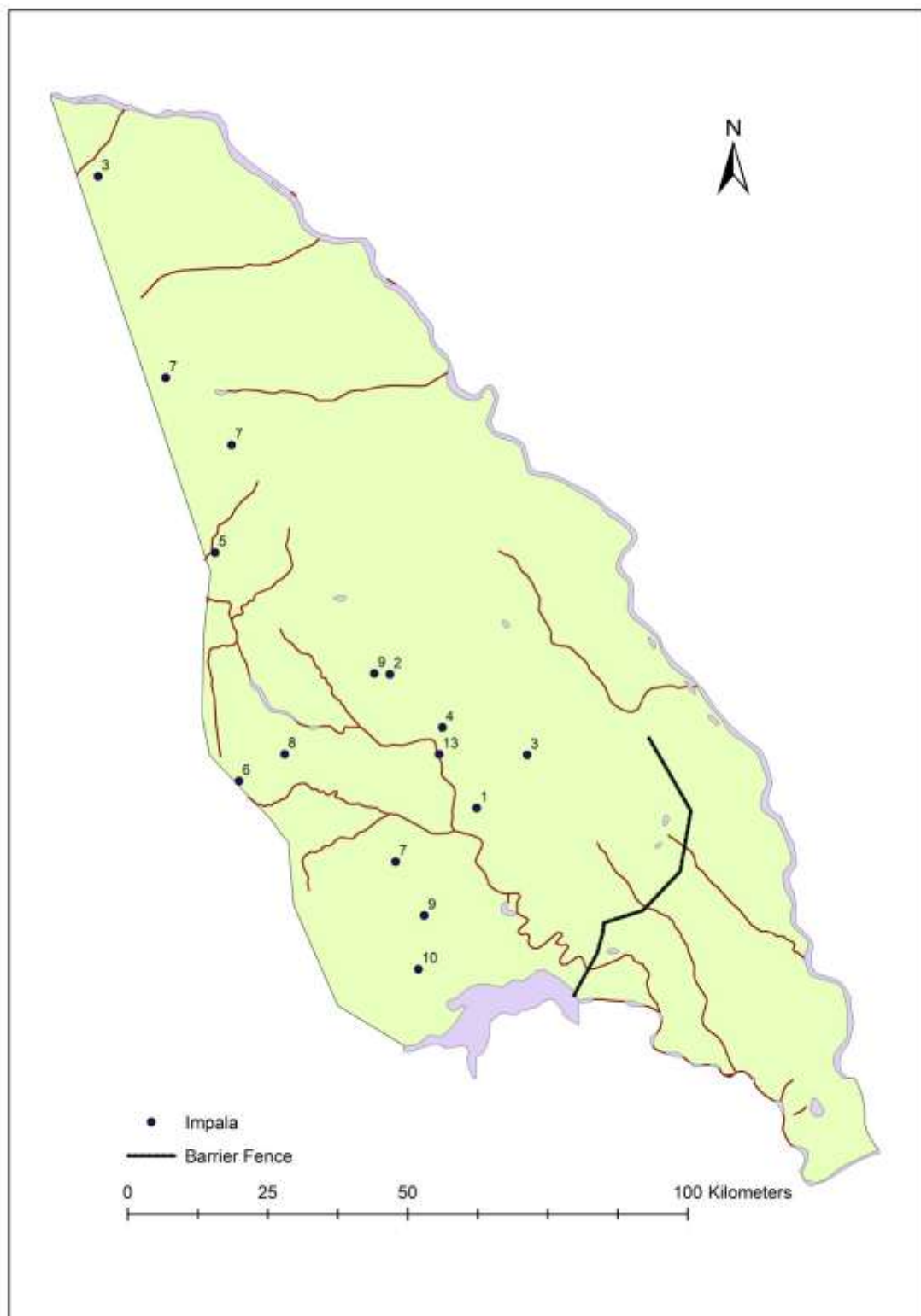**Figure 19: Human activity**

Figure 20: Impala
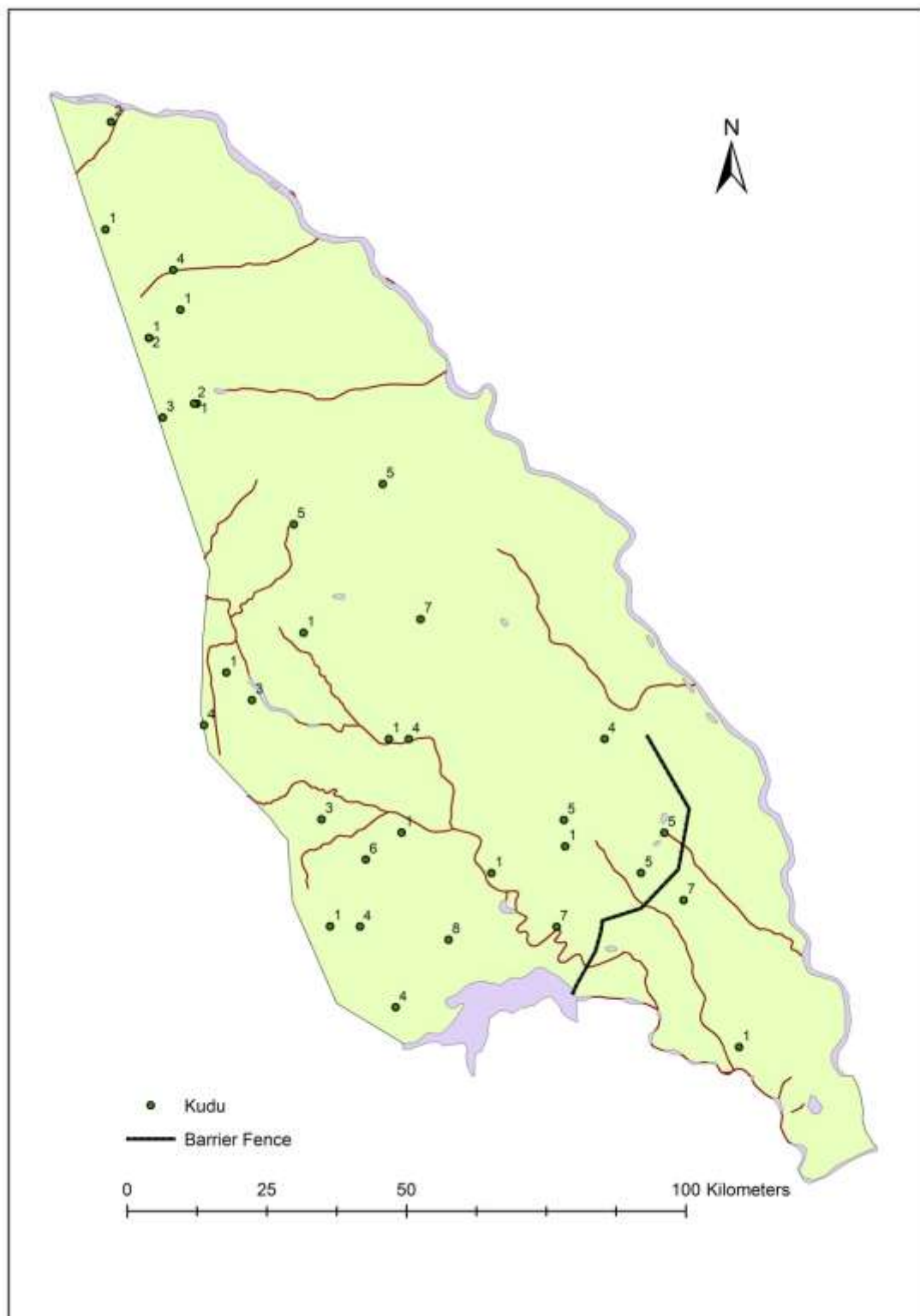
Figure 21: Kudu

Figure 22: Leopard

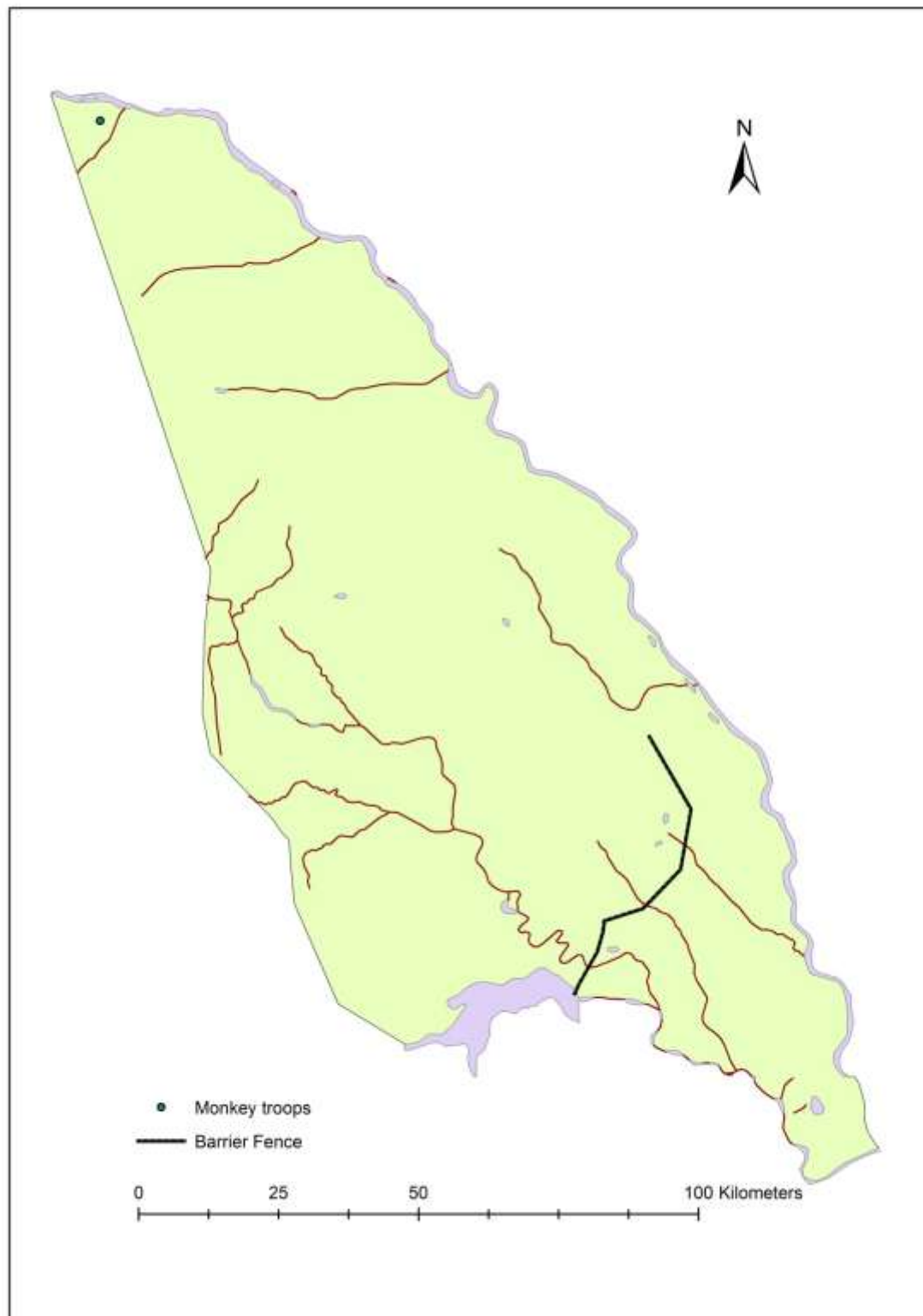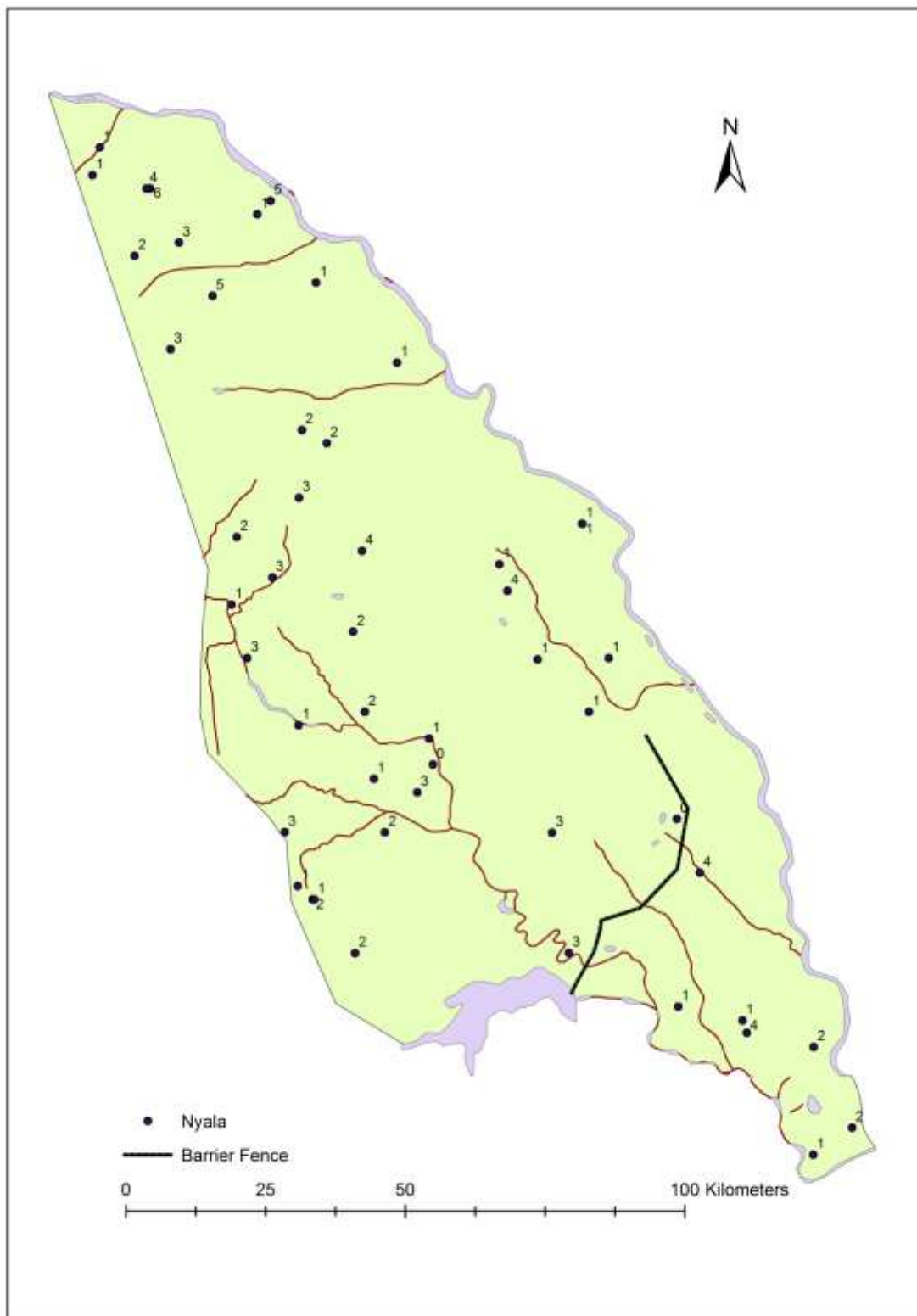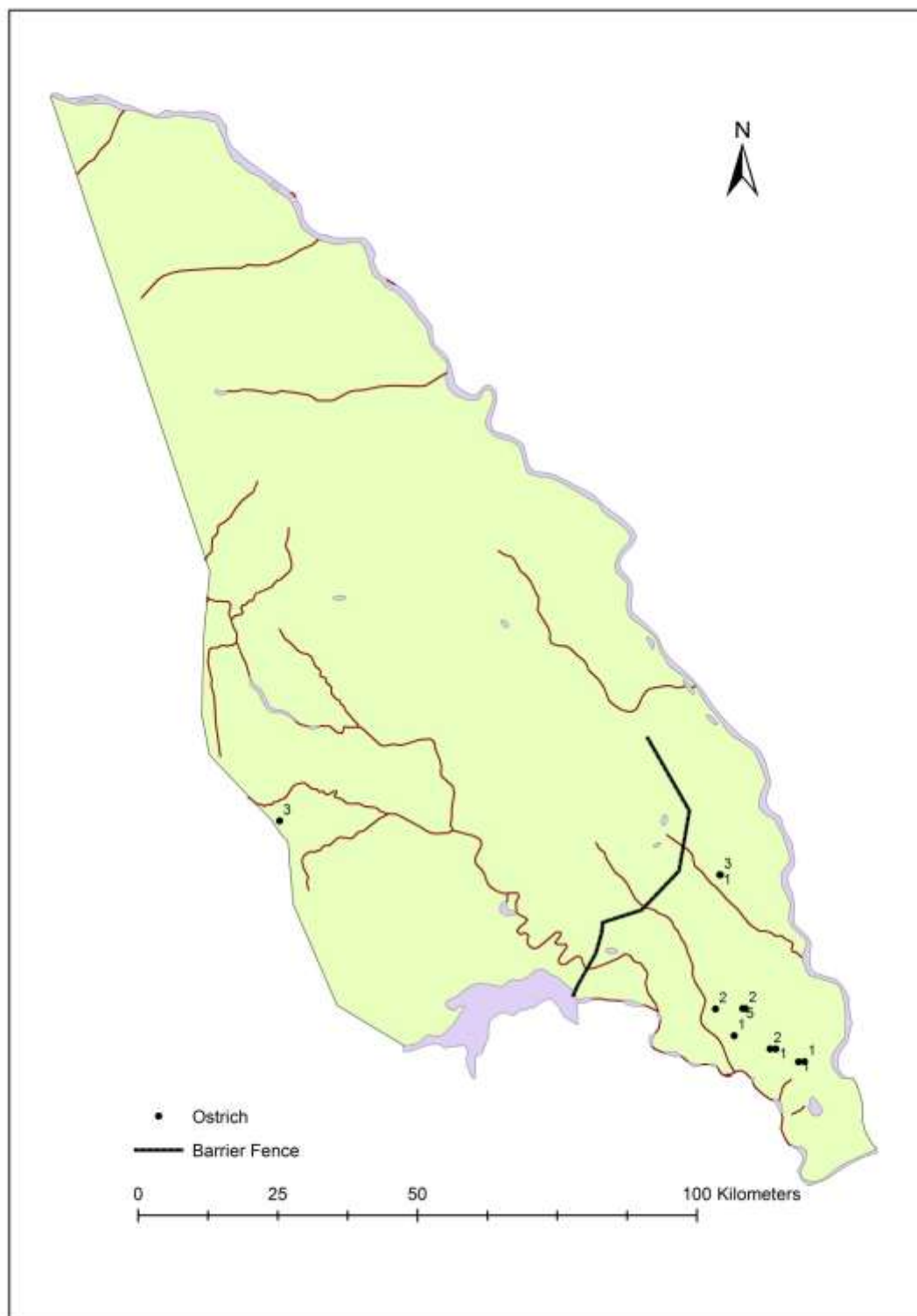**Figure 23: Monkey troops**
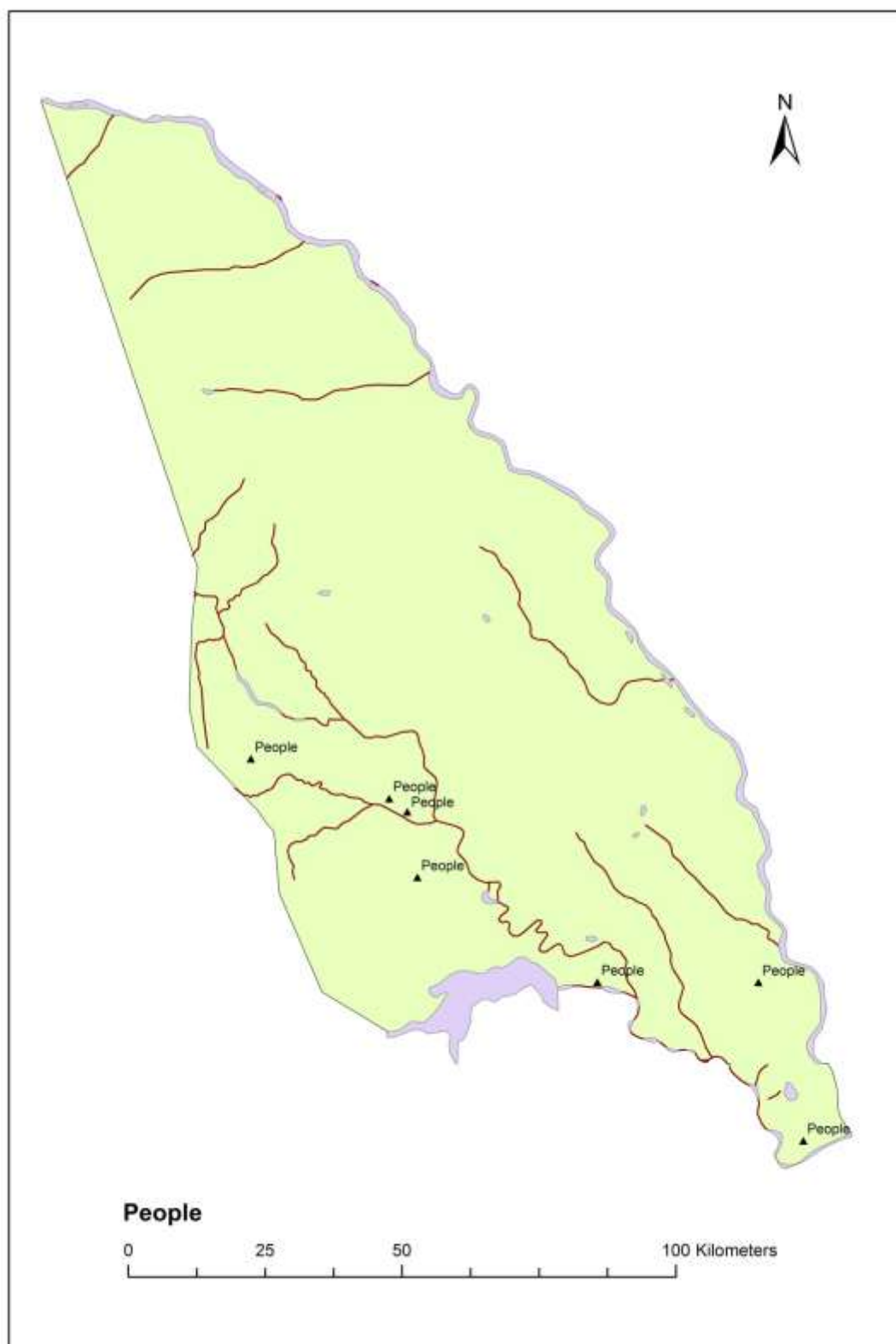
Figure 24: Nyala

Figure 25: Ostrich

Figure 26: People
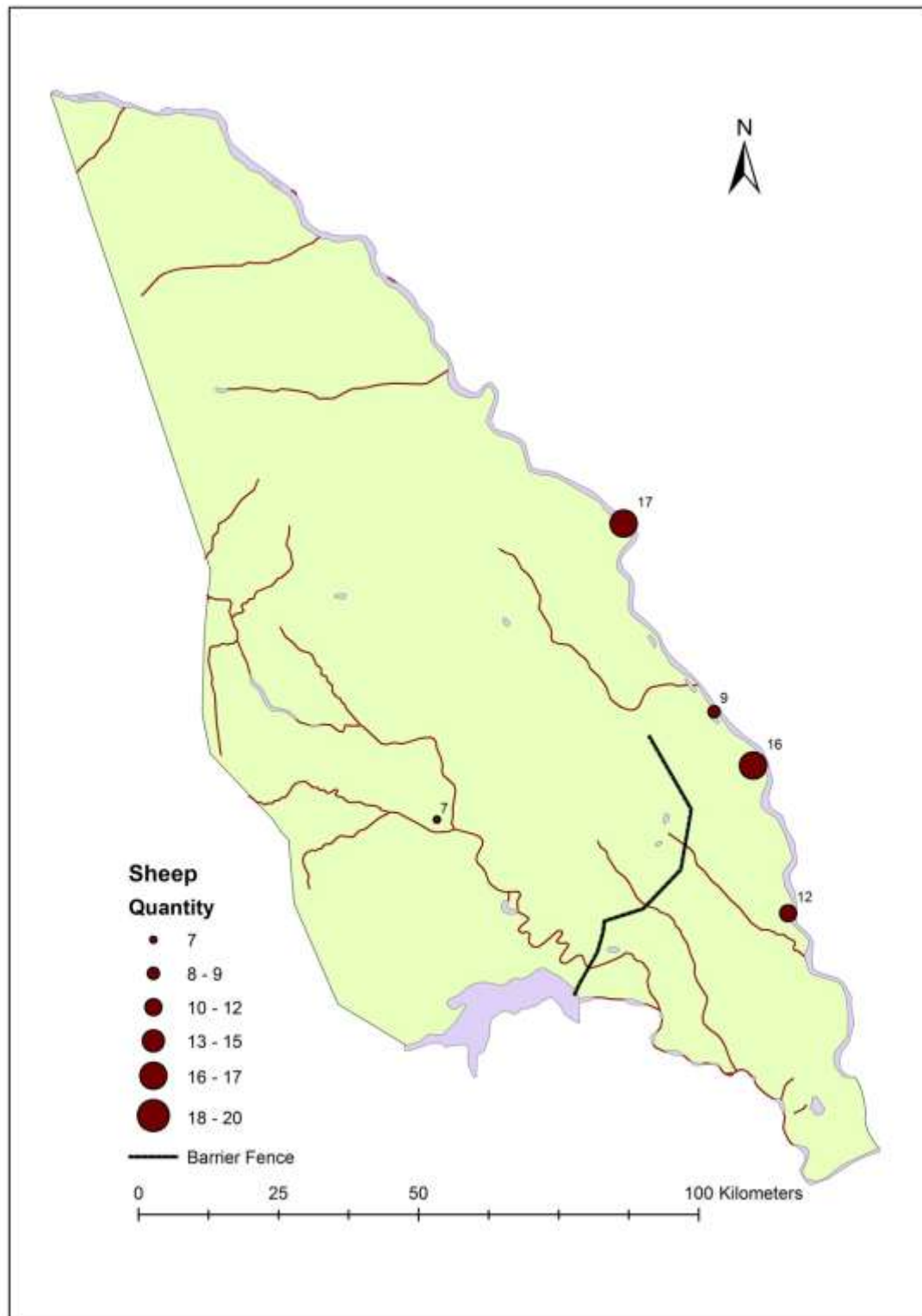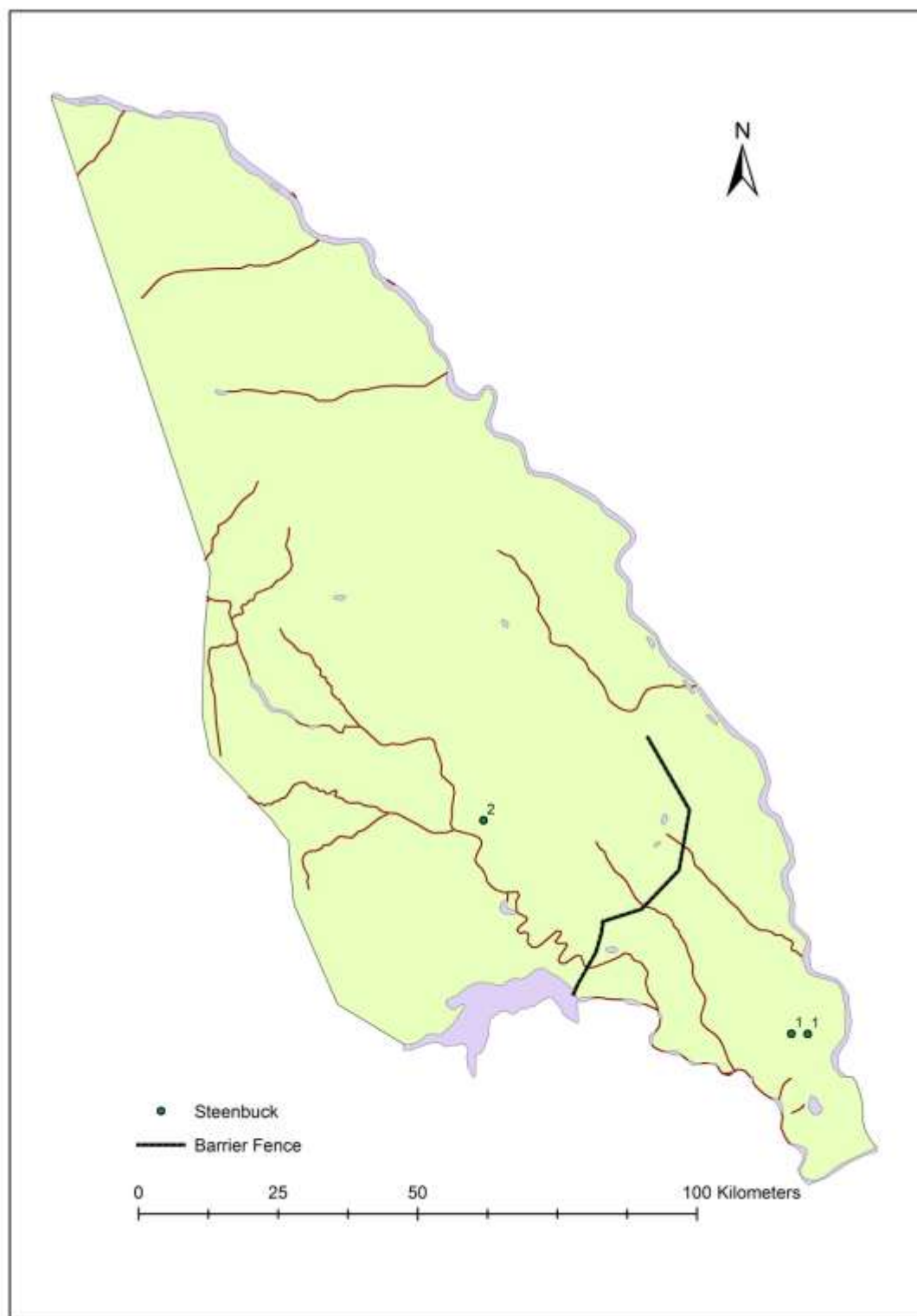
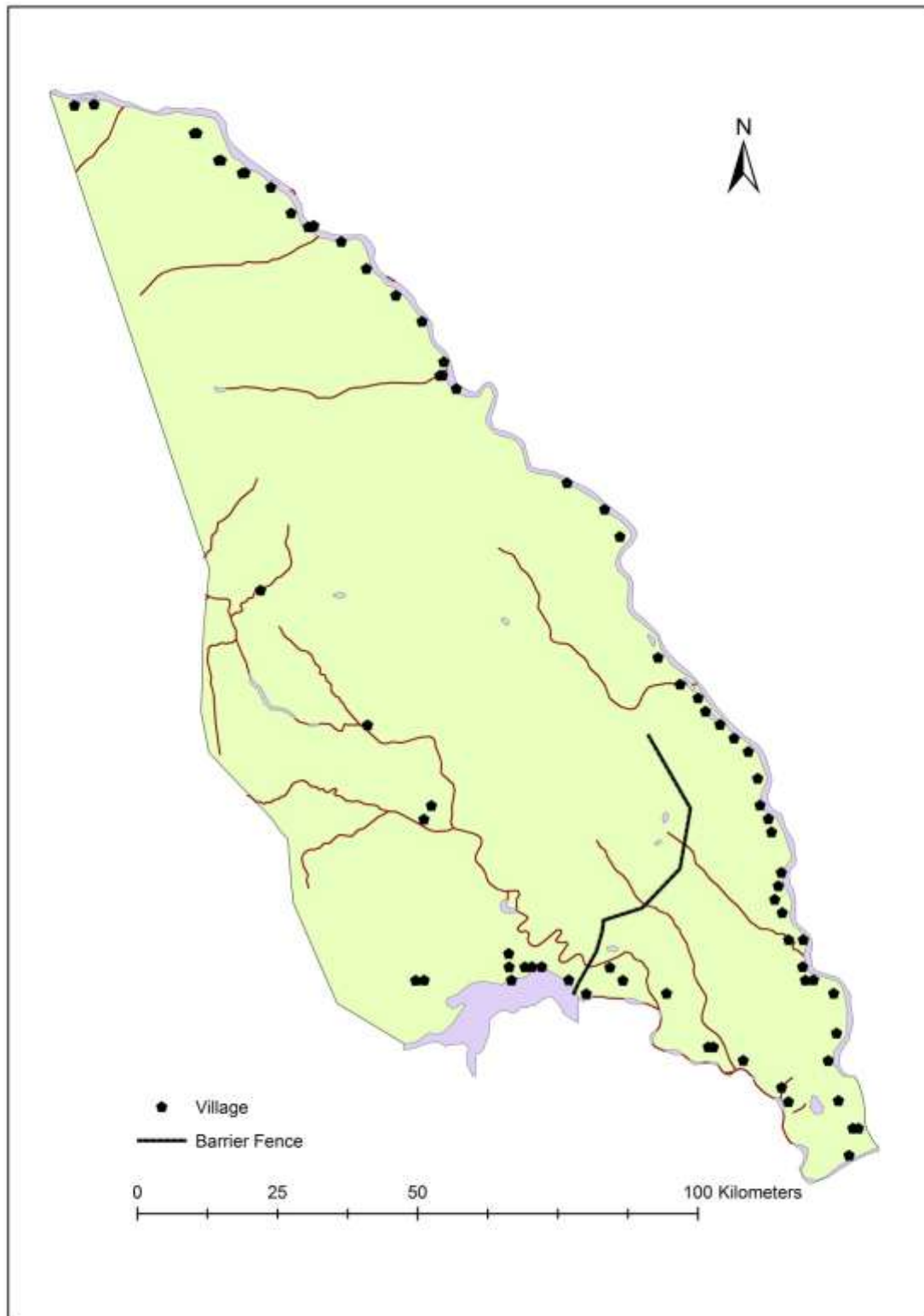Figure 27: White rhinoceros

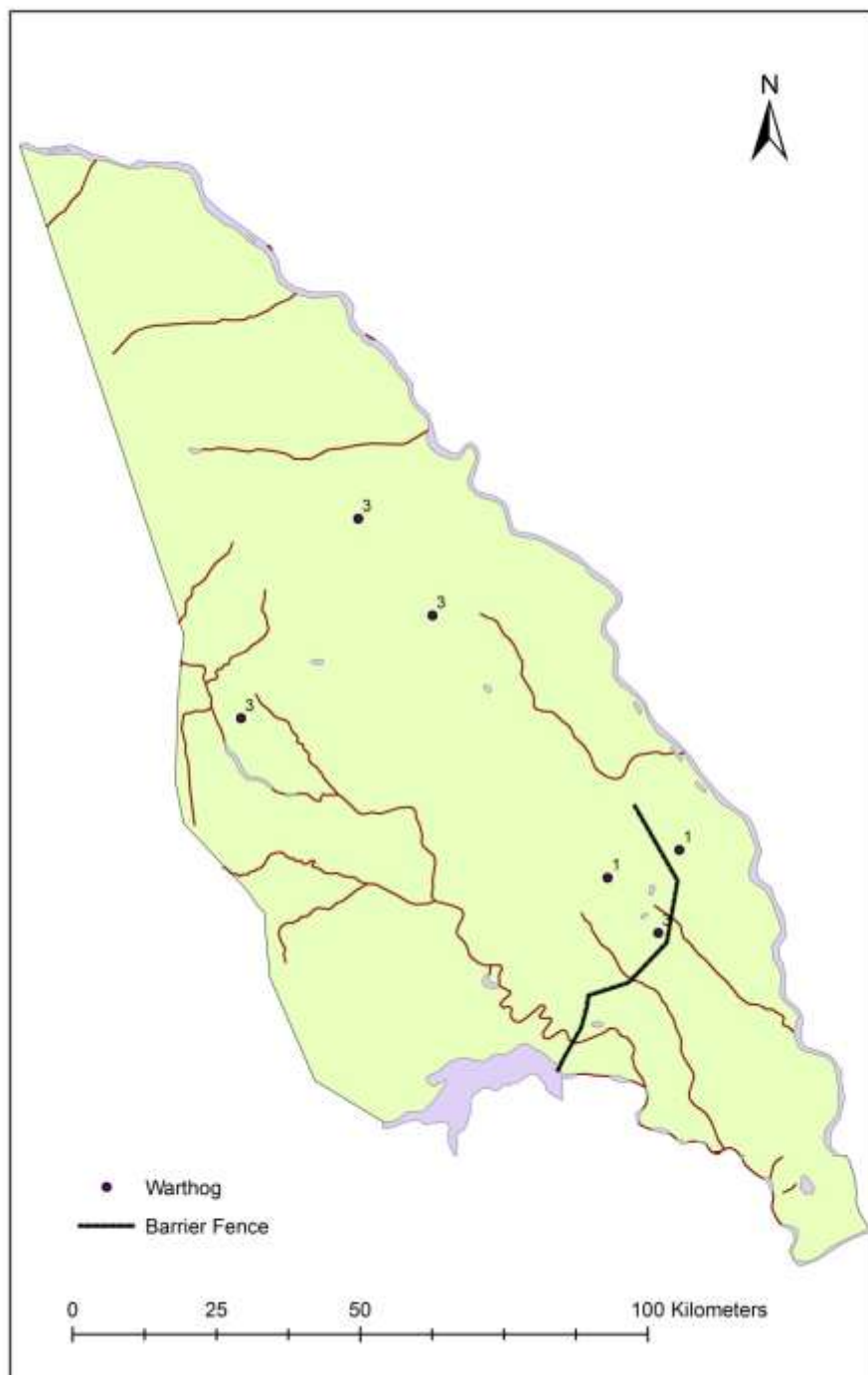Figure 28: Sheep

Figure 29: Steenbuck

Figure 30: Villages
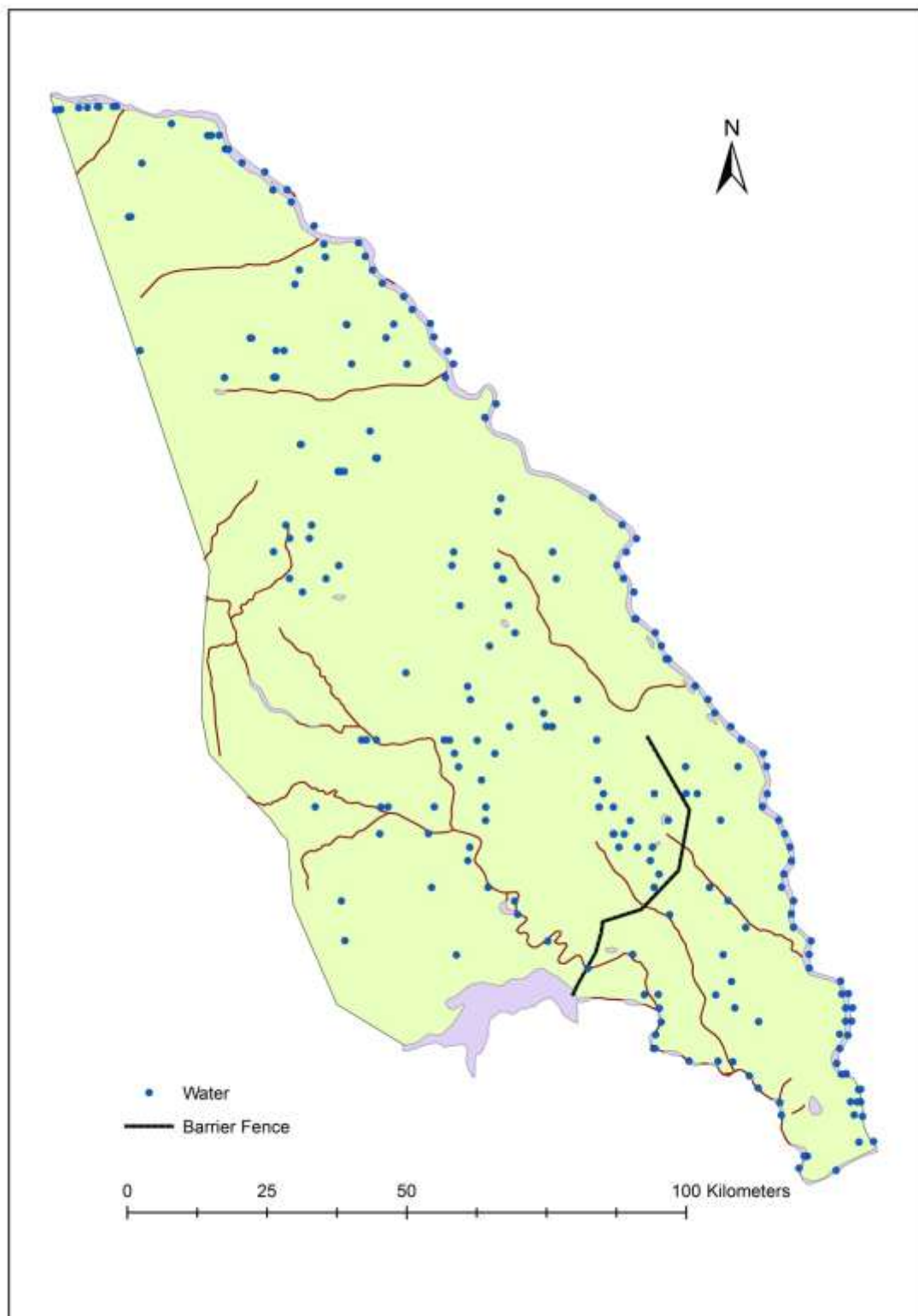
Figure 31: Warthog
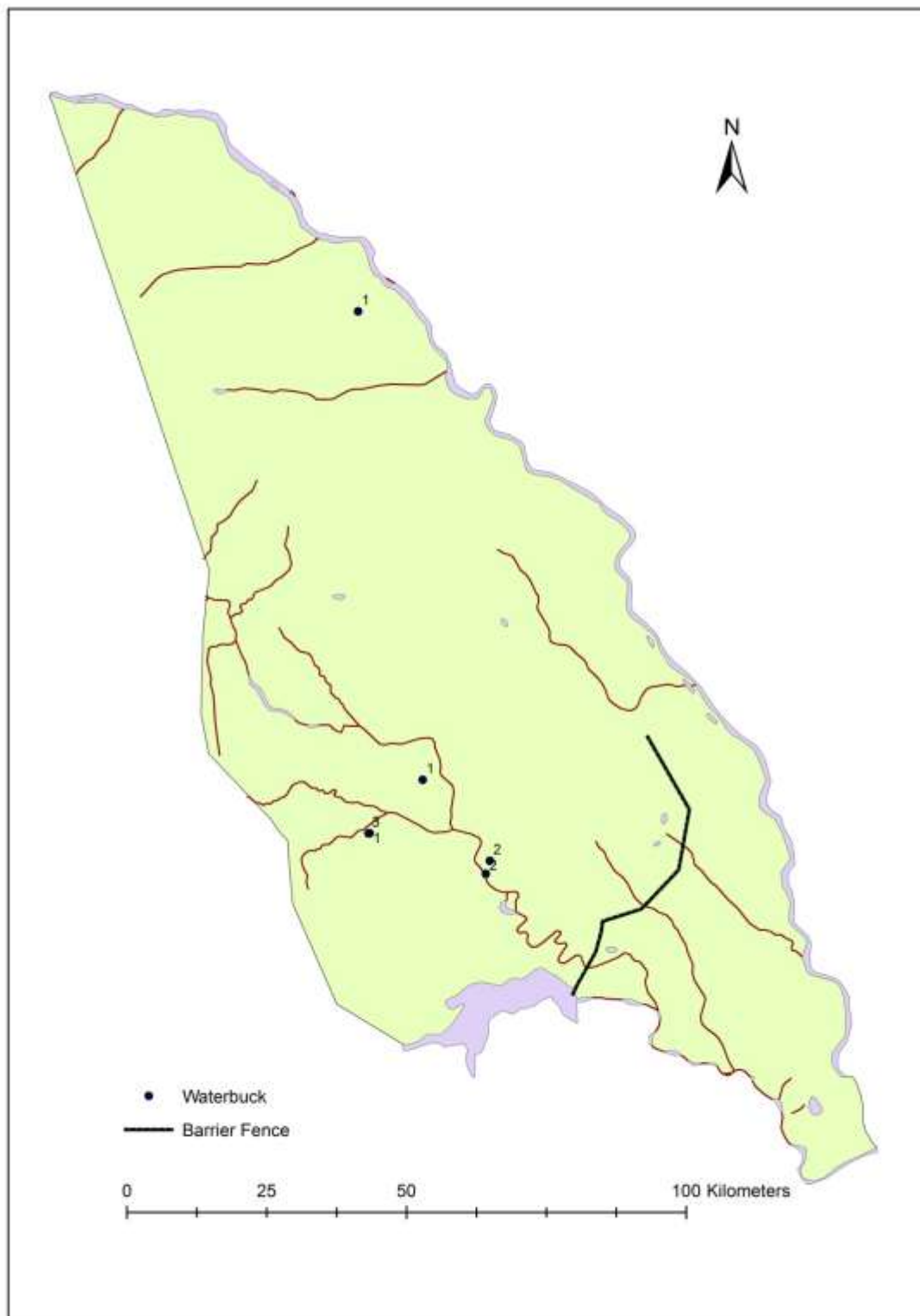
Figure 32: Surface water

Figure 33: Waterbuck
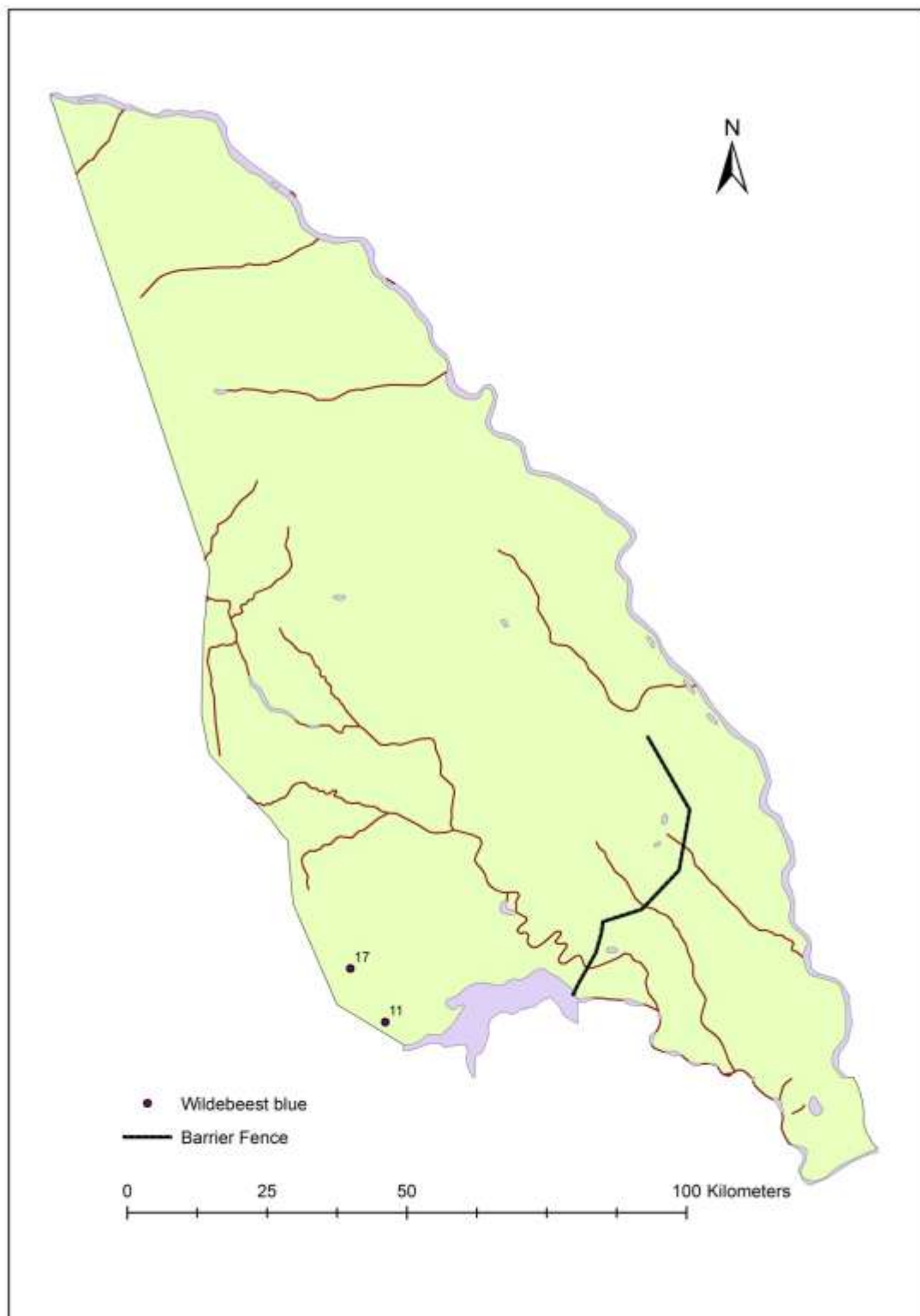
Figure 34: Blue wildebeest
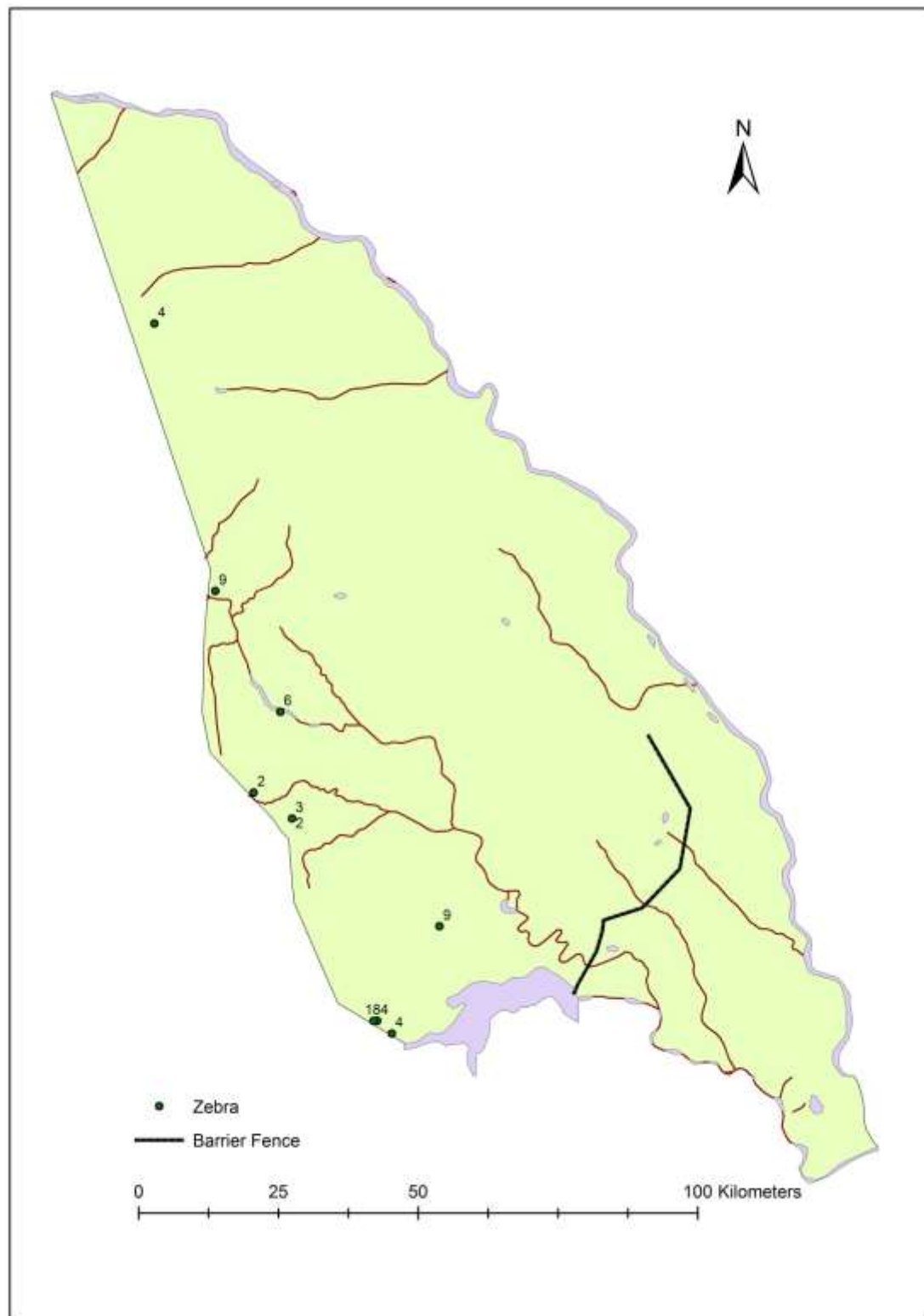
Figure 35: Zebra

Discussion & Comments

The results of the previous census in 2010 are compared with this census in the table below. These are the actual sightings and not the estimated numbers.

Wild animals

SPECIES	COUNT 2013	COUNT 2010	% DIFFERENCE
Baboon troops	3	13	23%
Buffalo	314	348	90%
Bushbuck	1	7	14%
Crested Guinea Fowl Flocks	-	5	-
Crocodile	10	1	1000%
Duiker	39	63	62%
Eland	1	-	-
Elephant	201	479	42%
Giraffe	15	39	38%
Hippo	8	3	267%
Hornbill Ground	38	60	63%
Impala	94	119	79%
Jackal B.B.	-	2	-
Klipspringer	-	2	-
Kudu	111	211	53%
Leopard	1	-	-
Nyala	107	307	35%
Ostrich	22	91	35%
Rhino White	2	-	-
Sable	-	40	-
Steenbuck	4	24	17%
Warthog	14	50	28%
Waterbuck	10	14	71%
Wildebeest Blue	28	105	27%
Zebra	61	166	37%

Domestic Stock

SPECIES	COUNT 2013	COUNT 2010	% DIFFERENCE
Cattle	2036	7551	27%
Dog	5	-	-
Goat	806	2418	33%
Sheep	61	119	51%
Carcass	26	17	153%

As can be seen in the two columns above for both wild and domestic animal sightings, the numbers recorded in 2010 were higher than in 2013 in both tables. There could be several reasons for this variance and the following observations are made to account for the variance:

Impact from Poaching: Carcass numbers were considerably higher in the last 2013 census. The wildlife count numbers were much lower, 50% of 2010 results while domestic count was also lower, 30% of the 2010 results. Lower counts were observed across the full range of Wildlife (Elephant, antelope etc.) and Domestic (Cattle, Goats etc.) animals except for carcass sightings. The fact that even domestic stock numbers were much lower than the previous census indicates that the lower count overall is probably not due to poaching but an under counting during the census. This is substantiated by a nominal increase in carcasses observed (from 17 to 26) as well as Park employee anecdotal wildlife and poaching observations.

It was observed by Park employees that there is an increasing elephant poaching threat and it is possible that this may account for part of the reduced elephant count (in addition to the Barrier fence reducing the available range) as the mobility of elephants enables them to move to more preferable areas. This would however not explain the reduction in other species numbers.

Census Methodology: The fact that the counts varied across all species implies that the reason could relate to the census methodology including the personnel, airplane, timing etc.

Some of the key personnel (pilot and main observers) were used in the census and the same observation methodology and calibration were used. Anecdotally the observation team and pilot confirmed that based on their memory, there were in fact less animals observed in the 2013 count. Sightings of smaller species (dogs, leopard, steenbok etc.) were still made so observers managed to see smaller species as well.

Constant airplane speed is also a factor as there is a tendency to go faster and climb higher as one gets tired. Normally flight sectors are not longer than two hours at a time as the observers start to become tired and lose concentration. These were however not considered by the census team as a notable contributing factor.

The census was undertaken approximately 1 month earlier than the previous count and this would usually result in reduced sightings due to increased leaf foliage. The neighbouring Kruger National Park normally undertakes their census in September and the aim was to do the 2010 census in September as well but due to technical reasons the census was only commenced in October. Possibly the best time to do the census would be just before the rains when leaf foliage is at its least so as not to reduce visibility of animals. Rains usually start in mid-October when new leaves begin sprouting.

Census Data Recording and Analysis: The data recorder should be the most experienced member of the team as he/she coordinates the whole count. This position should also be seated next to the pilot in the front seat which was the case. Unfortunately the coordinator who did the 2010 census was unavailable for the 2013 census due to other work commitments.

Due to a theft of the laptop and GPS certain data was lost however census data had been backed up as a safety measure and this data was used for the sightings data for the report although no GPS tracks could be used to correlate tracks, altitude and speed of the aircraft. There was also no way to verify that all the transects were flown. This makes it difficult to identify if there were any possible errors in this aspect of the methodology. The distribution of

animal observations across the full Park would however indicate that the full Park was observed. This is supported by Nyala which could be considered a good indicator species in this regard. While there was a reduction from 307 to 107 Nyala observed, their distribution was relatively consistent in both censuses across most of the Park which would support the indication that the difference in census results is due to lower observations across the full Park area.

Certain GPS sighting data anomalies were observed when analysing the data for the report writing process and these have been investigated with some sightings being discarded as a result. Some of the sightings in the data also had a null count so it cannot be determined what the actual numbers were. These sightings were given a count of 1 to show their distribution. However there were relatively few errors which would not make a significant difference in the population numbers.

Animal movement: There appears to be sufficient open water available all over the park so animals should not need to move away to water and most species are not known to move large distances in and or out of the Park. Due to some species large size and high visibility such as elephant and buffalo these species are the best indicators of census results. The comparable location for these species are shown on the below map to assist the census analysis and show a similar distribution with exception of the Gaza Safaris area where less observations were recorded and the area south of the Barrier Fence discussed further below.

Barrier Fence: The number of elephant observed south of the Barrier Fence reduced significantly (from 79 in 2010 to 1 in 2013). Park employee physical observations confirm a lower number of elephant in this area of the Park and this would in part be accounted to the construction of the Barrier Fence. By contrast the number of buffalo observed south of the Barrier fence increased from 3 to 48 however this is due to a single herd of 40 buffalo being recorded in the area.

Other Factors: It is possible that the results can be heavily impacted upon by timing as only a third of the total transects are flown, with the result that a large herd of elephant or buffalo could be outside the area counted and excluded from the census.

Whilst reviewing the data and writing this report, no confirmed reasons could be attributed for the reduced wildlife and domestic numbers but it may be worthwhile to review the census methodology. Doing a full census every five years may be better than a partial census every two years. A full census would give a far more accurate indication of what the baseline population is to start with. A partial census very often has more questions than answers. The downside of doing a census every five years is that problems such as overstocking, poaching or disease may not be picked up timeously. This is especially so in such a large area such as the LNP although ranger patrols would soon pick up any increases or decreases in population numbers.

The author did not have any further data to make any conclusive assumptions as to why there is a reduction in population numbers. Included in this report below are some maps indicating densities of the more common species or significant species such as buffalo, elephant, nyala and

kudu as well as sightings of buffalo and elephant comparisons in this census and the 2010 census. There is also a map showing distribution of all wild animals and domestic animals.

Density and comparative maps

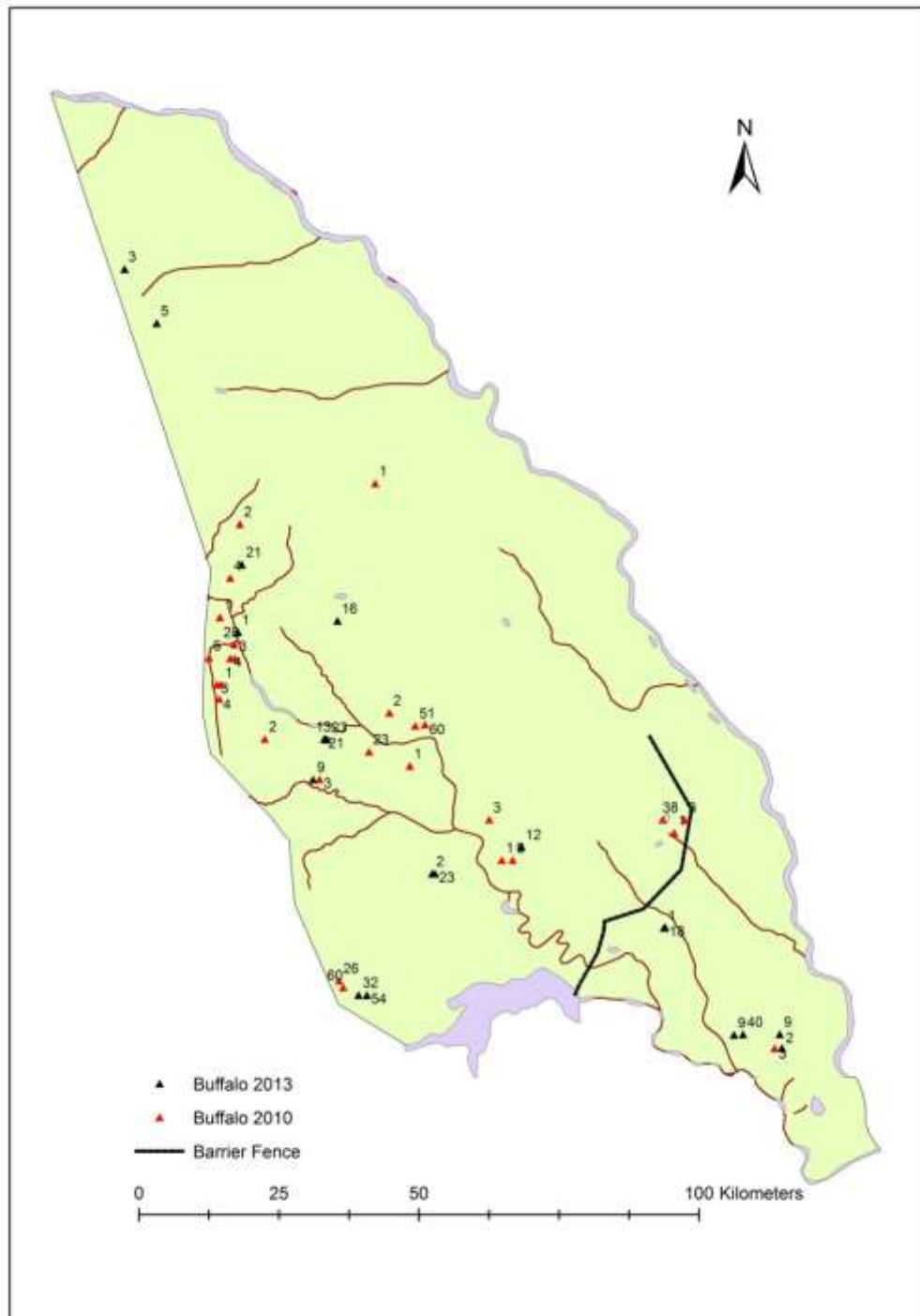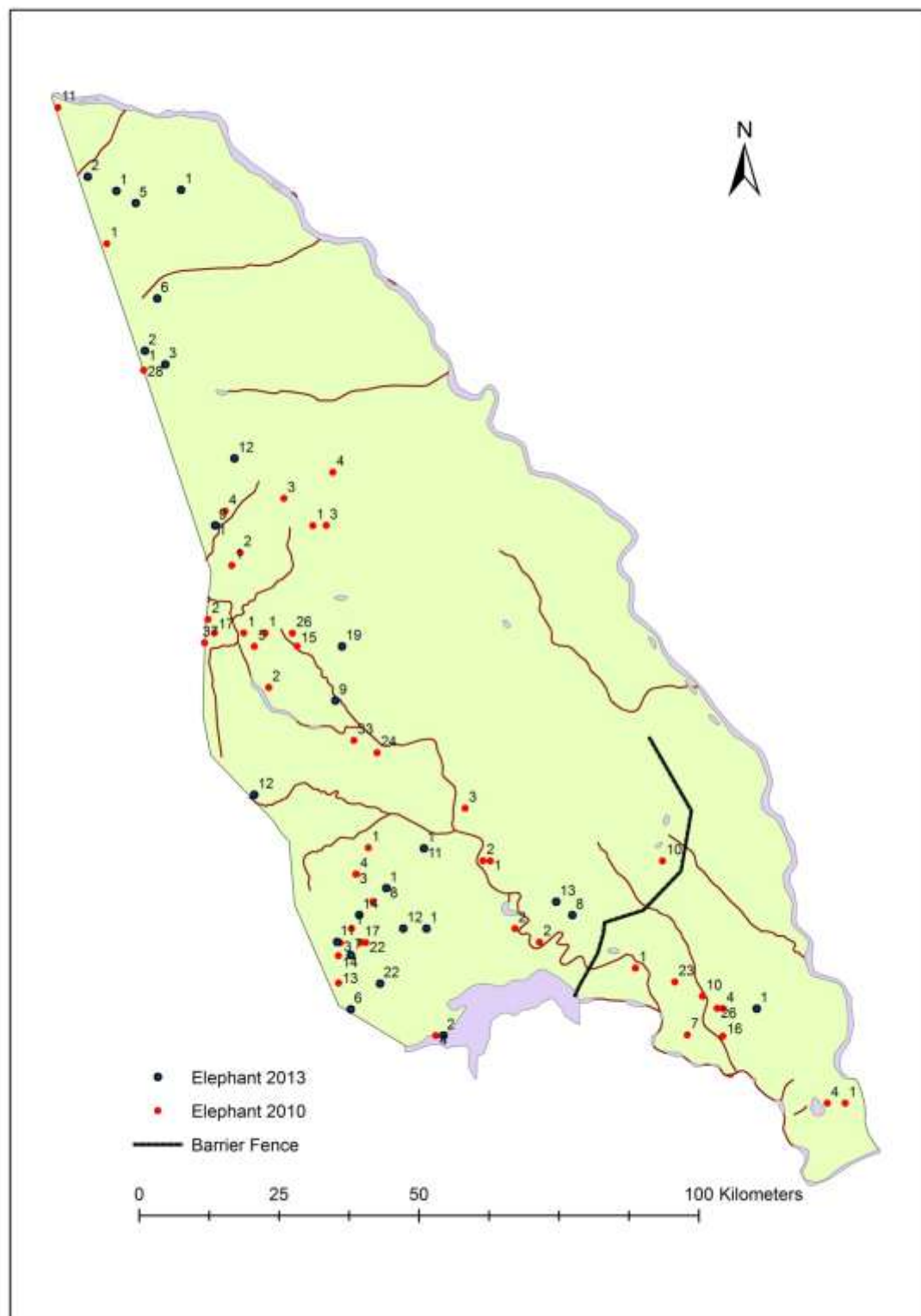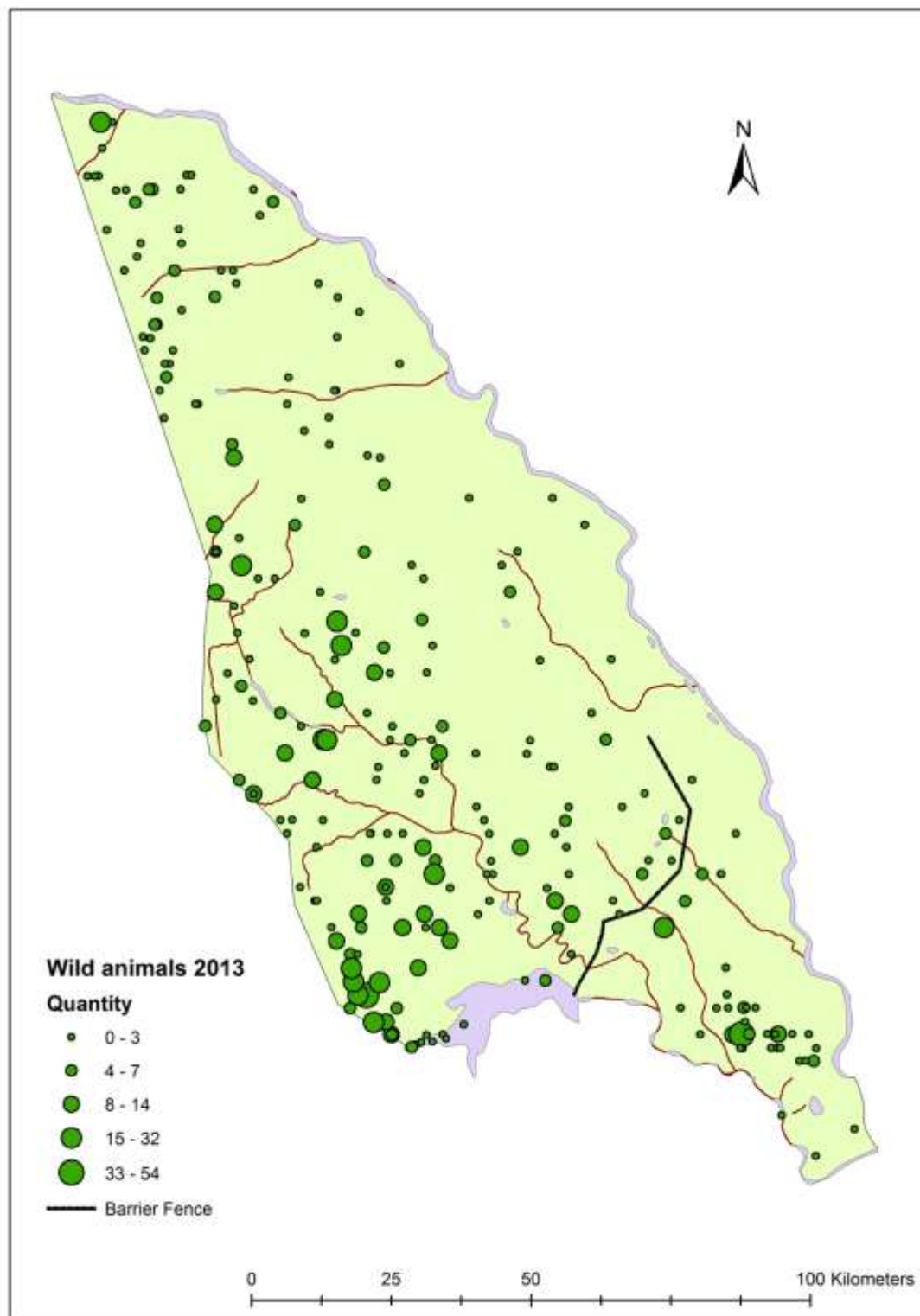**Figure 37: A comparison of elephant sightings from 2010 & 2013.**

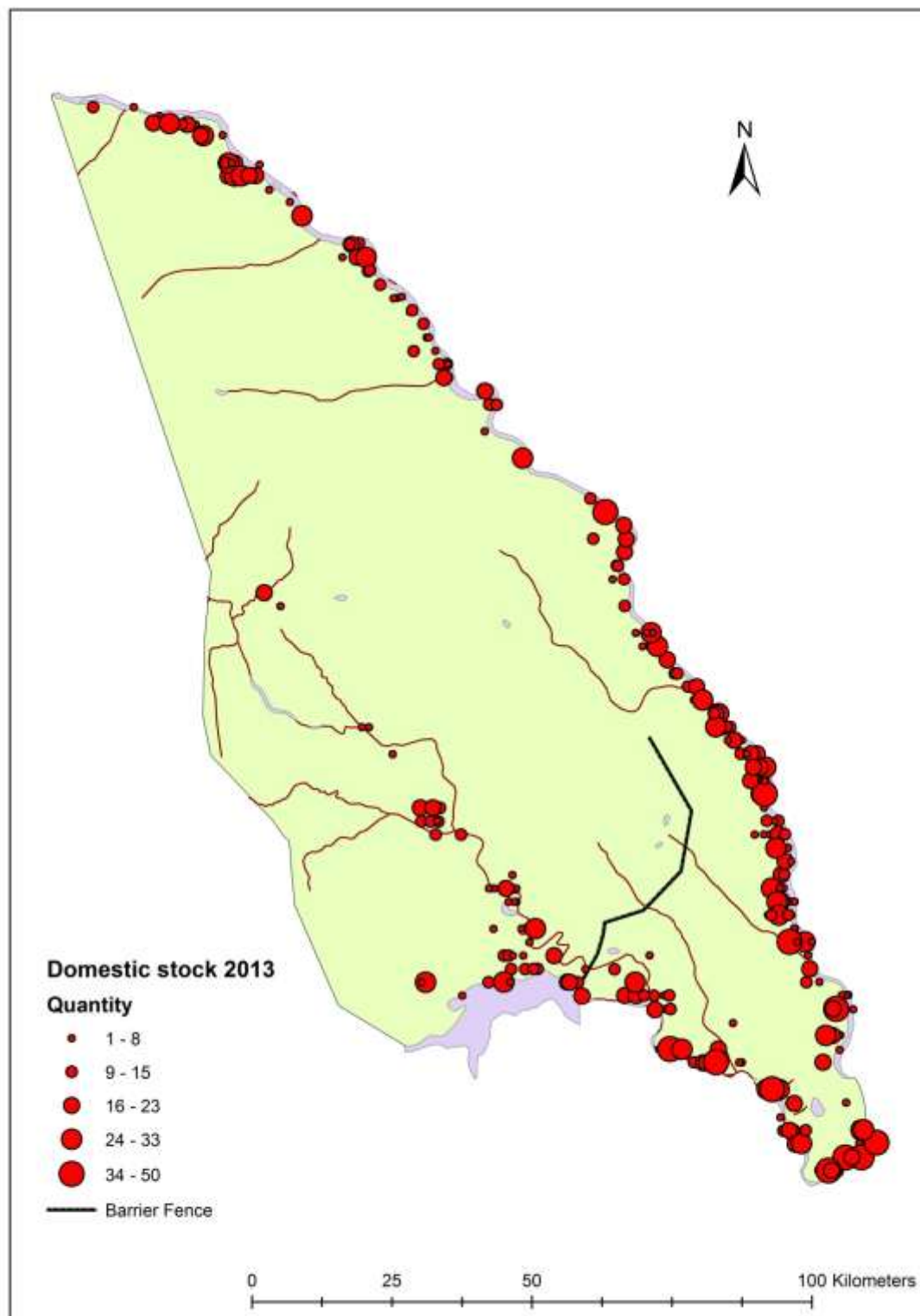Figure 38: Wild animal distribution during the 2013 census.
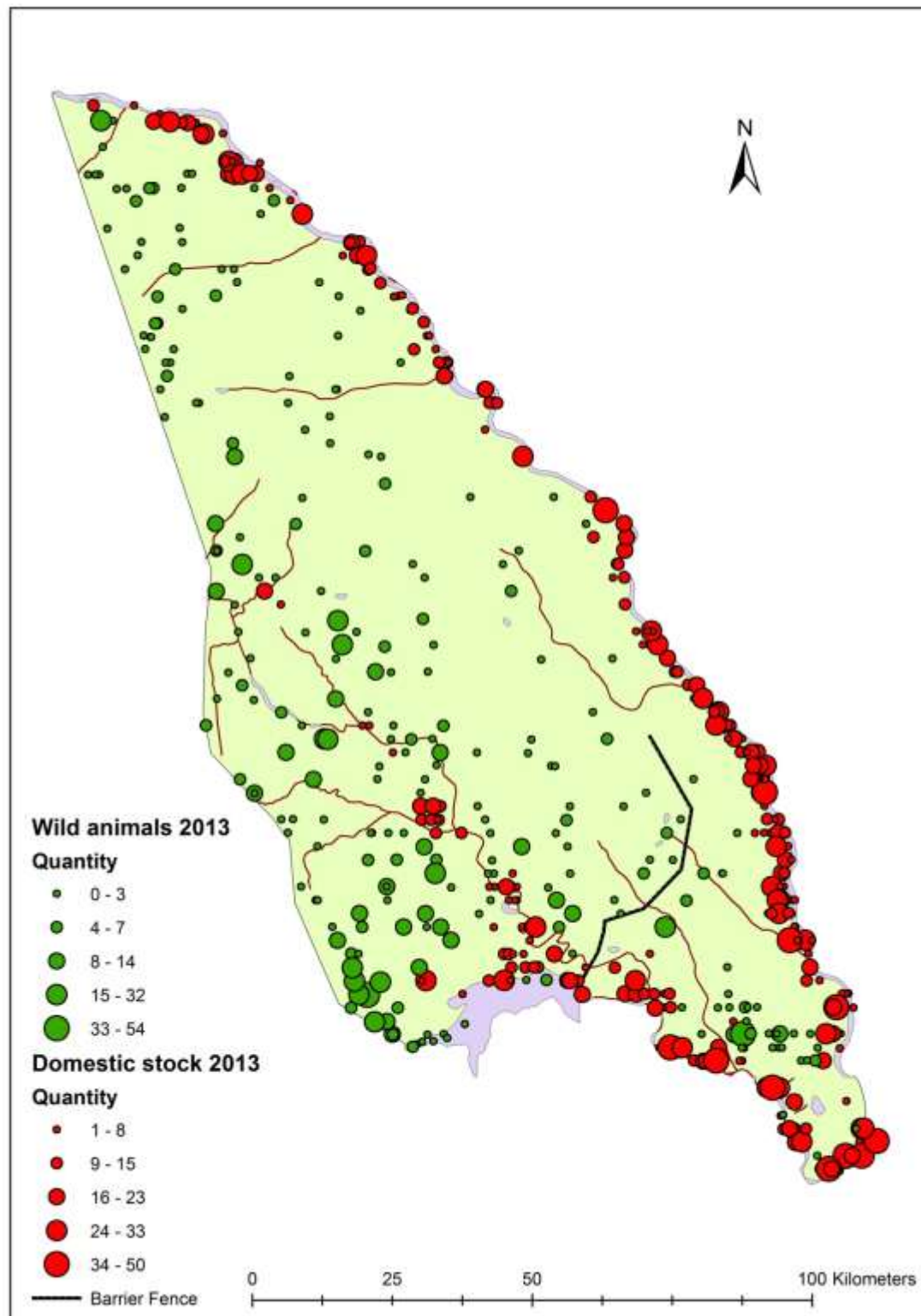
Figure 39: Domestic stock distribution for 2013.

Figure 40: A comparison of the distribution of wild animals and domestic stock for 2013.
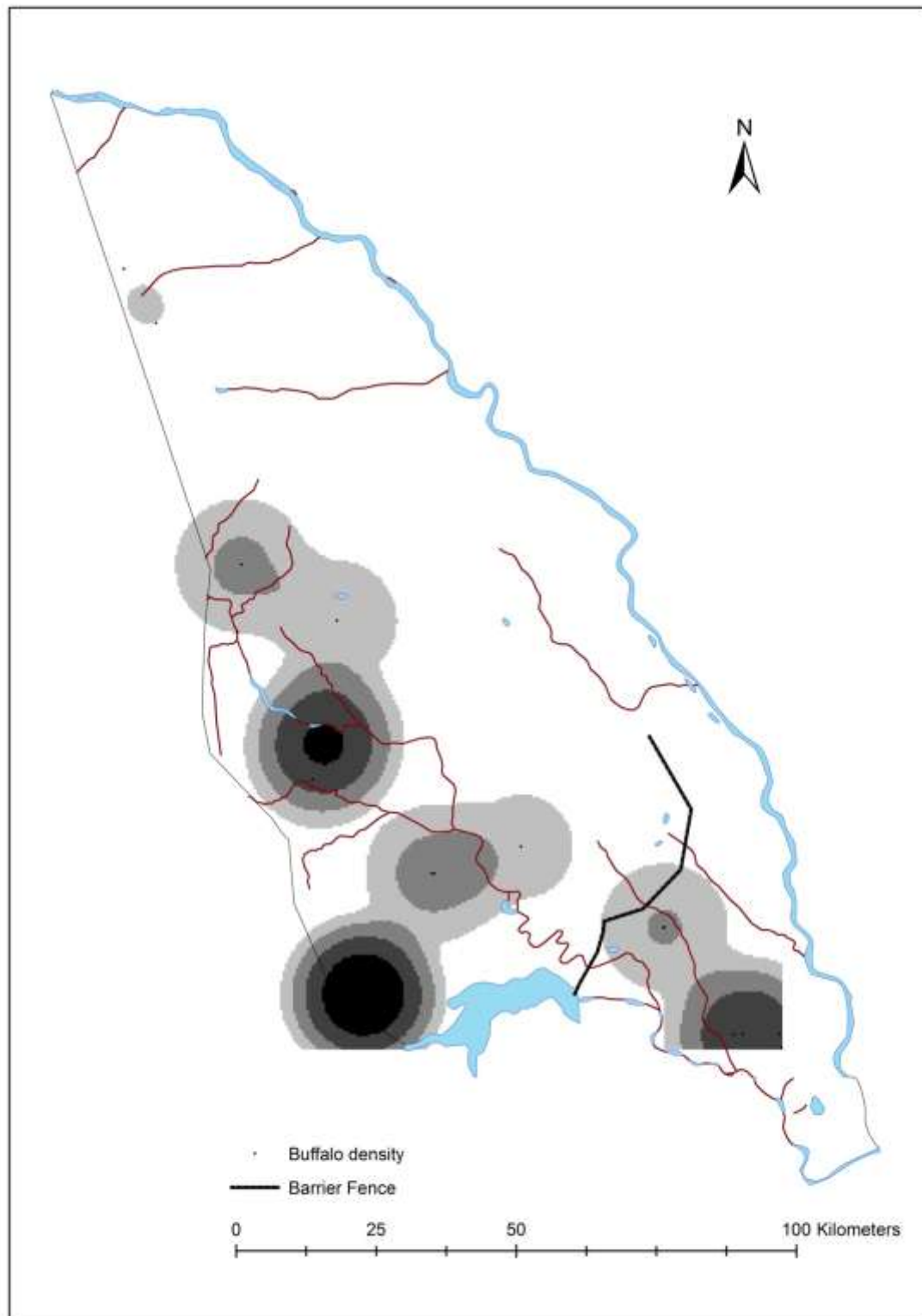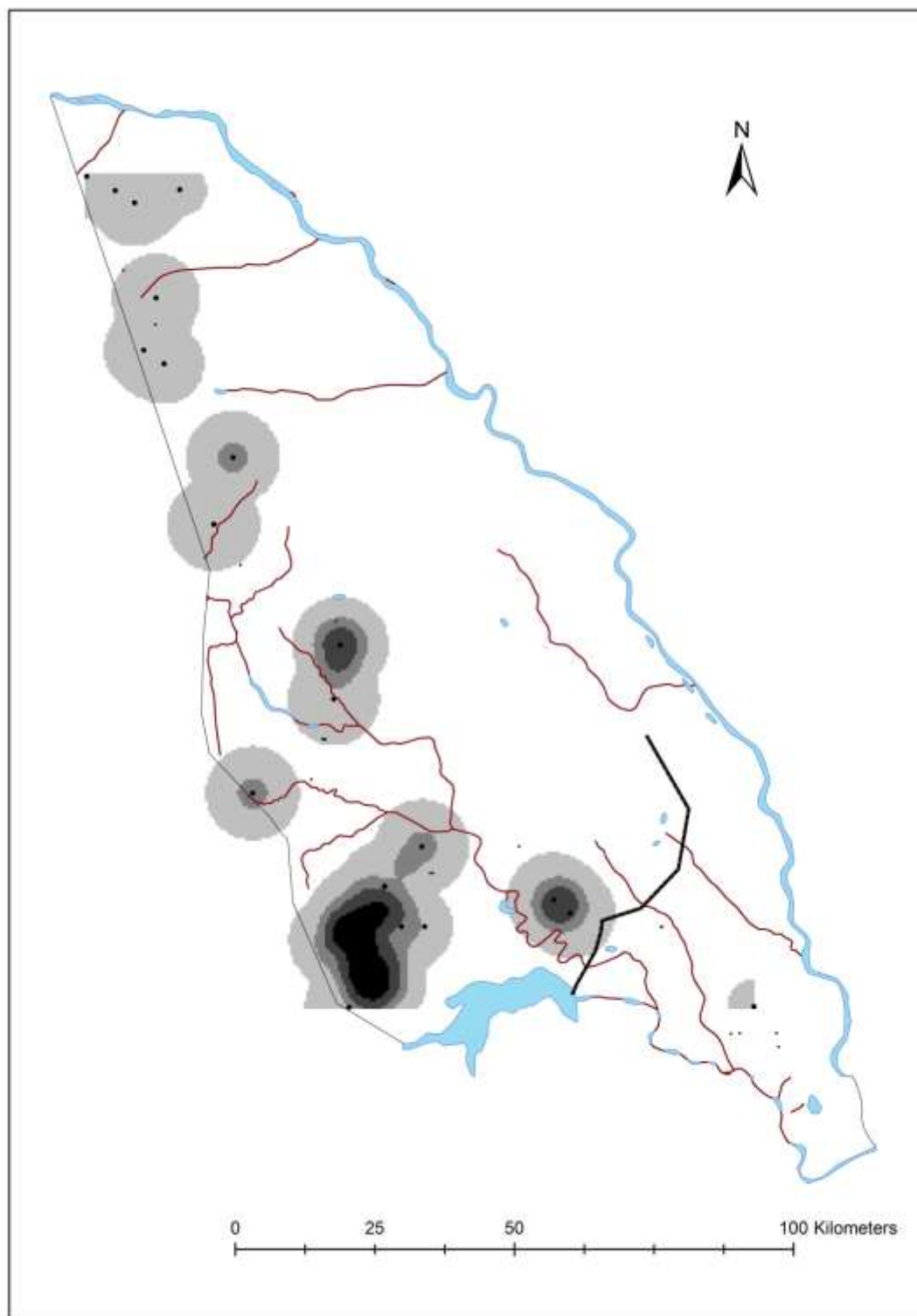
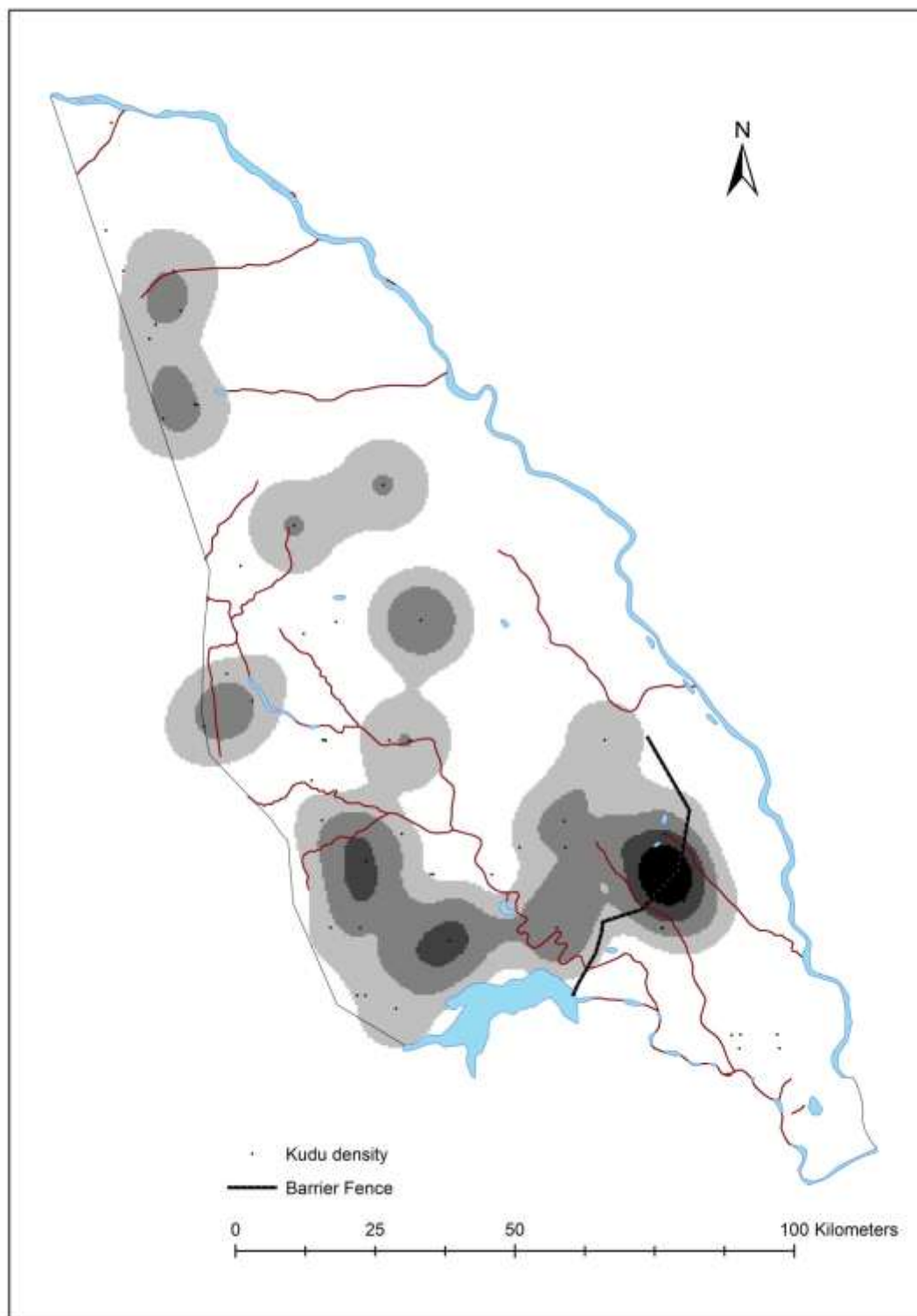Figure 41: Buffalo density

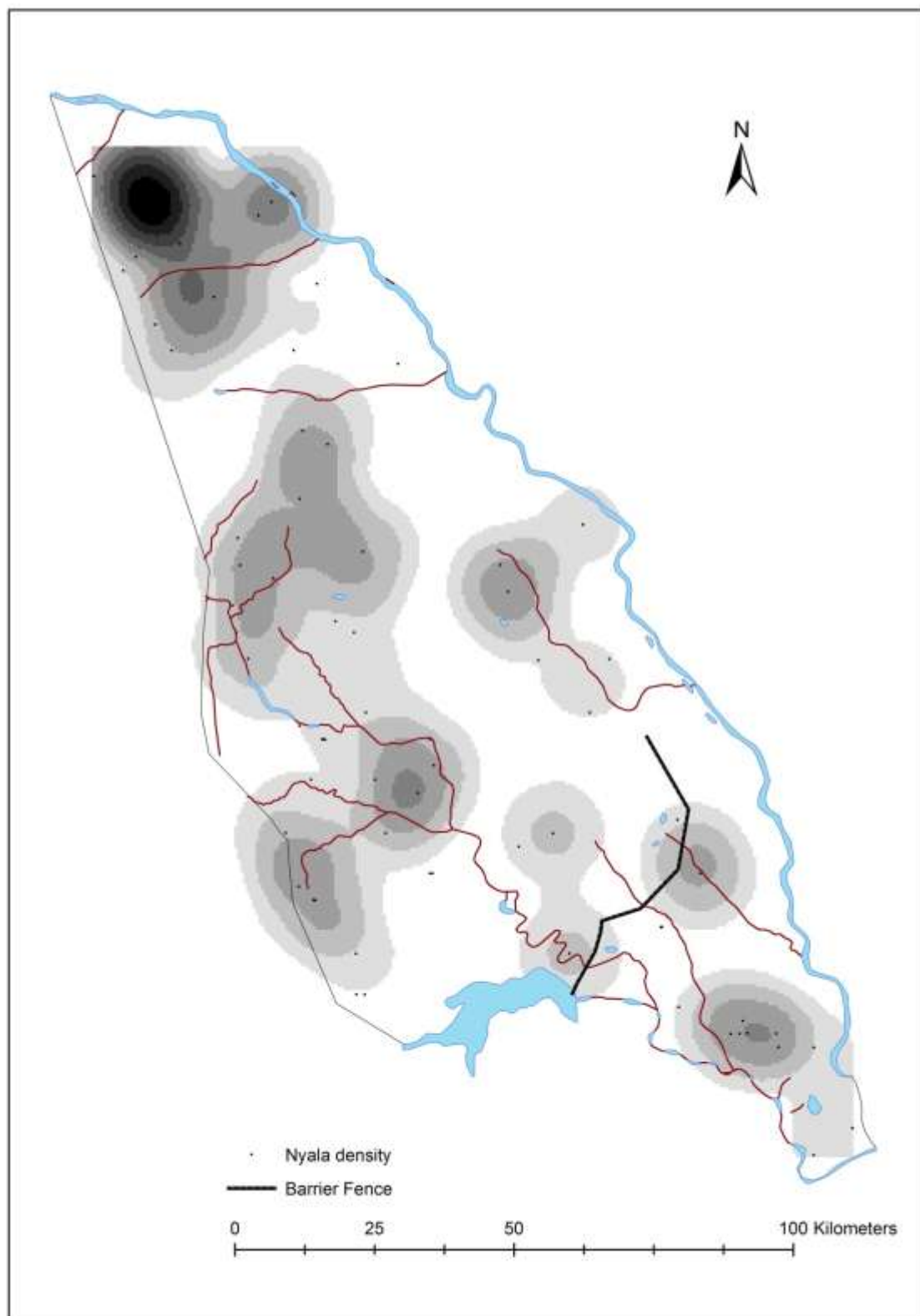Figure 42: Elephant density

Figure 43: Kudu density

Figure 44: Nyala density

Acknowledgements

The Park Warden, Mr Antonio Abacar and Mr Antony Alexander for contracting us to do the census. Pilot Dave Hart and Russell Best who recorded the sightings, Billy Swanepoel, coordinator, observer and for arranging everything including fuel, accommodation and other logistics.

Figure 45: Census team for the 2013 census. L – R Eugenio Mbenzane, Antonio Bila (driver), Fransisco Chipenembe (Airplane security), Guillerme dos Santos, Maluleque, Billy Swanepoel and Dave Hart.

Front kneeling: Adilson Mandlate

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