

Results of the  
NamibRand Nature Reserve  
and Pro-Namib Conservancy  
Annual Game Count  
28 May 2018



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## 1. Introduction

This report provides summarized results and analysis of the annual game count held on the NamibRand Nature Reserve and the Pro-Namib Conservancy on the 29<sup>th</sup> of May 2018. This is the 14<sup>th</sup> consecutive year that the count was held since its inception in 2005.

A game count briefing was held at the NamibRand Nature Reserve AGM on the day preceding the count where Control Warden Murray Tindall highlighted the objectives of the count and outlined the methodology and rules for the teams who would conduct the count. This helps to ensure consistency over consecutive years and allows a more accurate comparison from year to year.

Previous years data has been entered into a purpose designed database which generates the estimates used in this report in terms of total population, density and biomass. A few minor adjustments have been made to the database in order to improve its accuracy and this has slightly altered the figures for previous years as well as this years' count.

This year there was a substantial decline in the animal populations on the Reserve. While the drop in numbers looks rather severe, this is predominantly due to the large increase in numbers for the year 2017 as a result of good rains in selected parts of the Reserve. The large increase in numbers was no doubt due to migration into the area from neighbouring properties and once the limited amount of grass was depleted the animals once again left in search of better grazing. A much better indicator is to look at the long term trend where we can see a much more gradual decline since the record rainfall in 2011.

## 2. Summary

Data collected in the May 2017 game count was entered into our database and analyzed. The results are shown below bearing our three core objectives in mind:

### Objective 1: Population and biomass estimates:

Population estimates:

Table 1. Total number of game seen and the estimated numbers for May 2018.

<b>Total estimated numbers of game (Zone 1-10; May 2018)</b>		
<b>Species</b>	<b>No. Counted</b>	<b>Estimate 2018</b>
Gemsbok	995	3707
Springbok	266	1722
Kudu	0	0
Steenbok	0	0
Ostrich	54	131
Ludwigs Bustard	0	0
Ruppel's Korhaan	12	124
B. zebra	172	329
Hartebeest	25	67
<b>Total</b>	<b>1524</b>	<b>6080</b>
Giraffe*	9	9

\*Total numbers known

### Biomass estimates

Table 2. Wildlife biomass estimates for May 2018.

<b>Total wildlife numbers and wildlife biomass on NamibRand for May 2018 (Zone 1-10) ; 224 209 ha)</b>				
<b>Species</b>	<b>Mean mass (kg)</b>	<b>Estimated wildlife numbers from May 18 game count</b>	<b>Species biomass (kg)</b>	<b>Biomass per ha (kg)</b>
Gemsbok	220	3707	815540	4,37
Springbok	38	1722	65436	0,35
Kudu	180	0	0	0,00
Steenbok	11	0	0	0,00
Ostrich	68	131	8908	0,05
B. Zebra	300	329	98700	0,53
Hartebeest	130	67	8710	0,05
<b>Total</b>	<b>947</b>	<b>5956</b>	<b>5640332</b>	<b>5,34</b>

\* Total (estimate) numbers known

## Objective 2: Wildlife distribution and density

Table 3. Total number of animals counted per 100km in each route and the respective density percentage per zone.

Total no. of animals counted per 100km per route			
Route	Route Length (km)	No. of animals counted/100km	% of total animals counted per 100km
1	58	131	2%
2	62	362	7%
3	61	457	8%
4	44	930	17%
5	70	545	10%
6	35	873	16%
7	55	853	16%
8	50	396	7%
9	51	592	11%
10	57	326	6%
<b>Total</b>	<b>543</b>	<b>5465</b>	

## Objective 3: Population change

Table 4. The overall population estimate has decreased by 61.70% and the number of animals counted per 100km per route has decreased by 52.28%.

Total estimated numbers of game (Zone 1-10; May 2017-May 2018)					
Species	May-17		May-18		Percentage Change
	No. Counted	Total Estimated Number	No. Counted	Total Estimated Number	
Gemsbok	2887	10844	995	3707	-65,82%
Springbok	733	3649	266	1722	-52,81%
Kudu	1	4	0	0	-100,00%
Steenbok	0	0	0	0	0,00%
Ostrich	85	254	54	131	-48,43%
Ludwigs Bustard	29	222	0	0	-100,00%
Ruppel's Korhaan	22	234	12	124	-47,01%
B. zebra	347	492	172	329	-33,13%
Hartebeest	62	174	25	67	-61,49%
<b>Total</b>	<b>4166</b>	<b>15873</b>	<b>1524</b>	<b>6080</b>	<b>-61,70%</b>
Giraffe*	9	9	9	9	0,00%

\*Total (estimate) numbers known

### 3. Count Methodology

The primary objectives of the game count are to determine the density and distribution of game and to estimate the total number of game in a given, or total, area. For this reason, the survey methodology used is a combination of the road strip census and game distribution map techniques. In layman's terms, these can be explained as follows:

#### Road strip count

This is one of the most effective methods to use when counting in a relatively open and homogenous landscape. For the purposes of the count, the total area is divided into game count zones, each with its own standardized route, as shown in Figure 1 on the next page. The game count zones were, as far as possible, deliberately predetermined into homogenous habitats because the visibility of animals differs in each habitat. Each route forms a strip transect through its zone within which the animals are counted. A transect width of 1km is used (500m on either side of the road). During the count, all animals on either side of the road are recorded, and the distances (at right angles to the vehicle and road) from the road to the animal or group of animals is recorded. These distance records are important, as they shape the effective strip width (ESW) values, which are automatically adjusted each year when data is entered into the database.

The length of the transect (distance traveled) and its relation to the area represented in the zone is used to calculate the area correction factors for each zone, i.e. area represented/route length = area correction factor. The respective effective strip width (ESW) values and transect width then determines the relevant species correction factors, i.e. transect width (1000m) divided by (ESW x 2) = species correction factor. The area correction factors and species correction factors, adjusted by the relevant effective strip widths, i.e. how far each species is readily seen, is then used to calculate the population estimates. So basically, the area correction factor multiplies the number seen up based on the percentage of the area sampled and assumes all animals within 500m of the transect line are detected. The species correction factor then adjusts this estimate based on the detection curve (ESW) for the species. The correction factors and route distances as used in the 2015 game count methodology, along with the area represented per zone can be seen in table 5 below.

Table 5. Total count areas per zone (ha), route distances, area correction factors, effective strip widths and species correction factors for each species within each zone for 2017.

Count areas, area correction factors, effective strip widths and species correction factors							
Route No.	Total area per zone (ha)	Area represented per route	Route distance (km)	Area correction factor	Species	Effective strip width (m)	Species correction factor
1	18 072	12 513	52	2,41	Gemsbok	392	1,28
					Springbok	328	1,52
2	18 310	13 779	52	2,65	Gemsbok	310	1,61
					Springbok	226	2,21
3	27 039	26 424	58	4,56	Gemsbok	463	1,08
					Springbok	193	2,59
4	21 038	20 996	47	4,47	Gemsbok	622	0,80
					Springbok	479	1,04
5	18 038	17 491	72	2,43	Gemsbok	540	0,93
					Springbok	325	1,54
6	19 352	11 589	34	3,41	Gemsbok	541	0,92
					Springbok	346	1,45
7	28 343	18 833	55	3,42	Gemsbok	509	0,98
					Springbok	263	1,90
8	22 452	19 291	52	3,71	Gemsbok	607	0,82
					Springbok	419	1,19
9	21 710	21 125	50	4,23	Gemsbok	400	1,25
					Springbok	436	1,15
10	29 855	24 721	59	4,20	Gemsbok	324	1,54
					Springbok	501	1,00
<b>Total</b>	<b>224 209</b>	<b>186 762</b>	<b>531</b>				

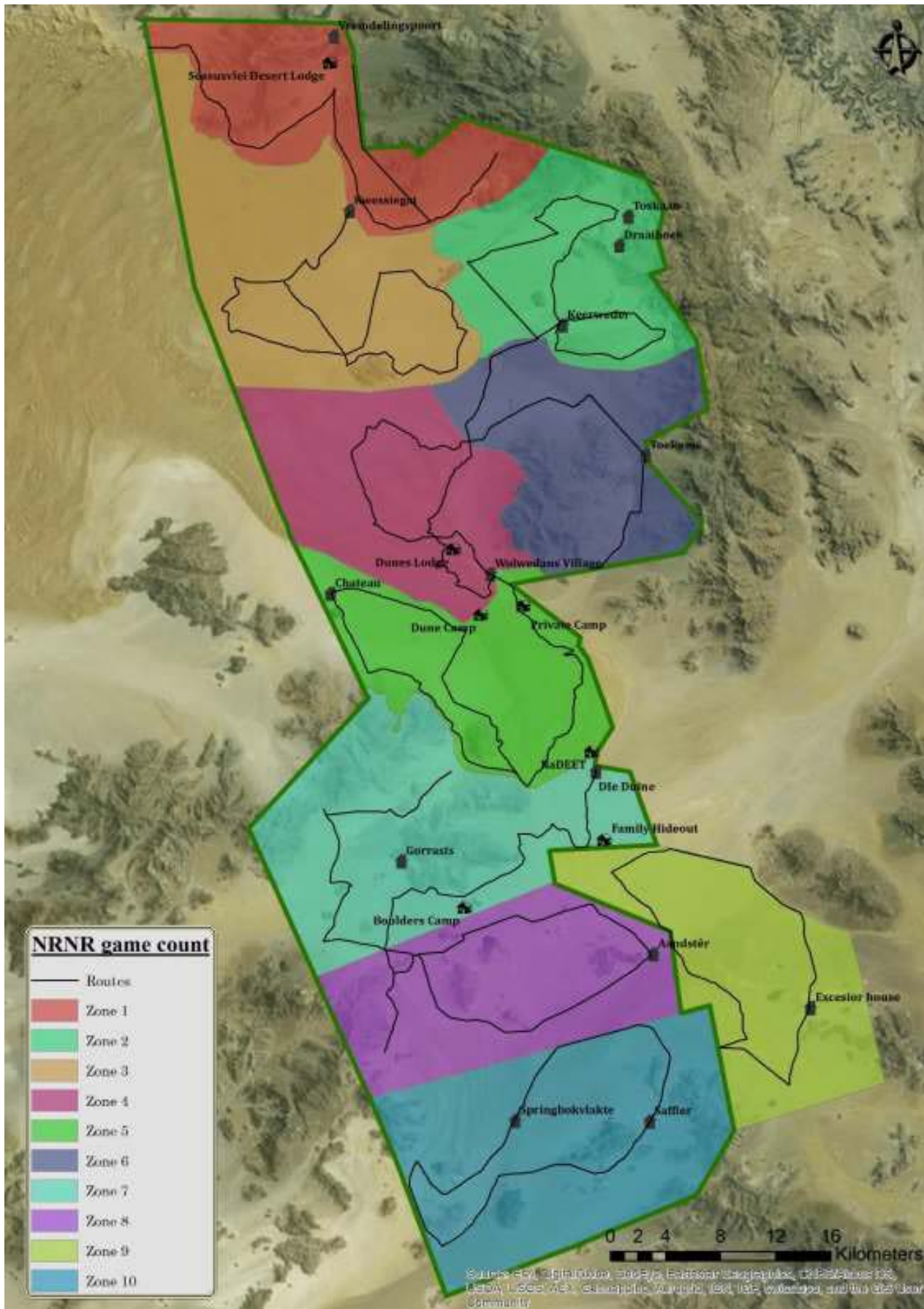


Figure 1. The game count area shows the ten zones used in May 2017 for the NamibRand Nature Reserve (1-8, 10) and the Pro-Namib Conservancy (9).

## Game distribution maps

In order to determine and show the distribution and density of game in the various zones of the count area, monad grids are used to map the locality of the animals counted. Each route is supplied with a map containing the monad, with reference numbers, of the zone in which that route is set as seen in the image below.

During the count the monad grid number in which animal counted is seen, is recorded. This grid number is then used to map the distribution of each recorded animal.

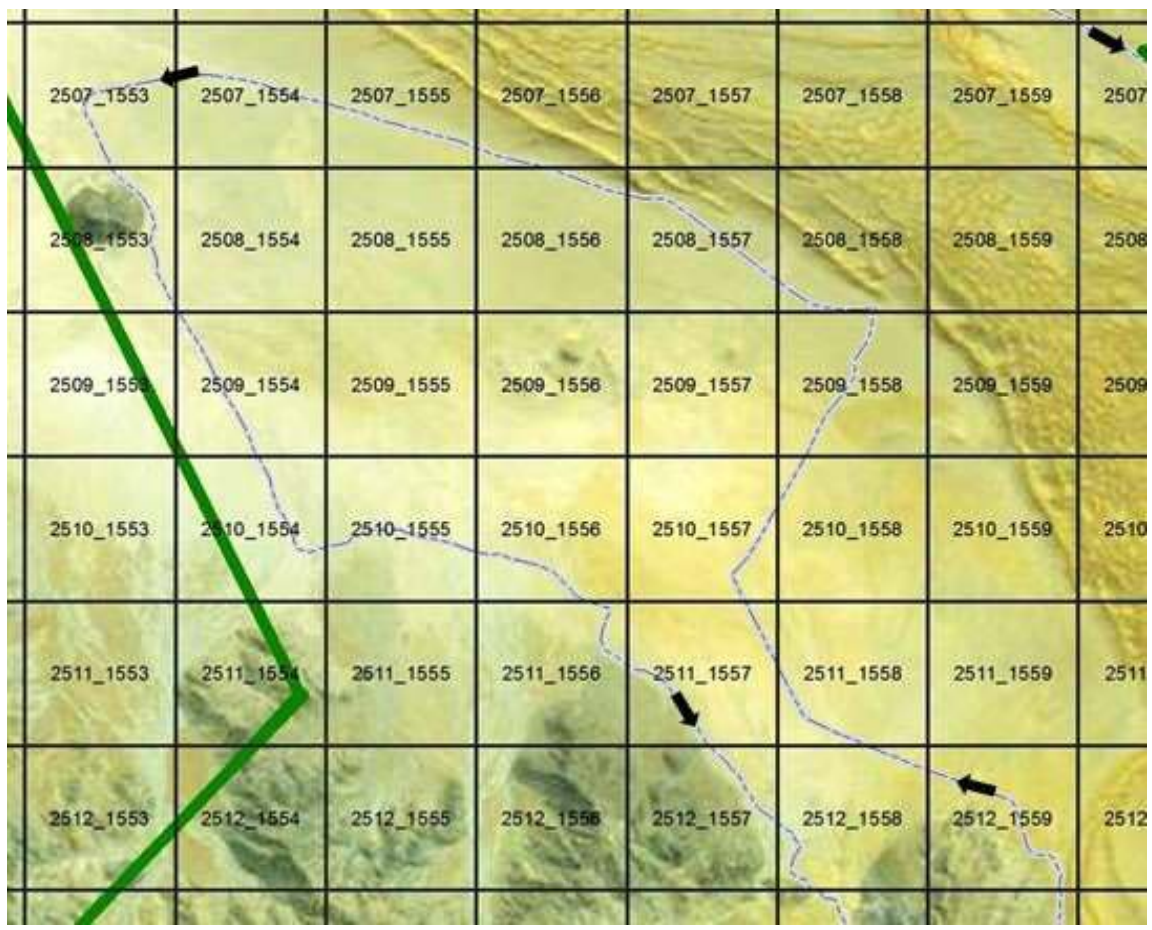


Figure 2. Monad maps.



## 4. Objectives and results of the May 2018 count:

### Objective 1: Population and biomass estimates

#### Population estimates:

The population estimates for individual species in the total count area are derived from the actual number of animals seen during the count and the relevant species and area correction factors that are applied to that number. The actual numbers seen is multiplied by the relevant area and species correction factors to get the population estimates.

S: Actual number of animals seen\*

A: Area correction factor

B: Species correction factor

\*Known numbers

Formula for calculating population estimates\*

$$(S \times A) \times B = P$$

Note that where total numbers of species with small populations are known (e.g. for recently introduced species such as red hartebeest, Burchell's zebra and giraffe), these known totals are used for the final population estimates in reference to the above calculated estimates.

The total estimates per species per zone were then combined for all zones in order to determine the total population estimate for each plains game species in the count area (see Table 1 below).

*Table 1. Total number of game seen and the estimated numbers for May 2018.*

<b>Total estimated numbers of game (Zone 1-10; May 2018)</b>		
<b>Species</b>	<b>No. Counted</b>	<b>Estimate 2018</b>
Gemsbok	995	3707
Springbok	266	1722
Kudu	0	0
Steenbok	0	0
Ostrich	54	131
Ludwigs Bustard	0	0
Ruppel's Korhaan	12	124
B. Zebra	172	329
Hartebeest	25	67
<b>Total</b>	<b>1524</b>	<b>6080</b>
Giraffe*	9	9

\*Total numbers known

## Biomass estimates

Population estimates are multiplied by the mean weight of the species and divided by the total count area (ha) to get the estimated biomass per species.

E: Estimated wildlife numbers  
M: Mean mass per species  
H: Total no. of hectares  
B: Biomass estimate

$$\text{Formula for calculating biomass estimates} \\ (E \times M) \div H = B$$

Biomass estimates are important in terms of managing habitat conditions and inter-specific competition. Note that agricultural Livestock Units (LSU) are not used for determining the biomass of wildlife species, due to differences between domestic and wild animals. These two species are different in aspects such as grazing/browsing patterns and agricultural stocking. LSU are also in a fenced systems opposed to the open, unfenced system within the Reserve.

Tables 6.1, 6.2 and 6.3 below show the biomass estimates for this year, and the biomass estimates for previous years compared to this year.

Table 6.1 Wildlife biomass estimates for May 2017.

Total wildlife numbers and wildlife biomass on NamibRand for May 2018 (Zone 1-10; 224,209 ha)				
Species	Mean mass (kg)	Estimated wildlife numbers from May 2018 game count	Species biomass (kg)	Biomass per ha (kg)
Gemsbok	220	3707	815540	4,37
Springbok	38	1722	65436	0,35
Kudu	180	0	0	0,00
Steenbok	11	0	0	0,00
Ostrich	68	131	8908	0,05
B. Zebra	300	329	98700	0,53
Hartebeest	130	67	8710	0,05
<b>Total</b>	<b>947</b>	<b>5956</b>	<b>5640332</b>	<b>5,34</b>

The chart in figure 3 below shows the biomass composition of the different species across the total count area for the year 2017.

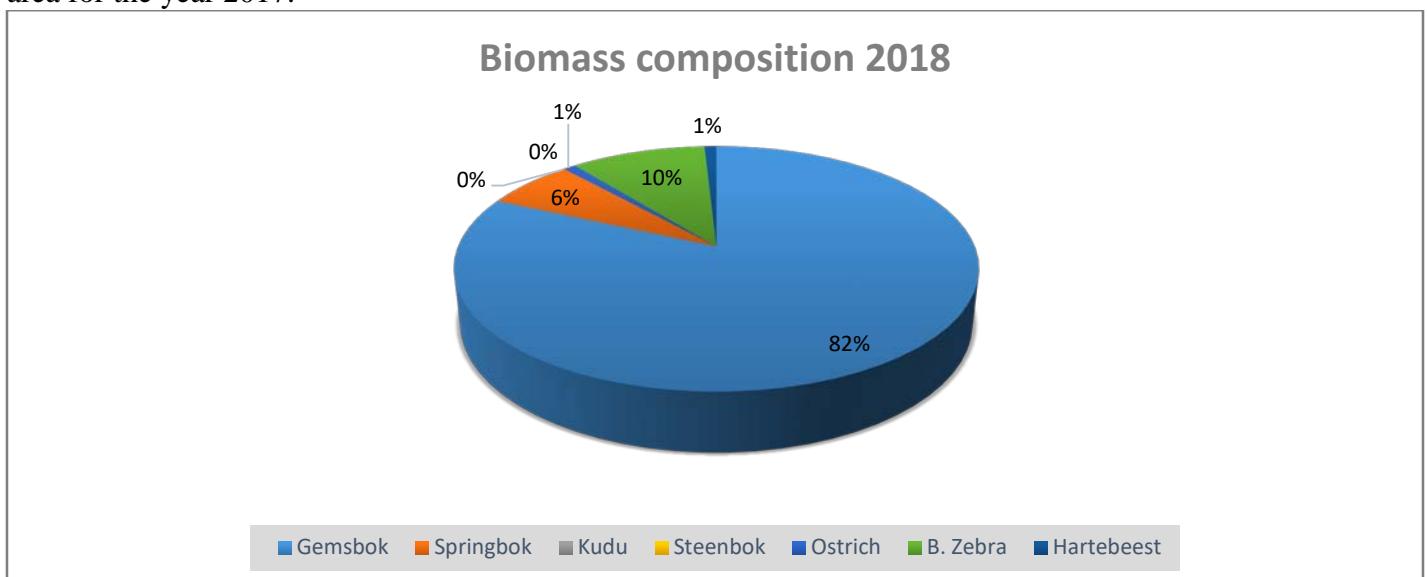


Figure 3. Biomass composition 2018.

Table 6.2 Wildlife biomass (2018) percentage change compared to the count of May 2017.

**Wildlife biomass on NamibRand for May 2017 and May 2018 (Zone 1-10; 224,209 ha)**

Wildlife Species	Mean Mass (kg)	May-17			May-18			Biomass Percentage Change
		Estimated Wildlife Numbers From May 2017 Game Count	Species Biomass (kg)	Biomass per ha (kg)	Estimated Wildlife Numbers From May 2018 Game Count	Species Biomass (kg)	Biomass per ha (kg)	
				Total			Total	
Gemsbok	220	10844	2385680	12,77	3707	815540	4,37	-65,82%
Springbok	38	3649	138662	0,74	1722	65436	0,35	-52,81%
Kudu	18	4	720	0,00	0	0	0,00	-100,00%
Steenbok	11	0	0	0,00	0	0	0,00	0,00%
Ostrich	68	254	17272	0,09	131	8908	0,05	-48,43%
B. Zebra	300	492	147600	0,79	329	98700	0,53	-33,13%
Red Hartebeest	130	174	22620	0,12	67	8710	0,05	-61,49%
<b>Total</b>		<b>15417</b>	<b>2712554</b>	<b>14,52</b>	<b>5956</b>	<b>997294</b>	<b>5,34</b>	<b>-63,23%</b>

Table 6.3 Wildlife biomass estimates from 2016-2018.

**Total wildlife biomass estimates (kg/ha) on NamibRand (May 2016 to May 2018)**

Wildlife Species	May-16	May-17	% Change from May-16	May-18	% Change from May-17
Gemsbok	7,83	12,77	63,14%	4,37	-65,82%
Springbok	0,60	0,74	23,74%	0,35	-52,81%
Kudu	0,00	0,00	0,00%	0,00	0,00%
Steenbok	0,00	0,00	0,00%	0,00	0,00%
Ostrich	0,05	0,09	84,96%	0,05	-48,43%
B. Zebra	0,71	0,79	11,31%	0,53	-33,13%
Red Hartebeest	0,10	0,12	21,12%	0,05	-61,49%
<b>Total</b>	<b>9.30</b>	<b>14.50</b>	<b>56.34%</b>	<b>5.30</b>	<b>-63.23%</b>

## Objective 2: Wildlife density and distribution

To calculate the population density, the actual number of animals per species counted in each zone is divided by the respective route length and then multiplied by 100 to get the total number of animals seen per 100km.

S: Actual number of animals seen

R: Length of route

K: Wildlife density - i.e. Animals seen per 100km driven

$$\text{Formula for calculating wildlife density} \\ (S \div R) \times 100 = K$$

For the purposes of this report, wildlife distribution is based on the amount of animals seen in each monad. During the game count, each sighting is marked to the corresponding monad the animal(s) was seen in. This data is then used to map the distribution of the animals (i.e. where animals were seen).

Please note that for the total wildlife distribution, all game species counted were used in the (mapping) calculation. The total wildlife (species) distribution and density are shown in the maps below. These densities were calculated using the formula prescribed above.

Note that the data is indicated on a gradient from light (low values) to dark (high values).

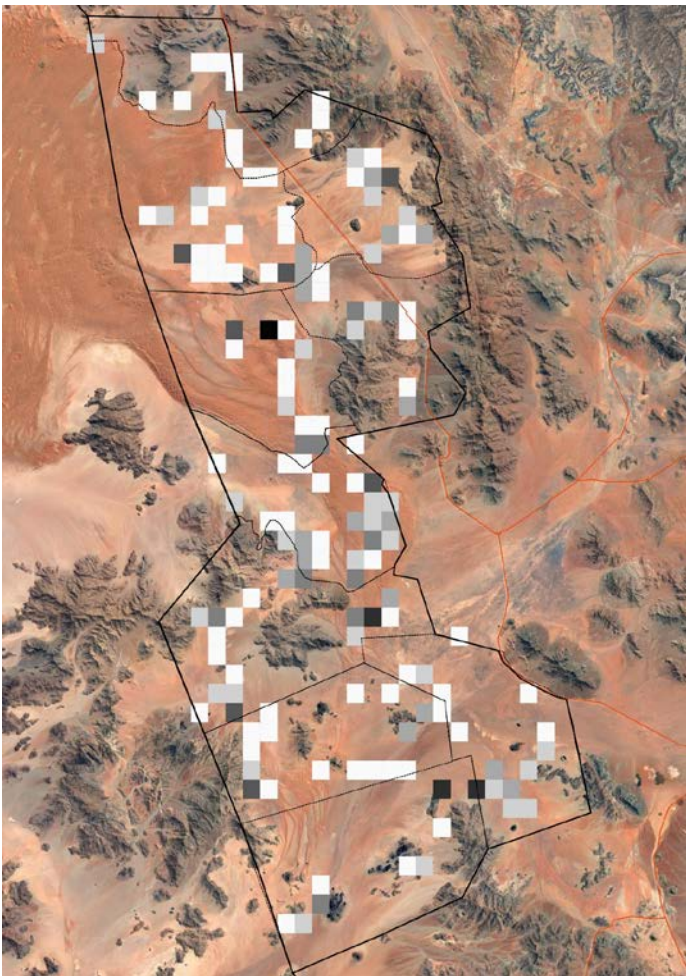


Figure 4.1 Total wildlife distribution

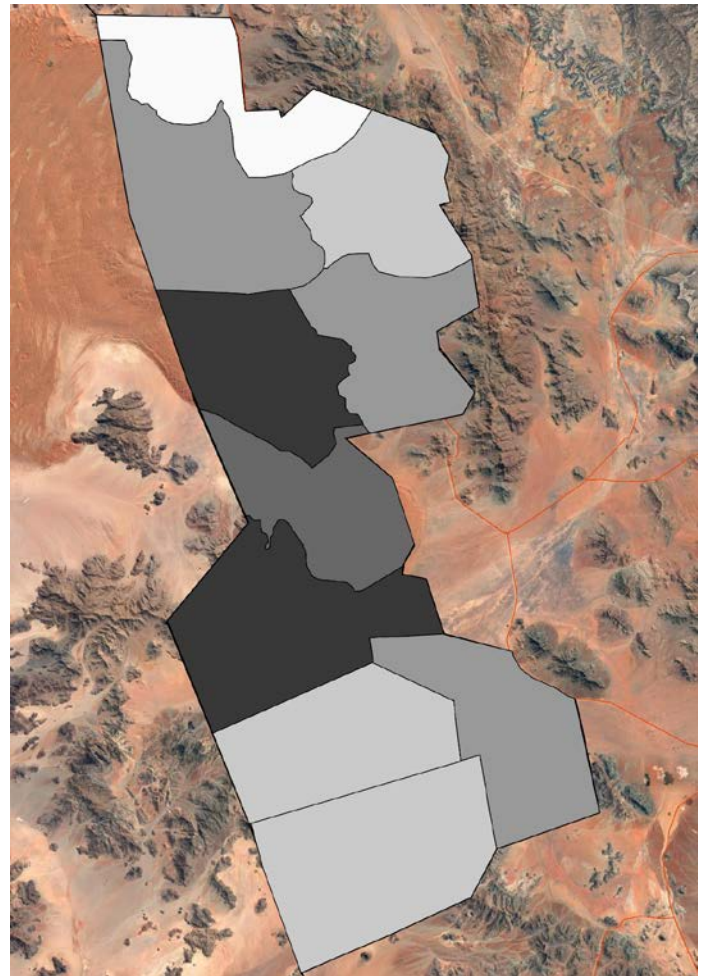


Figure 4.2 Total wildlife density

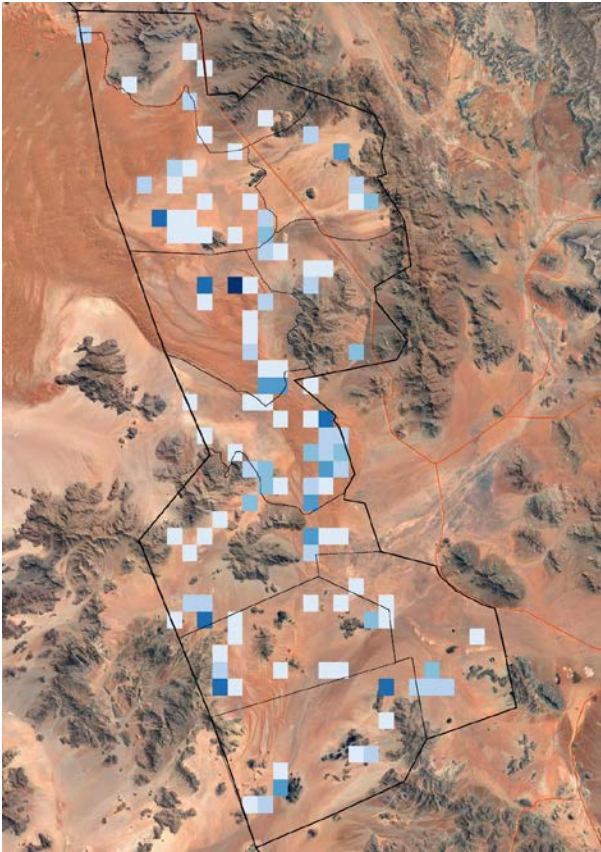


Figure 4.3 Distribution of gemsbok

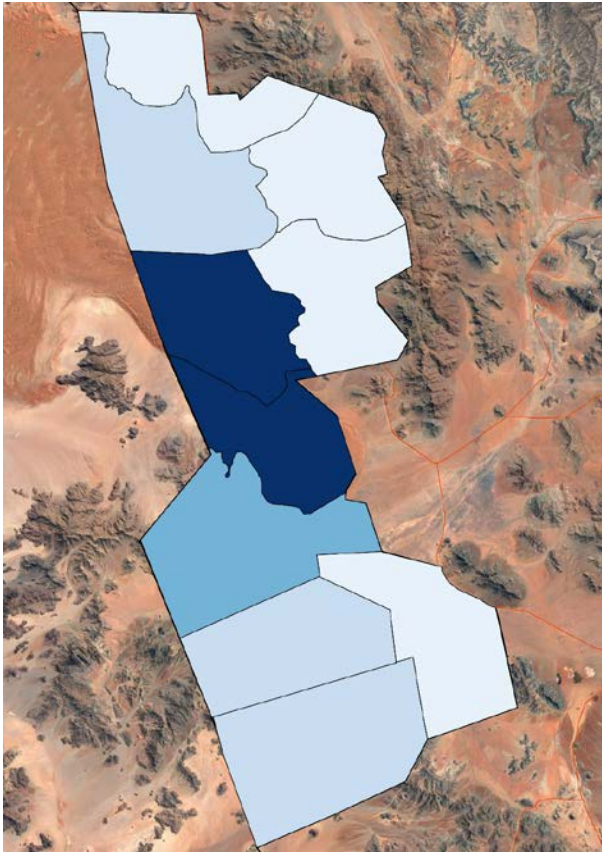


Figure 4.4 Density of gemsbok

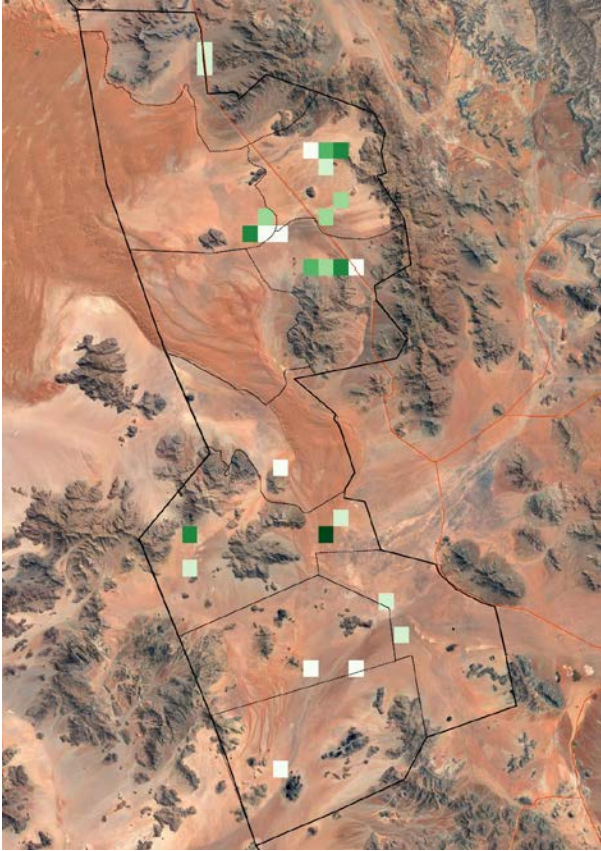


Figure 4.5 Distribution of springbok

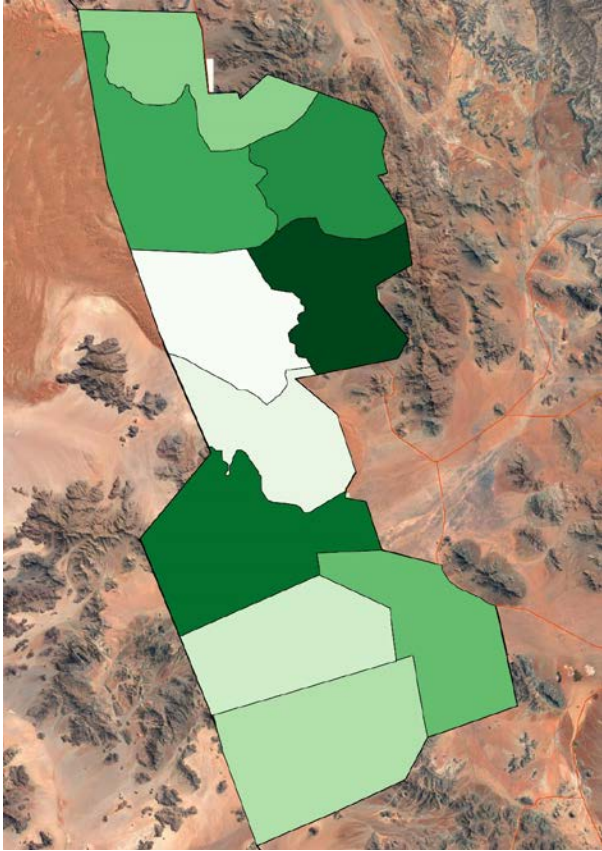


Figure 4.6 Density of springbok



Figure 4.7 Distribution of *B. zebra*

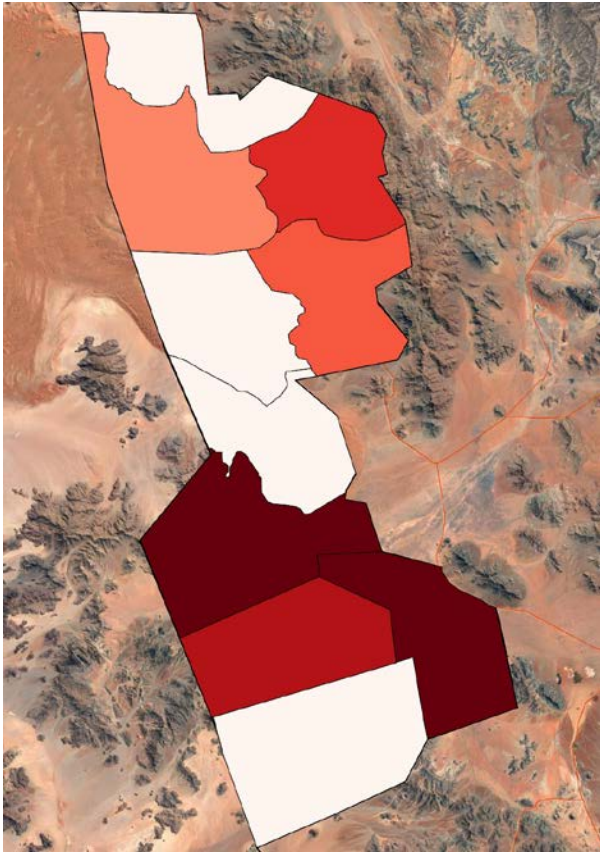


Figure 4.8 Density of *B. Zebra*



Figure 4.9 Distribution of ostrich

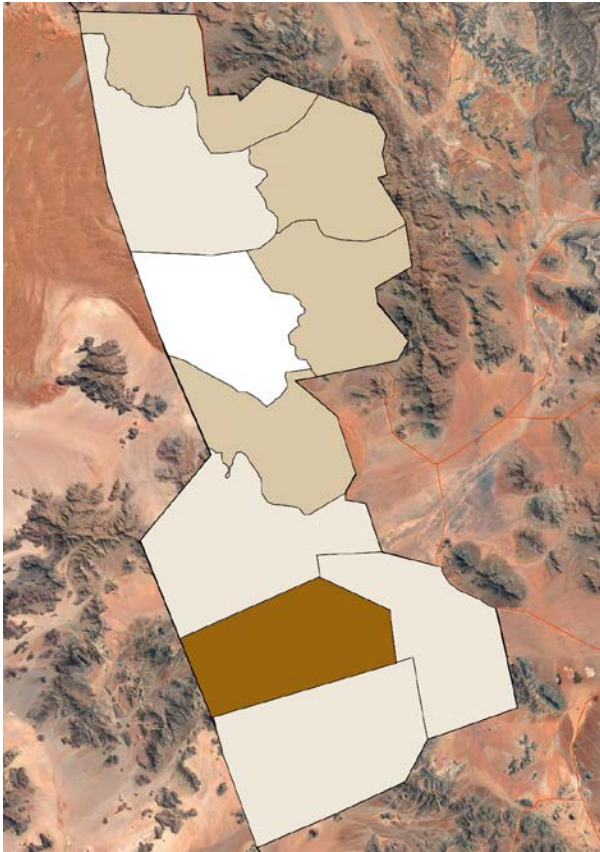


Figure 4.10 Density of ostrich

The population densities and actual number seen for individual species per zone are shown in tables 7.1-7.7 below.

Table 7.1

<b>Gemsbok</b>			
<b>Route</b>	<b>Route length</b>	<b>Actual number seen</b>	<b>Density</b>
1	58	25	43,10
2	62	56	90,32
3	61	115	188,52
4	44	180	409,09
5	70	257	367,14
6	35	39	111,43
7	55	106	192,73
8	50	70	140,00
9	51	45	88,24
10	57	102	178,95
<b>Total</b>	<b>543</b>	<b>995</b>	<b>183,24</b>

Table 7.2

<b>Springbok</b>			
<b>Route</b>	<b>Route length</b>	<b>Actual number seen</b>	<b>Density</b>
1	58	7	12,07
2	62	52	83,87
3	61	47	77,05
4	44	0	0,00
5	70	1	1,43
6	35	60	171,43
7	55	88	160,00
8	50	1	2,00
9	51	8	15,69
10	57	2	3,51
<b>Total</b>	<b>543</b>	<b>266</b>	<b>48,99</b>

Table 7.3

<b>Ostrich</b>			
<b>Route</b>	<b>Route length</b>	<b>Actual number seen</b>	<b>Density</b>
1	58	6	10,34
2	62	8	12,90
3	61	1	1,64
4	44	0	0,00
5	70	7	10,00
6	35	4	11,43
7	55	2	3,64
8	50	21	42,00
9	51	3	5,88
10	57	2	3,51
<b>Total</b>	<b>543</b>	<b>54</b>	<b>9,94</b>

Table 7.4

<b>Burchell's Zebra</b>			
<b>Route</b>	<b>Route length</b>	<b>Actual number seen</b>	<b>Density</b>
1	58	0	0,00
2	62	8	12,90
3	61	5	8,20
4	44	0	0,00
5	70	0	0,00
6	35	4	11,43
7	55	52	94,55
8	50	7	14,00
9	51	96	188,24
10	57	0	0,00
<b>Total</b>	<b>543</b>	<b>172</b>	<b>31,68</b>

Table 7.5

<b>Red Hartbeest</b>			
<b>Route</b>	<b>Route length</b>	<b>Actual number seen</b>	<b>Density</b>
1	58	0	0,00
2	62	15	24,19
3	61	0	0,00
4	44	0	0,00
5	70	0	0,00
6	35	0	0,00
7	55	10	18,18
8	50	0	0,00
9	51	0	0,00
10	57	0	0,00
<b>Total</b>	<b>543</b>	<b>25</b>	<b>4,60</b>

Table 7.6

<b>Ruppel's Korhaan</b>			
<b>Route</b>	<b>Route length</b>	<b>Actual number seen</b>	<b>Density</b>
1	58	6	10,34
2	62	0	0,00
3	61	2	3,28
4	44	0	0,00
5	70	2	2,86
6	35	0	0,00
7	55	0	0,00
8	50	0	0,00
9	51	2	3,92
10	57	0	0,00
<b>Total</b>	<b>543</b>	<b>12</b>	<b>2,21</b>

Table 7.7

<b>Ludwig's Bustard</b>			
<b>Route</b>	<b>Route length</b>	<b>Actual number seen</b>	<b>Density</b>
1	58	0	0,00
2	62	0	0,00
3	61	0	0,00
4	44	0	0,00
5	70	0	0,00
6	35	0	0,00
7	55	0	0,00
8	50	0	0,00
9	51	0	0,00
10	57	0	0,00
<b>Total</b>	<b>543</b>	<b>0</b>	<b>0,00</b>



The total wildlife density for all game species (including Ludwig’s Bustard and Ruppel’s Korhaan) combined in each count zone for May 2018 is shown in Table 8 below, and the percentage distribution in each zone is shown in Figure 5 that follows.

Table 8. Total number of animals counted per 100km for each route in 2018.

Total no. of animals counted per 100km per route			
Route	Route Length (km)	No. of animals counted/100km	% of total animals counted per 100km
1	58	76	3%
2	62	224	8%
3	61	279	10%
4	44	409	14%
5	70	381	13%
6	35	306	11%
7	55	469	17%
8	50	198	7%
9	51	302	11%
10	57	186	7%
<b>Total</b>	<b>543</b>	<b>2830</b>	

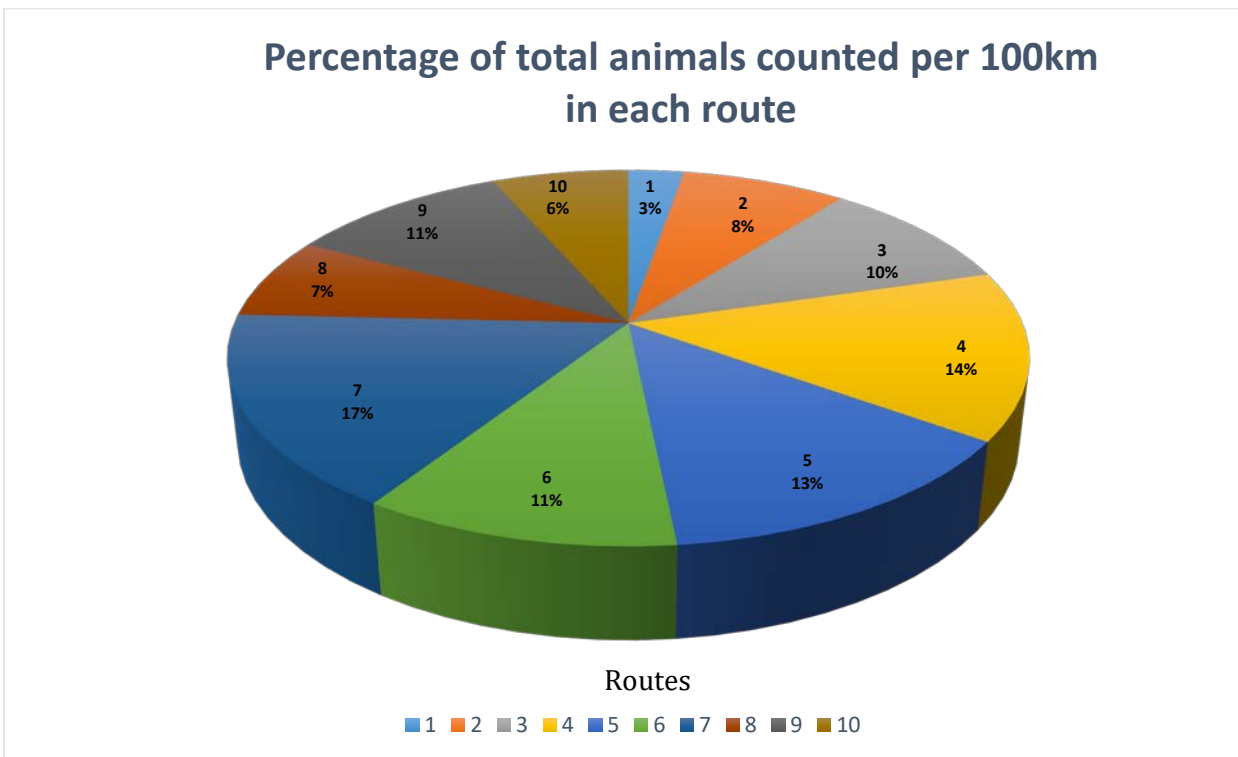


Figure 5. Population density percentages throughout the count area.

The total wildlife density for all species (including Ludwig’s Bustard and Ruppel’s Korhaan) combined per count zone in May 2018, compared to May 2016 and May 2017, is shown in Table 9 below.

Table 9. Total number of animals counted per 100km for each route in 2018 compared to 2016 and 2017.

<b>Total no of animals counted per 100 km per route (May 2016 - May 2018)</b>				
Route	May-16	May-17	May-18	% change (May-17 to May-18)
1	154	293	76	-74,11%
2	261	1775	224	-87,37%
3	383	979	279	-71,53%
4	721	1589	409	-74,25%
5	612	780	381	-51,10%
6	639	1597	306	-80,86%
7	785	427	469	9,86%
8	380	771	198	-74,32%
9	1050	277	302	9,01%
10	25	91	186	104,36%
Total	640	588	281	-52,28%

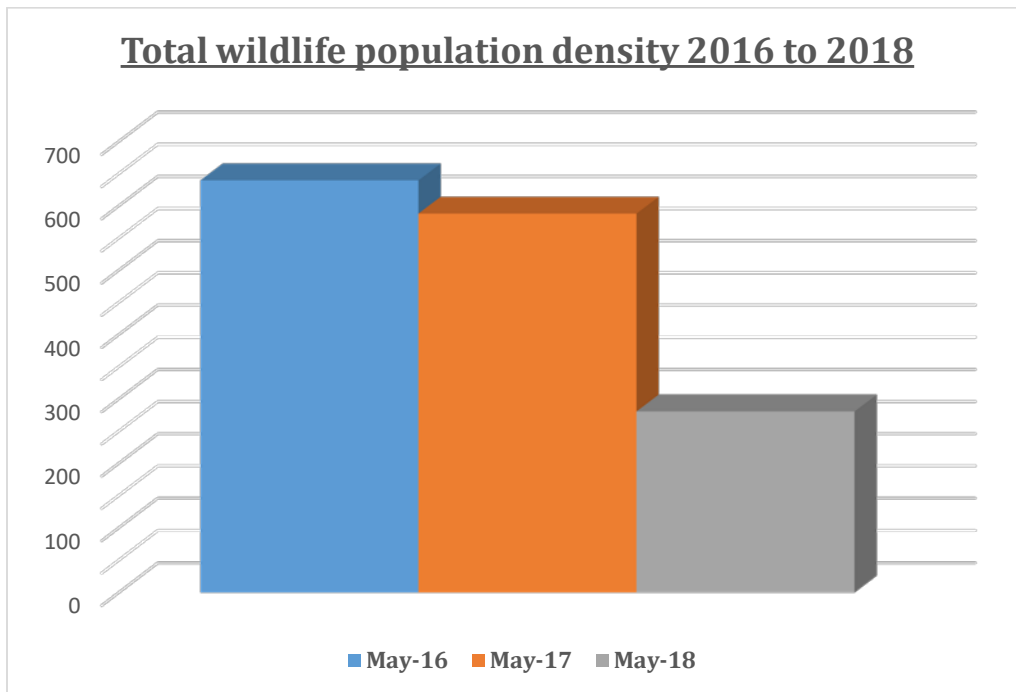


Figure 6. Total wildlife density change from 2016-2018.

### Objective 3: Population change

The total estimated numbers of game for the May 2017 count is compared to those from previous years to

illustrate the population change, and are shown in Tables 10 and 11 below. The overall population estimate has increased by 43% and the number of animals counted per 100km per route has increased by 38.42%.

Table 10. Population estimates for 2018 compared to 2017.

Total estimated numbers of game (Zone 1-10; May 2017-May 2018)					
Species	May-17		May-18		Percentage Change
	No. Counted	Total Estimated Number	No. Counted	Total Estimated Number	
Gemsbok	2887	10844	995	3707	-65,82%
Springbok	733	3649	266	1722	-52,81%
Kudu	1	4	0	0	-100,00%
Steenbok	0	0	0	0	0,00%
Ostrich	85	254	54	131	-48,43%
Ludwig's bustard	29	222	0	0	-100,00%
Ruppell's korhaan	22	234	12	124	-47,01%
B. Zebra	347	492	172	329	-33,13%
Hartebeest	62	174	25	67	-61,49%
<b>Total</b>	<b>4166</b>	<b>15873</b>	<b>1524</b>	<b>6080</b>	<b>-61,70%</b>
Giraffe*	9	9	9	9	0,00%

\*Total (estimate) numbers known

The long term total population estimates are presented in the table below.

Table 11. Population estimates for years 2007-2018.

Species	Jun '07	Jun '08	Jun '09 (1-9)	Jun '10 (1-9)	Jun '11 (1-9)	Jun '12 (1-10)	Jun '13 (1-10)	May 2014 (1-10)	May 2015 (1-10)	May 2016 (1-10)	May 2017 (1-10)	May 2018 (1-10)
Gemsbok	3571	2938	5069	3972	6696	7493	8112	9087	7447	6650	10625	3707
Springbok	7704	11705	11938	7359	9968	6225	5828	3024	3420	2944	3243	1722
Kudu	151	23	31	10	15	16	5	0	7	0	4	0
Steenbok	123	151	40	0	0	0	0	0	0	0	0	0
Ostrich	550	312	733	448	365	748	183	220	218	145	226	131
Ludwigs Bustard	286	45	53	693	286	285	381	247	119	92	222	0
Ruppel's Korhaan	127	0	224	210	335	468	388	229	145	362	234	124
B. zebra*	677	668	318	350	370	470	320	352	367	510	509	329
Hartebeest*	80	80	80	110	125	177	204	197	220	149	174	67
Giraffe*	0	0	4	8	6	6	6	7	7	9	9	9
<b>Total</b>	<b>13269</b>	<b>15922</b>	<b>18490</b>	<b>13160</b>	<b>18166</b>	<b>15888</b>	<b>15427</b>	<b>13363</b>	<b>11950</b>	<b>10861</b>	<b>15246</b>	<b>6089</b>
Blesbok*	20	20	23	19	18	7	3	0	0	0	0	0
% change	-35,89%	19,99%	16,13%	-28,83%	38,04%	-12,54%	-2,90%	-13,38%	-10,57%	-9,11%	40,37%	-60,06%

\*Total numbers known

The graphs in figure 7.1-7.4 below, show the total long term individual estimate changes for the four most common species. Please note that the figures of these graphs are taken from the respective species estimates from the maximum number of routes counted in each year.

Figure 7.1

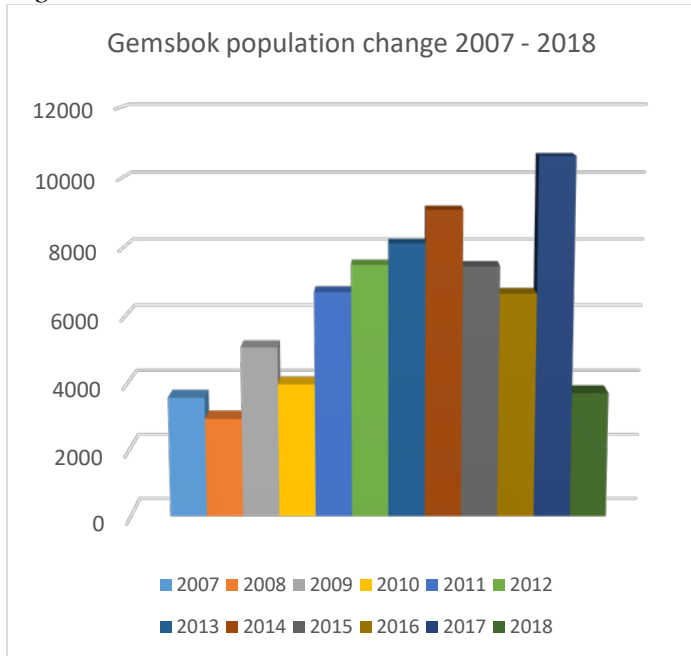


Figure 7.2

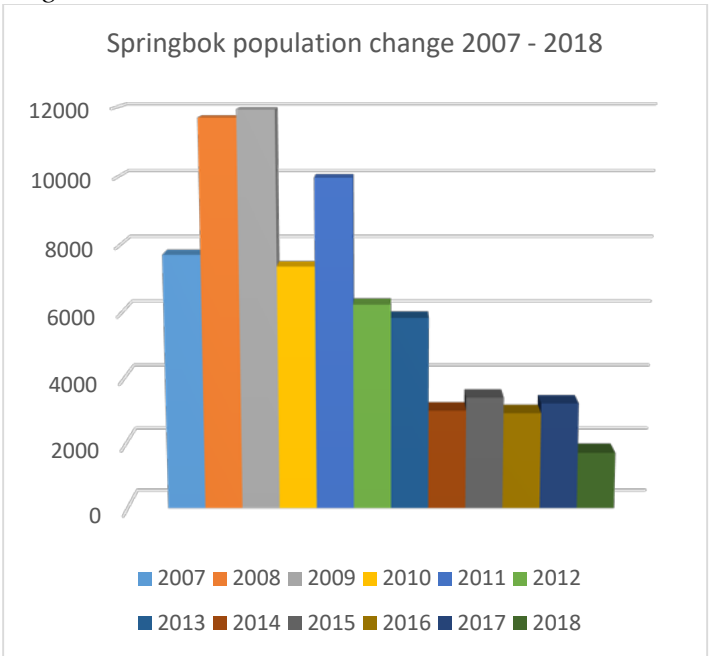


Figure 7.3

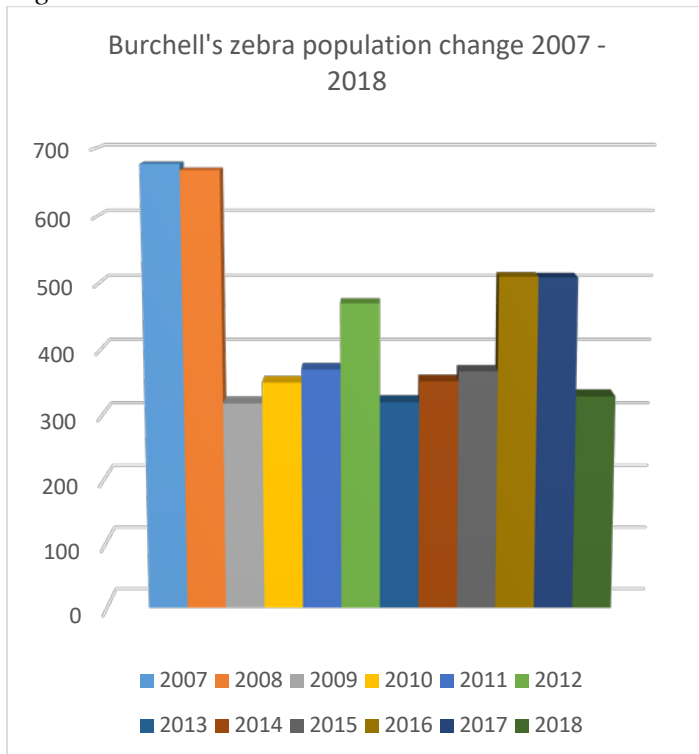
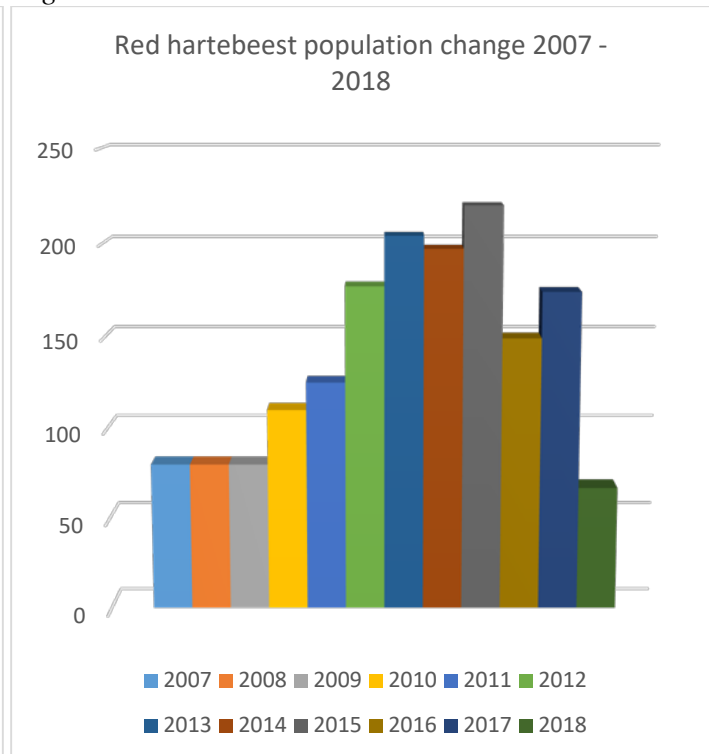
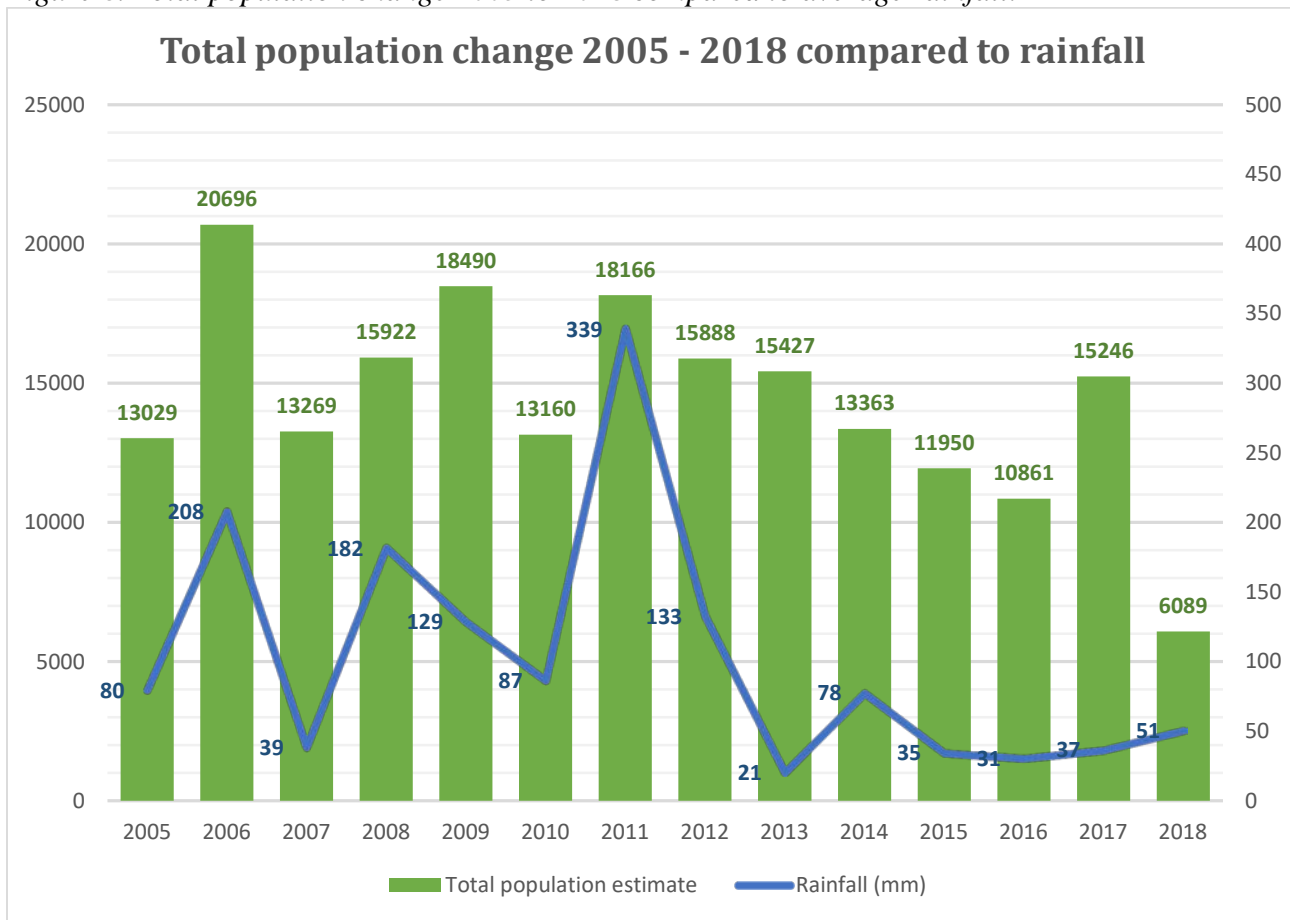


Figure 7.4



The graph in Figure 8 below shows long term total population estimate change compared to the average annual rainfall received for the same period. Please note that as with the previous graphs, the figure for this graph was taken from the total population estimates and from the maximum number of routes counted in each year.

Figure 8. Total population change 2005 to 2018 compared to average rainfall.



## 5. Discussion and conclusions

### **Gemsbok**

The results of the 2017 gemsbok population estimate show an increase of 59.77% (10,625 gemsbok) from last year's estimate (6,650 gemsbok). This is the first increase in gemsbok estimate numbers since 2014. While this is a significant increase in the population, it should be noted that there was an increase in rainfall in the central zones, thus causing an immigration of herds.

The highest density of gemsbok was recorded in Zone 4, which had a total of 1,138 gemsbok per 100 km. This is consistent with the previous two years indicating a preference for the habitat found in this zone. The second highest density of gemsbok was in Zone 6 (1,050 gemsbok per 100 km). The higher densities of gemsbok in Zones 4 and 6 represents a southerly shift which is also seen in the previous year's data. In 2016, the highest densities were recorded in Zone 4 and Zone 7. The lowest density recorded in the 2017 population estimate was 50 gemsbok per 100 km, which was recorded in Zone 10. The second lowest density was recorded in Zone 9, 75 gemsbok per 100 km.

Overall, the population appears to be shifting slightly towards the central and southern parts of the reserve. These results follow trends in previous year's data, which indicates a shift from the northern part of the reserve, to the central and southern parts.

### **Springbok**

The estimated number of springbok for this year is 3,243, which is an increase of 10.16% from last year's estimate of 2,944. Although the estimated number of springbok is higher, the actual number of springbok seen has decreased from 690 in 2016 to 651 in 2017. This is a 6% decrease in springbok sightings.

The springbok were predominantly concentrated in Zones 4, 6 and 7. Of the estimated 3,243 springbok, there were 2,858 springbok or 63% of the total population in these zones. No springbok were accounted for in Zone 9 and only 8 springbok were estimated for Zone 10. The other zones showed an average estimated population of 150 springbok.

### **Kudu**

Only one kudu was counted in this year's game count and an estimated population for the reserve is 4. This estimated population does not give a true reflection of the kudu population, as sightings and camera trap images throughout the year suggest that there is a healthy population of kudu on the reserve. There was no kudu recorded during last year's game count and only two were recorded in 2015's game count. The game count method for this species is the most likely explanation for the fact that very few have been seen in the past three years.

### **Steenbok**

For the fourth year in a row, no steenbok have been seen during the game count. As the case with the kudus, the census method is not well suited for steenbok. Although no steenbok have been recorded, this is not a true reflection of the population on the reserve.

### **Ostrich**

This year's ostrich population estimate is 226. This is an 56.9% increase from last year's population estimate of 145. The majority of the sightings were in Zone 6 (24 ostrich) and Zone 10 (27 ostrich), whereas no ostrich were recorded for Zones 1, 2, 8 and 5. This is the first increase in the population in more than five years.

### **Ludwig's Bustard**

The estimated number of Ludwig's Bustard increased from 92 in 2016 to 222 in 2017, a 141% increase. This indicates a huge increase in the population size, something that has been seen throughout previous years. There are vast fluctuations in the Ludwig's Bustard estimated population size from year to year, and there are no trends to suggest a steady increase or decrease in the population.

### **Ruppel's Korhaan**

The estimated number of Ruppel's Korhaan decreased from 362 in 2016 to 234 in 2017, a 35% decrease. This decrease is most certainly attributable to the drought across the reserve. Overall, 22 Ruppel's Korhaan were seen this year as opposed to 29 last year.

### **Burchell's Zebra**

This is the second year calculated estimates were used to estimate the total population size for Burchell's zebra, since their range has expanded to cover most zones on the reserve. The Effective Strip Width (ESW) provides a greater visibility of Burchell's zebras and provided estimates that should closely resemble the total count number.

This year, a total of 347 zebra were counted to give a total estimated population of 717. This is a 107% increase from 2016. As indicated previously the population is widespread throughout the reserve and zebra were only absent, or not counted, in Zones 9, 4, 3, and 1. Zone 2 had the highest density of 533 zebra per 100km and accounted for more than half of the estimated population.

Burchell's zebra are considered less drought tolerant than gemsbok or springbok, but the population continued to increase. The increase in population is most likely attributable to their range expansion, coupled with the widespread provision of water in the reserve. The threshold has not yet been met for the zebra, but in the future their numbers will reach their threshold of tolerance and begin to decline.

### **Red Hartebeest**

The estimated number of red hartebeest increased from 149 in 2016 to 174 in 2017, a 16.78% increase. This population estimate however might be a bit low, because they were only seen in two zones. There was 61 hartebeest seen in Zone 2 and only 1 seen in Zone 5.

### **Giraffe**

There were no giraffe sightings during this year's game count. Although there were no sightings there are regular sightings that suggest there are 9 giraffes on the reserve. There are 6 giraffes in the southern parts of the reserve, and 3 found in the northern parts of the reserve. It is unlikely that the population of giraffes will change in the near future, because the cows and bulls were separated during the relocation of a group of 4 to the southern part of the reserve.

### **Total population change, distribution and densities**

The total population estimate increased by 43.24% this year to 15,445 animals. The actual number of animals counted also increased from 2,915 animals in 2016 to 4,035 animals in 2017, an increase of 38.42%. The increase in both the estimated and counted populations of animals is most likely due to the drought across the reserve. The reserve is currently in the longest consecutive period of below average rainfall since the inception of the game count in 2005.

From the data, it is possible to suggest that the estimated and counted populations increased due to the immigration of animals onto the reserve. The movement of animals suggests that the reserve has a more adequate water supply and better resources for the majority of animals, and the animals are most likely coming from a more drought-stricken regions. This increase in the total population size will lead to major increases in

competition for resources in the near future. The areas throughout the reserve will be depleted of its vital resources more quickly than usual due to the huge fluctuation in population size.

The overall density showed a 44.76% increase from the previous year and was consistent with the estimated population increase from previous years. This year, a total density of 760 animals per 100km was observed compared to 525 in 2016. The overall distribution of animals across the reserve showed a slight trend of migration towards the northern parts of the NamibRand Nature Reserve.



## 6. Acknowledgments

The NamibRand Nature Reserve would like to thank all of its concessionaires, stakeholders, neighbors and participants for their enthusiastic involvement to make this year's game count another success.

This year's participants were:

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## 7. Appendix

### Results per count route per zone

Tables 12.1 to 12.10 list the data collected on each route in May 2018, which were used as a basis for the analysis.

Table 12.1

Route 1			
Species	Total number counted	Density	Estimated population
Gemsbok	25	43	69
Springbok	7	12	23
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	6	10	10
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	6	10	46
B. Zebra	0	0	0
Hartebeest	0	0	0
<b>Total</b>	<b>44</b>	<b>76</b>	<b>148</b>
Jackal*	4		
Hartmann's Mountain Zebra*	2		

\*Not included in count

Table 12.2

Route 2			
Species	Total number counted	Density	Estimated population
Gemsbok	56	90	201
Springbok	52	84	256
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	8	13	13
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. Zebra	8	13	9
Hartebeest	15	24	33
<b>Total</b>	<b>139</b>	<b>224</b>	<b>512</b>
Jackal*	3		

\*Not included in count

Table 12.3

<b>Route 3</b>			
Species	Total number counted	Density	Estimated population
Gemsbok	115	189	538
Springbok	47	77	527
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	1	2	3
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	2	3	31
B. Zebra	5	8	11
Hartebeest	0	0	0
<b>Total</b>	<b>170</b>	<b>279</b>	<b>1110</b>
Jackal*	2		
Bat-eared Fox*	3		

\*Not included in count

Table 12.4

<b>Route 4</b>			
Species	Total number counted	Density	Estimated population
Gemsbok	180	409	690
Springbok	0	0	0
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	0	0	0
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. Zebra	0	0	0
Hartebeest	0	0	0
<b>Total</b>	<b>180</b>	<b>409</b>	<b>690</b>
Jackal*	1		
Bat-eared Fox*	4		

\*Not included in count

Table 12.5

<b>Route 5</b>			
Species	Total number counted	Density	Estimated population
Gemsbok	257	367	595
Springbok	1	1	4
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	7	10	13
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	2	3	18
B. Zebra	0	0	0
Hartebeest	0	0	0
<b>Total</b>	<b>267</b>	<b>381</b>	<b>630</b>
Lappet-faced Vulture*	3		

\*Not included in count

Table 12.6

<b>Route 6</b>			
Species	Total number counted	Density	Estimated population
Gemsbok	39	111	119
Springbok	60	171	287
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	4	11	10
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. Zebra	4	11	7
Hartebeest	0	0	0
<b>Total</b>	<b>107</b>	<b>306</b>	<b>423</b>
Jackal*	3		
Giraffe*	2		

\*Not included in count

Table 12.7

<b>Route 7</b>			
Species	Total number counted	Density	Estimated population
Gemsbok	106	193	357
Springbok	88	160	573
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	2	4	5
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. Zebra	52	95	89
Hartebeest	10	18	34
<b>Total</b>	<b>258</b>	<b>469</b>	<b>1058</b>
Bat-eared Fox*	2		
Lappet-faced Vulture*	5		

\*Not included in count

Table 12.8

<b>Route 8</b>			
Species	Total number counted	Density	Estimated population
Gemsbok	70	140	222
Springbok	1	2	5
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	21	42	61
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. Zebra	7	14	14
Hartebeest	0	0	0
<b>Total</b>	<b>99</b>	<b>198</b>	<b>302</b>
Bat-eared Fox*	3		
Lappet-faced Vulture*	1		

\*Not included in count

Table 12.9

<b>Route 9</b>			
Species	Total number counted	Density	Estimated population
Gemsbok	45	88	233
Springbok	8	16	38
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	3	6	9
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	2	4	29
B. Zebra	96	188	199
Hartebeest	0	0	0
<b>Total</b>	<b>154</b>	<b>302</b>	<b>508</b>
Bat-eared Fox*	27		

\*Not included in count

Table 12.10

<b>Route 10</b>			
Species	Total number counted	Density	Estimated population
Gemsbok	102	179	683
Springbok	2	4	9
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	2	4	7
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. Zebra	0	0	0
Hartebeest	0	0	0
<b>Total</b>	<b>106</b>	<b>186</b>	<b>699</b>

\*Not included in count

Table 12.11

Total number of game			
Species	Total number counted	Density	Estimated population
Gemsbok	995	183	3707
Springbok	266	49	1722
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	54	10	131
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	12	2	124
B. Zebra	172	32	329
Hartebeest	25	5	67
<b>Total</b>	<b>1524</b>	<b>281</b>	<b>6080</b>
Jackal*	13		
Bat-eared Fox*	39		
Giraffe*	2		
Lappet-faced Vulture*	9		
Hartmann's Mountain Zebra*	2		

\*Not included in count