NamibRand
Nature Reserve
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Results of the
NamibRand Nature Reserve
and Pro-Namib Conservancy
Annual Game Count
30 May 2015

Photo by: Felix Lipov ©

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1. Introduction

This report provides summarised results and analysis of the annual game count held on the NamibRand Nature Reserve and the Pro-Namib Conservancy on the 30th of May 2015. This is the eleventh consecutive year that the count was held since its inception in 2005.

For this game count we were joined by students from the University of Nebraska's school of Natural Resources. These students along with the other NRNR stakeholders attended the game count briefing held at Wolwedans on the afternoon prior to the game count. At the game count briefing, Nils Odendaal explained the game count methodology and divided the participants into the various routes.

This year we contracted game count experts, Tony Robertson and Alice Jarvis of JARO consultancy, through the NAMPLACE project to develop a game count database for the Reserve and whole landscape. The aim of the database is to (automatically) generate, consistent, quick and accurate results of the game count done, once the game count data is entered onto the database. In the formation of the game count database, Tony and Alice found a few inconsistencies in our game count methodology and results, which they corrected and incorporated into the database. For this reason, the results from previous years differ, but were corrected and these corrected figures are used in this report and will be used in future reports.

As a result of the third year of drought we are currently going through, it is not surprising that this year's results show a decrease of 18.05% in gemsbok population estimate on the Reserve. The springbok population estimate increased by 13.10%. This can be attributed to the correction of errors as described above as the actual number of springbok seen in this year's count only increased by 1.12% from last year. It is interesting to note that of the 633 springbok counted in this year's count, 254 (40.13%) was counted in Zone 2, and none were seen in Zones 3 and 10.

The burchell's zebra (b. zebra) and hartebeest populations are believed to have increased only slightly, as the respective population estimates show a 5.11% and 11.68% increase respectively compared to last year's figures. These two species expanded their home range to the South of the Reserve, and thus a total count of these animals has become a lot more difficult to do. During the game count, 126 of the total 219 counted b. zebra were recorded in the South of the Reserve, in Zones 5, 7 and 8. The total number of b. zebra and hartebeest counted throughout the count area was supplemented with individual sightings reported close to the game count date, the number of juveniles counted last year, and the mortalities recorded in the past year. These together with past trends were all used to calculate an estimate of the total population of these species. We plan to integrate these two species into game count population estimates for next year.

Please note that while the game count method employed is good for estimating larger numbers of common plains game, it less suited for other species such as kudu and steenbok. No single census method is complete in itself, but needs to be supplemented and complemented on a dynamic basis by local knowledge and other sources of information, e.g. independent total counts of recently re-introduced species, incidental sightings and camera trap recordings.

2. Summary

Data collected in the May 2015 game count was entered into our database and analysed, and is shown below bearing our three core objectives in mind:

Objective 1: Population and biomass estimates:

Population estimates:

The total number of game seen and the estimated numbers is shown in the table below.

Total estimated numbers of game (Zone 1-10; May 2015)		
Species	**No. Counted**	**Estimate 2015**
Gemsbok	2099	7447
Springbok	633	3420
Kudu	2	7
Steenbok	0	0
Ostrich	67	218
Ludwigs Bustard	13	119
Ruppel's Korhaan	11	145
Total	**2825**	**11356**
B. zebra*	219	370
Hartebeest*	66	220
Giraffe*	7	7

** Total numbers known*

Biomass estimates

The table below shows the wildlife biomass estimates for May 2015.

Total wildlife numbers and wildlife biomass on NamibRand for May 2015 (Zone 1-10) ; 224 209 ha)				
Species	**Mean mass (kg)**	**Estimated wildlife numbers from June 15 game count**	**Species biomass (kg)**	**Biomass per ha (kg)**
Gemsbok	220	7447	1638340	8,77
Springbok	38	3420	129960	0,70
Kudu	180	7	1260	0,01
Steenbok	11	0	0	0,00
Ostrich	68	218	14824	0,08
B. Zebra*	300	370	111000	0,59
Hartebeest*	130	220	28600	0,15
Total	**947**	**11682**	**11062854**	**10,30**

** Total (estimate) numbers known*

Objective 2: Wildlife distribution and density

The table below shows the total number of animals counted per 100km in each route and the respective density percentage per zone.

Total no of animals counted per 100 km per route			
Route	**Route length (km)**	**No of animals counted/100km**	**% of total animals counted per 100km**
1	52	155	3%
2	52	817	14%
3	58	579	10%
4	47	1182	20%
5	72	814	14%
6	34	901	15%
7	55	731	12%
8	52	563	9%
9	50	76	1%
10	59	171	3%
Total	**531**	**5989**	

Objective 3: Population change

The overall population estimate is down by 11.33% and the number of animals counted per 100km per route has decreased by 6.58%.

Total estimated numbers of game (Zone 1-10; May 2014 - May 2015)					
Species	**May-14**		**May-15**		**Percentage change**
	No. Counted	**Total estimated number**	**No. Counted**	**Total estimated number**	
Gemsbok	2261	9087	2099	7447	-18,05%
Springbok	626	3024	633	3420	13,10%
Kudu	0	0	2	7	700,00%
Steenbok	0	0	0	0	0,00%
Ostrich	82	220	80	218	-0,91%
Ludwigs Bustard	28	247	13	119	-51,82%
Ruppel's Korhaan	27	229	11	145	-36,68%
B. zebra*	223	352	219	370	5,11%
Hartebeest*	197	197	66	220	11,68%
Total	**3444**	**13356**	**3123**	**11946**	**-10,56%**
Giraffe*	6	6	7	7	16,67%

** Total (estimate) numbers known*

3. Count Methodology

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

Road strip count

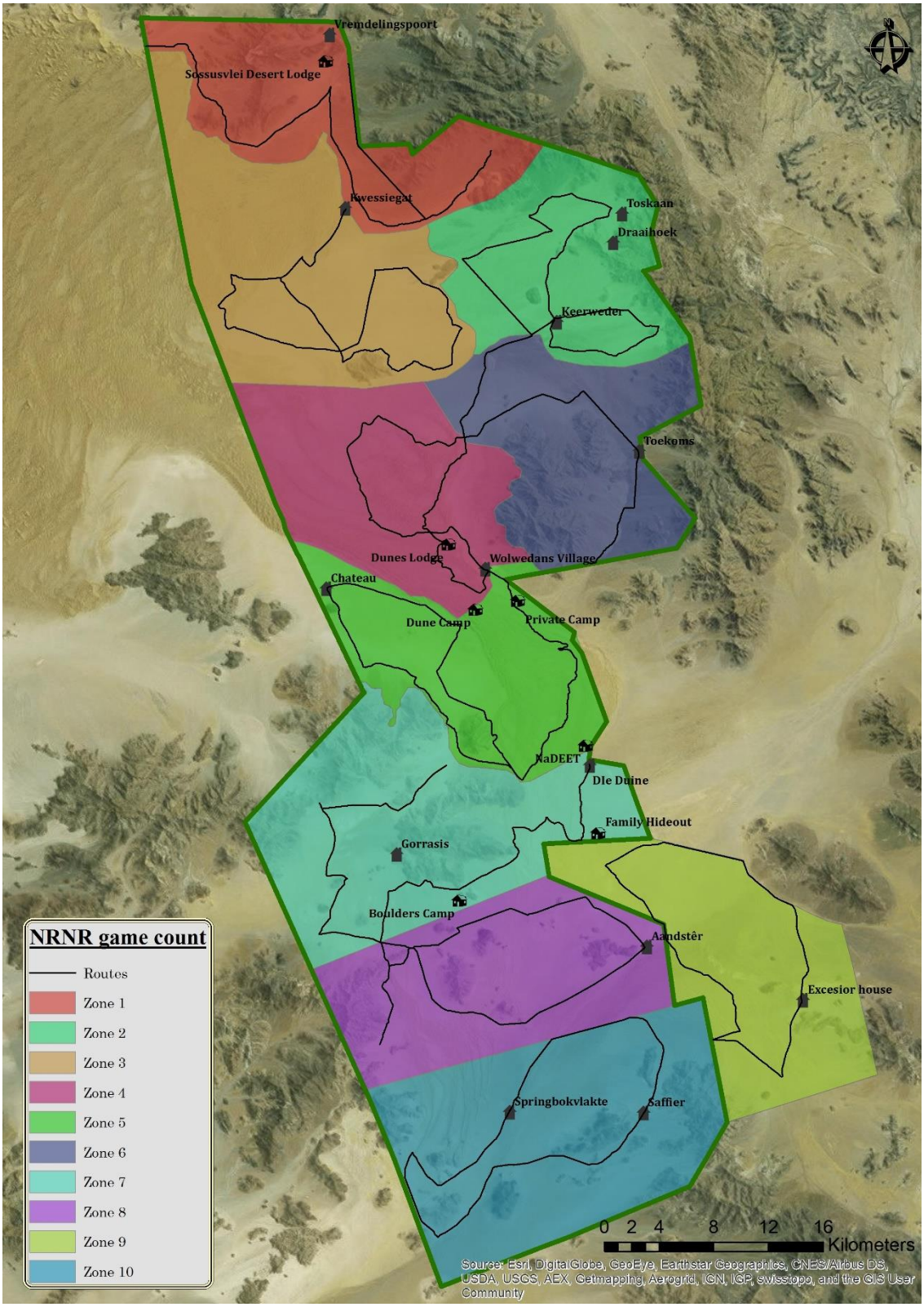
This is one of the most effective methods to use when counting in a relatively open and homogenous landscape. For the purposes of the count, the total area is divided into game count zones, each with its own standardized route, as shown in figure 1 on the next page. The game count zones were, as far 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 travelled) 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 1 below.

Table 1. 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 2015

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
Total	224 209	186 762	531				

Species	Effective strip width (m) routes 1 - 10	Species correction factor (m) routes 1 - 10
Ostrich	667	0,75
Kudu	417	1,20
Steenbok	51	9,80
Ruppells korhaan	141	3,55
Ludwigs bustard	208	2,40

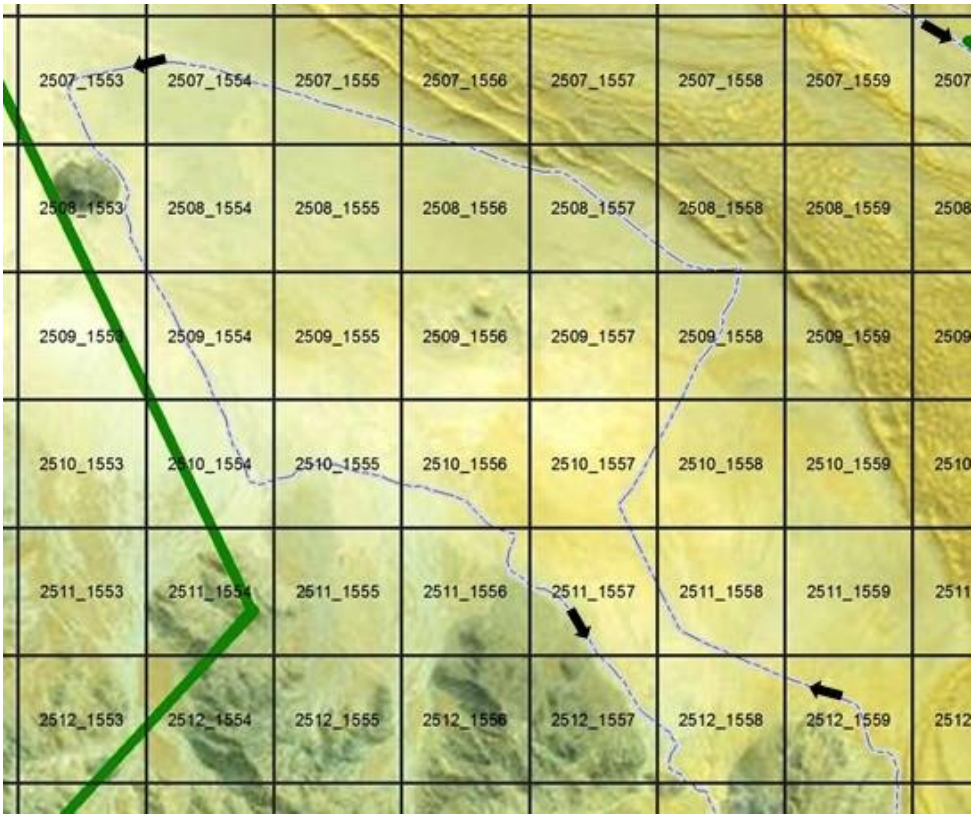
Figure 1. The game count area show the ten zones used in May 2015 for the NamibRand Nature Reserve (1-8, 10) and the Pro-Namib Conservancy (9).



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.

Figure 2: Monad maps.



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 the each recorded animal.

4. Objectives and results of the May 2015 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.

Actual number of animals seen* (S)
Area correction factor (A)
Species correction factor (B)

Formula for calculating population estimates*
(S x A) x B=P

**Known numbers*

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 preference 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 2.1 below).

Table 2.1: Total estimated numbers of game for 2015

Total estimated numbers of game (Zone 1-10; May 2015)		
Species	**No. Counted**	**Estimate 2015**
Gemsbok	2099	7447
Springbok	633	3420
Kudu	2	7
Steenbok	0	0
Ostrich	67	218
Ludwigs Bustard	13	119
Ruppel's Korhaan	11	145
B. zebra*	219	370
Hartebeest*	66	220
Total	**3110**	**11946**
Giraffe*	7	7

** 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.

Estimated wildlife numbers (E)
Mean mass per species (M)
Total no. of hectares (H)

Formula for calculating biomass estimates
(E x M) ÷ 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 in aspects such as grazing/browsing patterns, and agricultural stocking according to a camps system as opposed to the open, unfenced system within the Reserve.

The tables 3.1, 3.2 and 3.3 below show the biomass estimates for this year, and the biomass estimates for previous years compared to this year.

Table 3.1 Wildlife biomass estimates for May 2015.

Total wildlife numbers and wildlife biomass on NamibRand for May 2015 (Zone 1-10) ; 224 209 ha)				
Species	**Mean mass (kg)**	**Estimated wildlife numbers from June 15 game count**	**Species biomass (kg)**	**Biomass per ha (kg)**
Gemsbok	220	7447	1638340	8,77
Springbok	38	3420	129960	0,70
Kudu	180	7	1260	0,01
Steenbok	11	0	0	0,00
Ostrich	68	218	14824	0,08
B. Zebra*	300	370	111000	0,59
Hartebeest*	130	220	28600	0,15
Total	**947**	**11682**	**11062854**	**10,30**

** Total (estimate) numbers known*

The chart in figure 3 below shows the biomass composition of the different species across the total count area for the year 2015.

Figure 3: Biomass composition 2015

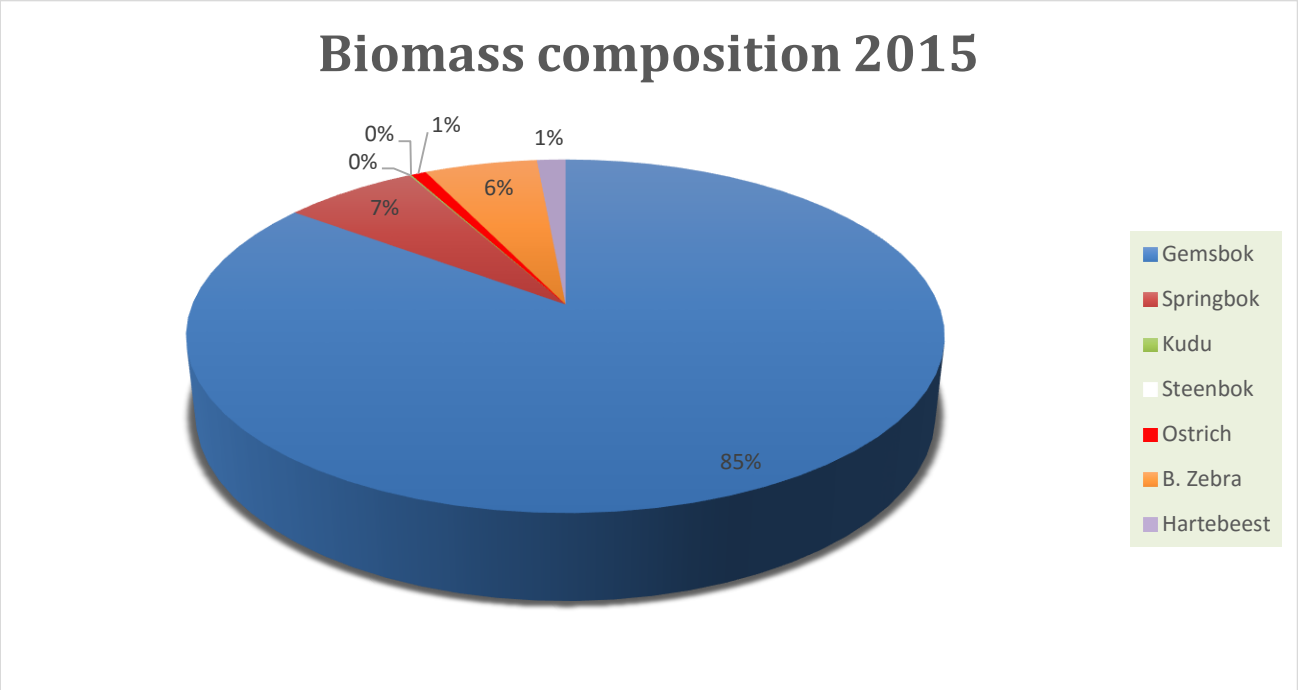


Table 3.2 Wildlife Biomass (2015) percentage change compared to the count of May 2014.

Wildlife biomass on NamibRand for May 2014 and May 2015 (Zone 1-10) ; 224 209 ha)								
Wildlife species	Mean mass (kg)	May-14			May-15			
		Estimated wildlife numbers from May 2014 game count	Species Biomass (kg)	Biomass per ha (kg) TOTAL	Estimated wildlife numbers from May 2015 game count	Species Biomass (kg)	Biomass per ha (kg) TOTAL	Biomass percentage change
Gemsbok	220	9087	1999140	10,70	7447	1638340	8,77	**-18,05**
Springbok	38	3024	114912	0,62	3420	129960	0,70	**13,10**
Kudu	180	0	0	0,00	7	1260	0,01	**0,01**
Steenbok	11	0	0	0,00	0	0	0,00	**0,00**
Ostrich	68	220	14960	0,08	218	14824	0,08	**-0,91**
B. zebra *	300	352	105600	0,57	370	111000	0,59	**5,11**
Red Hartebeest*	130	197	25610	0,14	220	28600	0,15	**11,68**
Total		**12880**	**2260222**	**12,10**	**11682**	**1923984**	**10,30**	**-14,88**

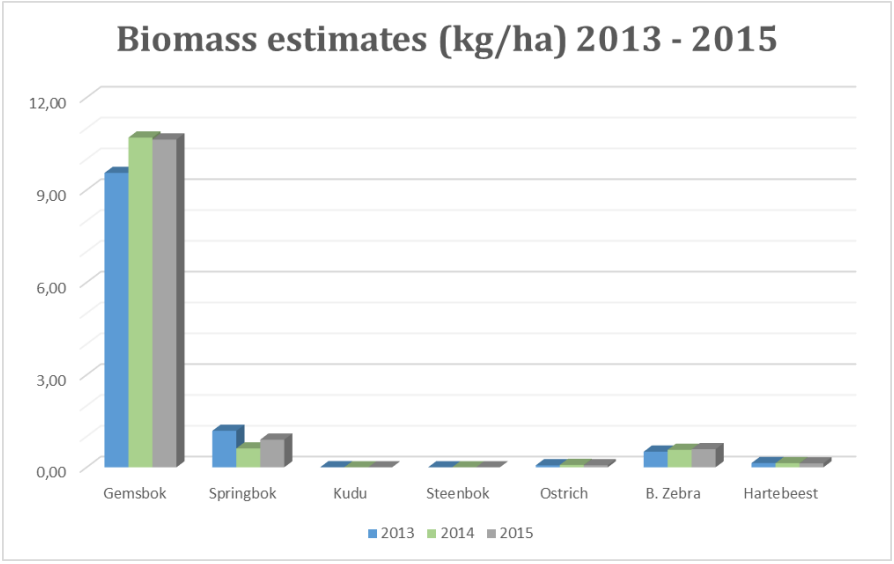
** Total (estimate) numbers known*

Table 3.3 Wildlife Biomass estimates from 2013 to 2015.

Total wildlife biomass estimates (kg/ha) on NamibRand June 2013 to May 2015					
Wildlife species	Jun-13	May-14	% change from Jun-13	May-15	% change from Jun-14
Gemsbok	9,56	10,70	*0,12*	8,77	*-18,05%*
Springbok	1,19	0,62	*-0,48*	0,70	*13,10%*
Kudu	0,00	0,00	*-1,00*	0,01	*1,00%*
Steenbok	0,00	0,00	*0,00*	0,00	*0,00%*
Ostrich	0,07	0,08	*0,20*	0,08	*-0,91%*
B. Zebra	0,51	0,57	*0,12*	0,59	*5,11%*
Hartebeest	0,14	0,14	*-0,02*	0,15	*11,68%*
Total	**11,5**	**12,1**	**-1,1**	**10,3**	***14,88%***

The graph in figure 4 below show the biomass estimates (kg/ha) from 2013 to 2015.

Figure 4: Biomass estimates 2013 to 2015



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 number of animals seen per 100km.

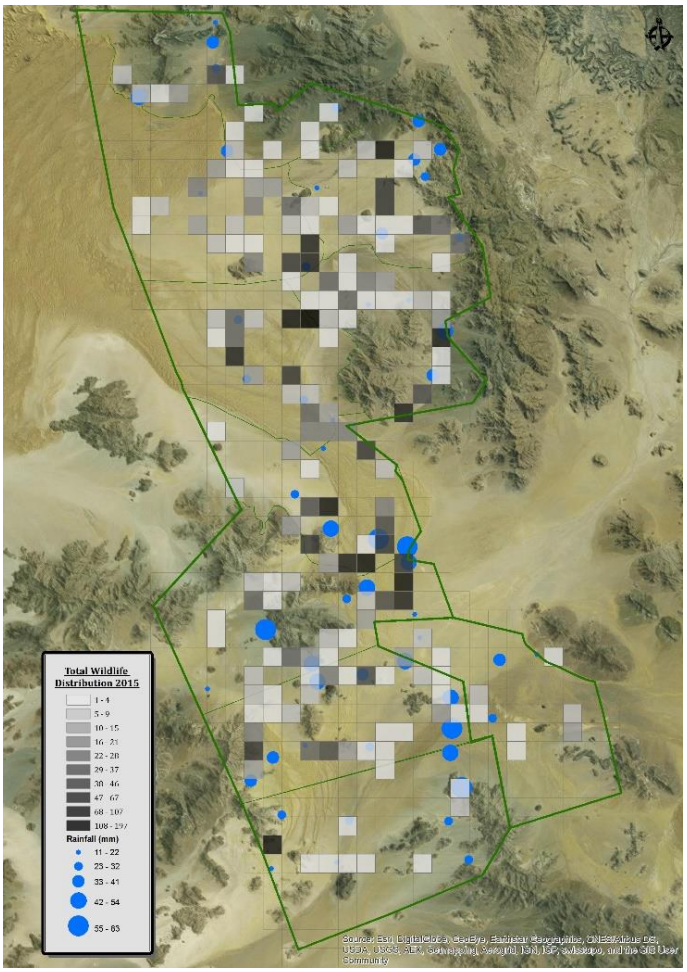
Actual number of animals seen (S)
Length of route (R)
Wildlife density - i.e. Animals seen per 100km driven (K)

Formula for calculating wildlife density
(S ÷ R) x 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. That data is then used to map the distribution of the animals (i.e. where animals were seen).

In the distribution maps below, the wildlife distribution is compared to rainfall received from January 2015 to May 2015. The wildlife distribution, particularly the springbok and to some extend the gemsbok distribution clearly show a correlation with the rainfall received in the different areas of the count area. Please note that for the total wildlife distribution, all game species counted was used in the (mapping) calculation. The wildlife (species) densities are shown in the maps on the right. 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 5.1 Total wildlife distribution compared to rainfall *Figure 5.2 Total wildlife density*



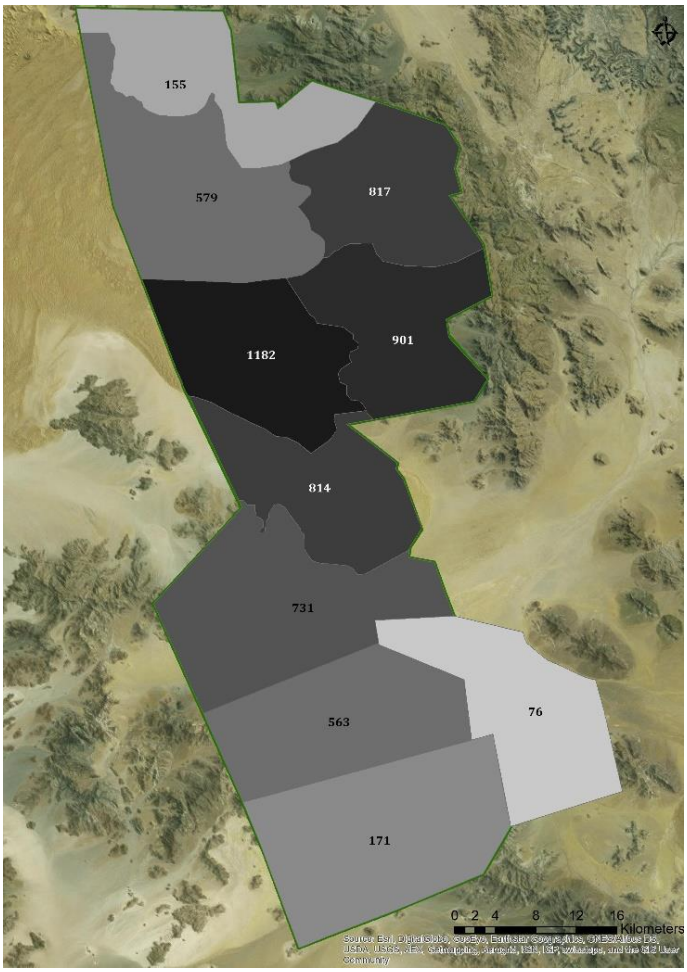


Figure 5.3 Distribution of gemsbok compared to rainfall

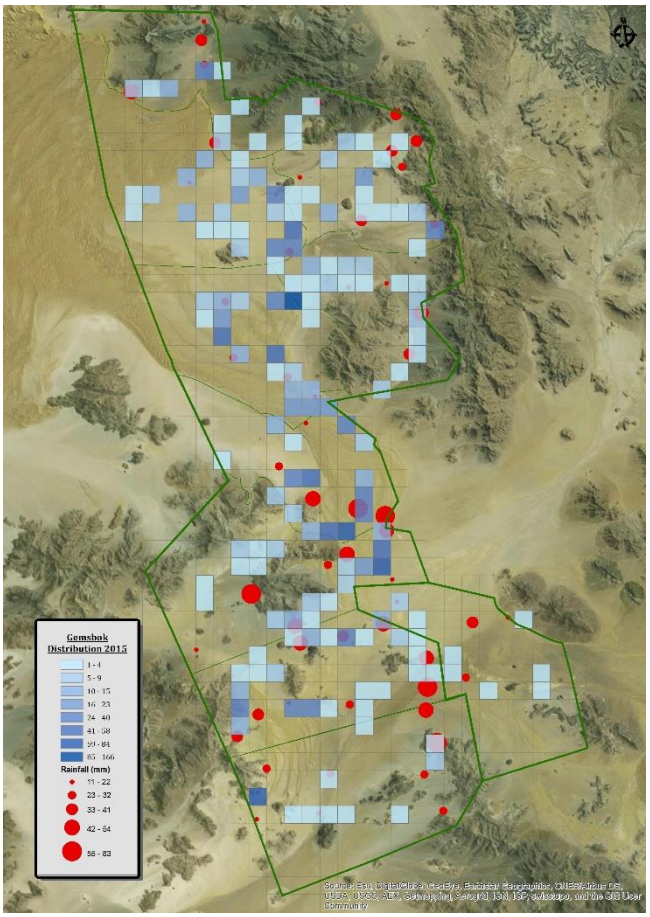


Figure 5.4 Density of gemsbok

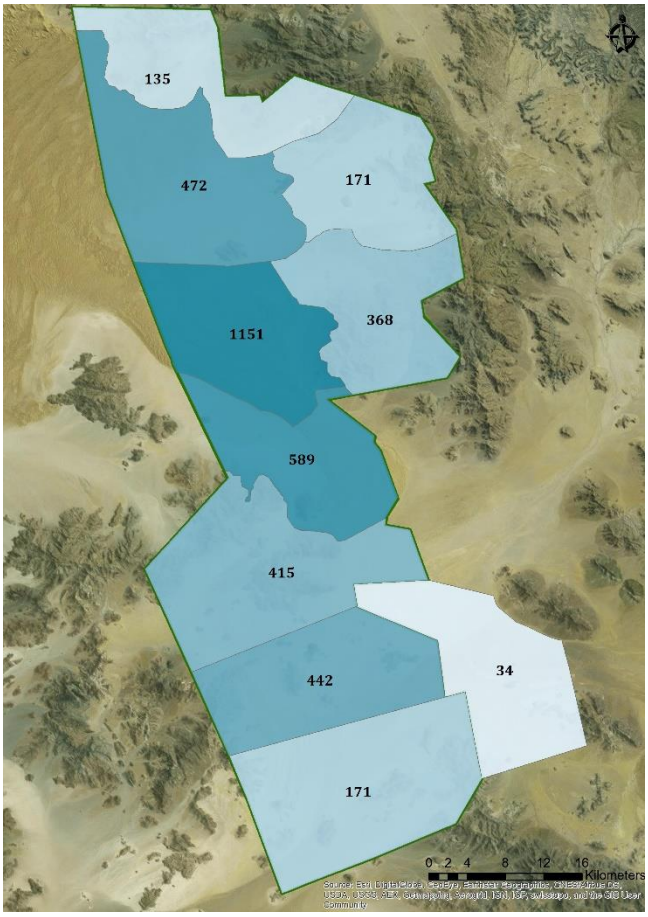


Figure 5.5 Distribution of springbok compared to rainfall

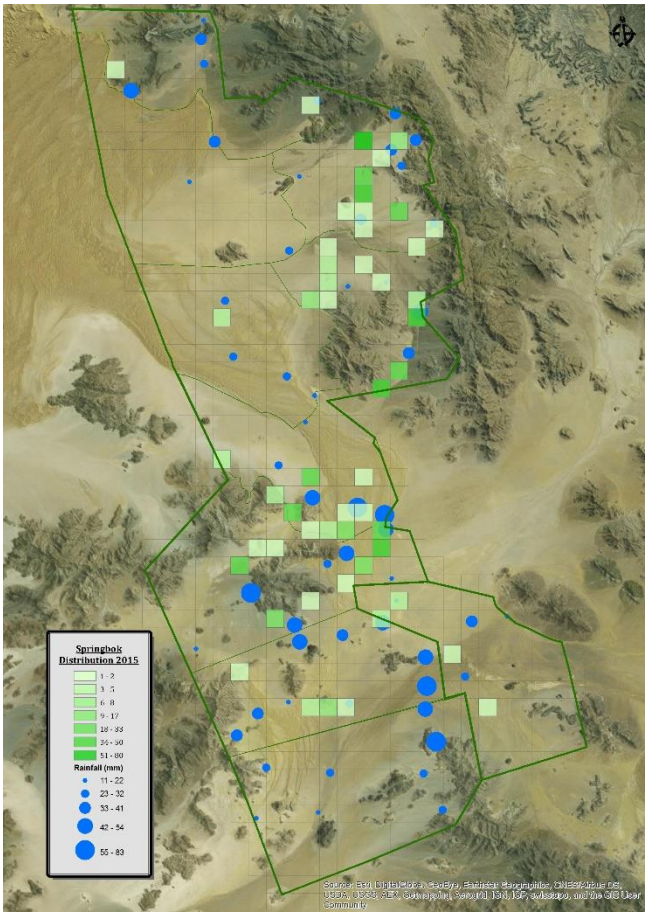


Figure 5.6 Density of springbok

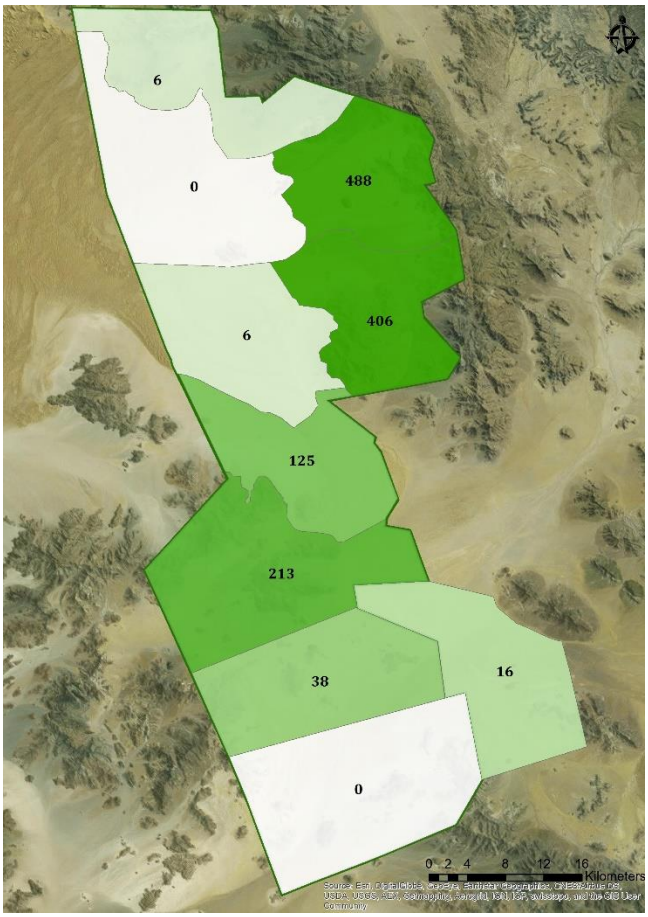


Figure 5.7 Distribution of b. zebra compared to rainfall

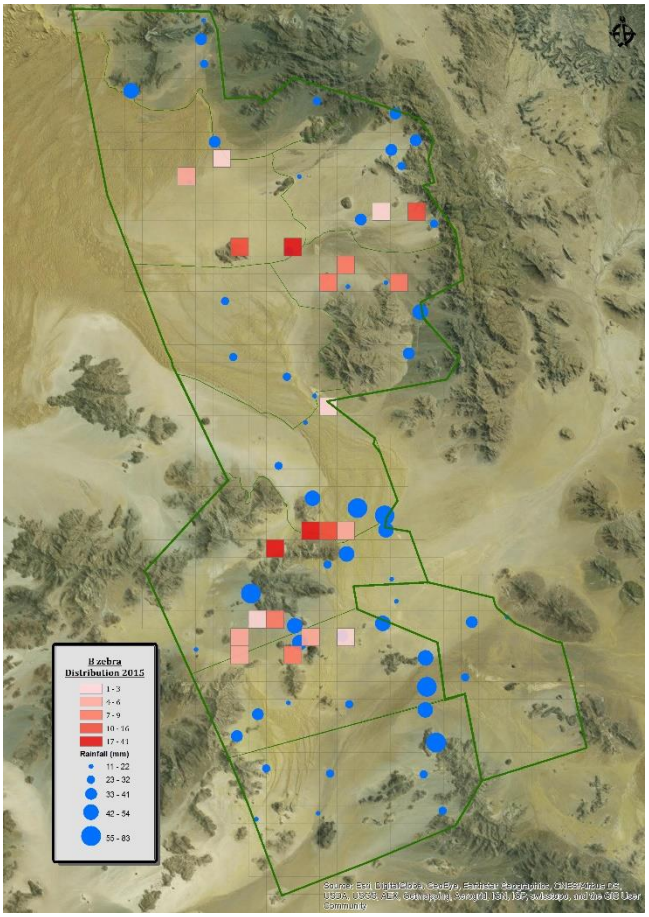


Figure 5.8 Density of b zebra

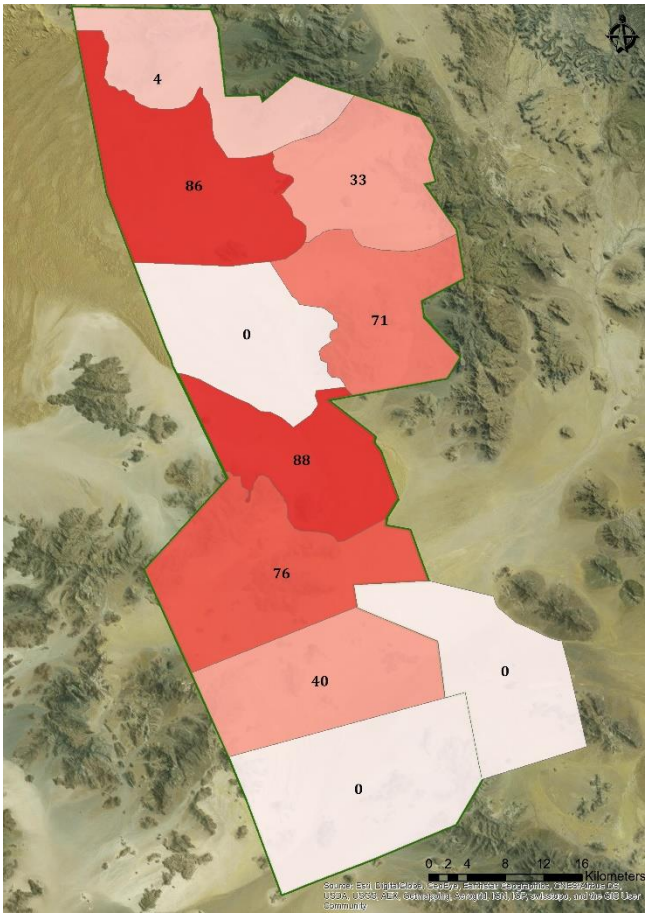


Figure 5.9 Distribution of ostrich compared to rainfall

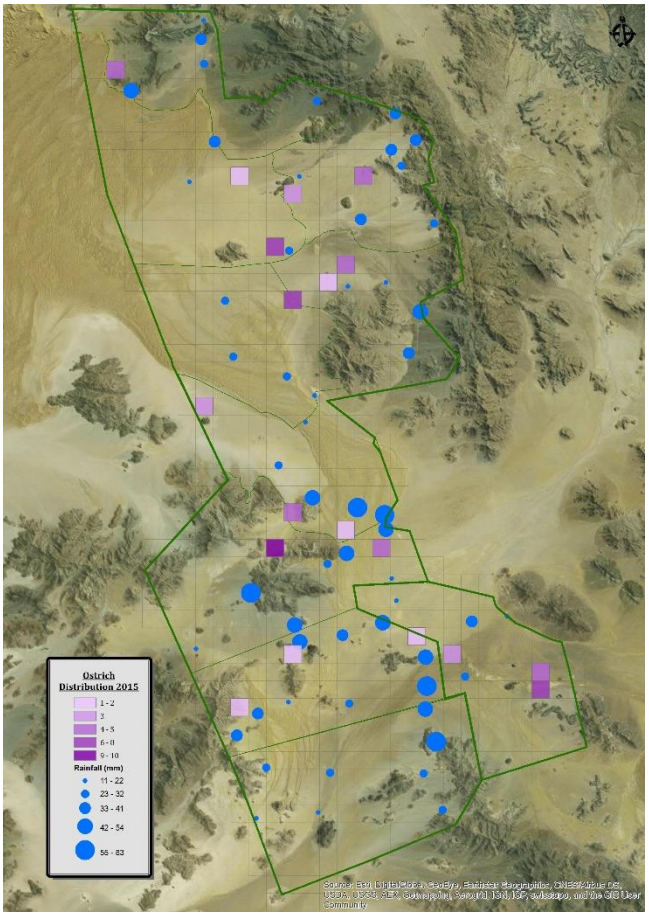
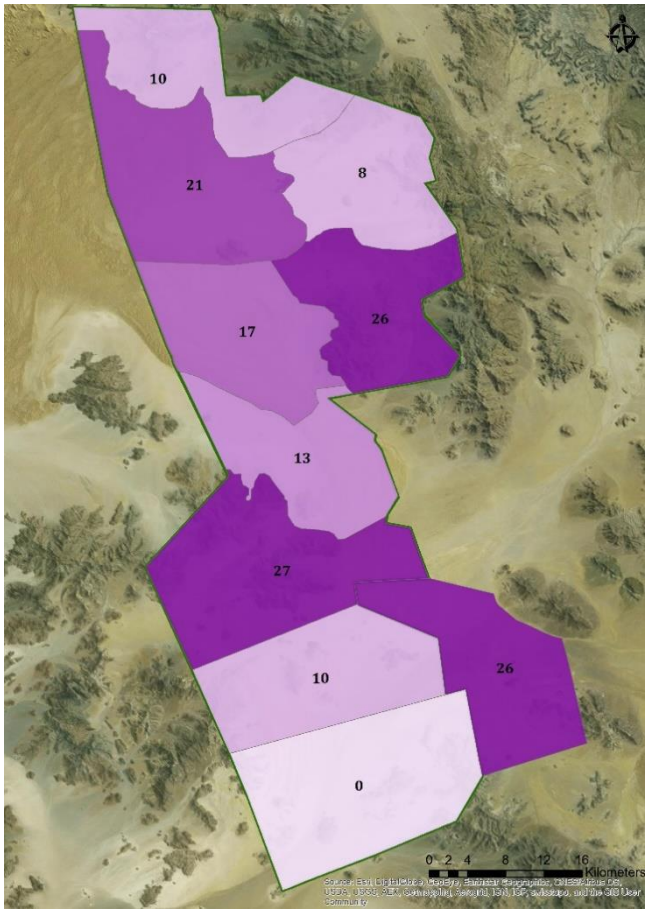


Figure 5.10 Density of ostrich



The population densities and actual number seen for individual species per zone is shown in the tables below.

Table 4.1

Gemsbok			
Route	Route length	Actual number seen	Density
1	52	70	135
2	52	89	171
3	58	274	472
4	47	541	1151
5	72	424	589
6	34	125	368
7	55	228	415
8	52	230	442
9	50	17	34
10	59	101	171
		2099	**3948**

Table 4.2

Springbok			
Route	Route length	Actual number seen	Density
1	52	3	6
2	52	254	488
3	58	0	0
4	47	3	6
5	72	90	125
6	34	138	406
7	55	117	213
8	52	20	38
9	50	8	16
10	59	0	0
		633	**1299**

Table 4.3

Ostrich			
Route	Route length	Actual number seen	Density
1	52	5	10
2	52	4	8
3	58	12	21
4	47	8	17
5	72	9	13
6	34	9	26
7	55	15	27
8	52	5	10
9	50	13	26
10	59	0	0
		80	**157**

Table 4.4

Burchell's zebra			
Route	Route length	Actual number seen	Density
1	52	2	4
2	52	17	33
3	58	50	86
4	47	0	0
5	72	63	88
6	34	24	71
7	55	42	76
8	52	21	40
9	50	0	0
10	59	0	0
		219	**398**

Table 4.5

Red Hartebeest			
Route	Route length	Actual number seen	Density
1	52	0	0
2	52	60	115
3	58	0	0
4	47	1	2
5	72	0	0
6	34	5	15
7	55	0	0
8	52	0	0
9	50	0	0
10	59	0	0
		66	**132**

Table 4.6

Kudu			
Route	Route length	Actual number seen	Density
1	52	0	0
2	52	1	2
3	58	0	0
4	47	0	0
5	72	0	0
6	34	1	3
7	55	0	0
8	52	0	0
9	50	0	0
10	59	0	0
		2	**5**

Table 4.7

Ludwigs Bustards			
Route	Route length	Actual number seen	Density
1	52	0	0
2	52	0	0
3	58	0	0
4	47	3	6
5	72	0	0
6	34	4	12
7	55	0	0
8	52	6	12
9	50	0	0
10	59	0	0
		13	**30**

Table 4.8

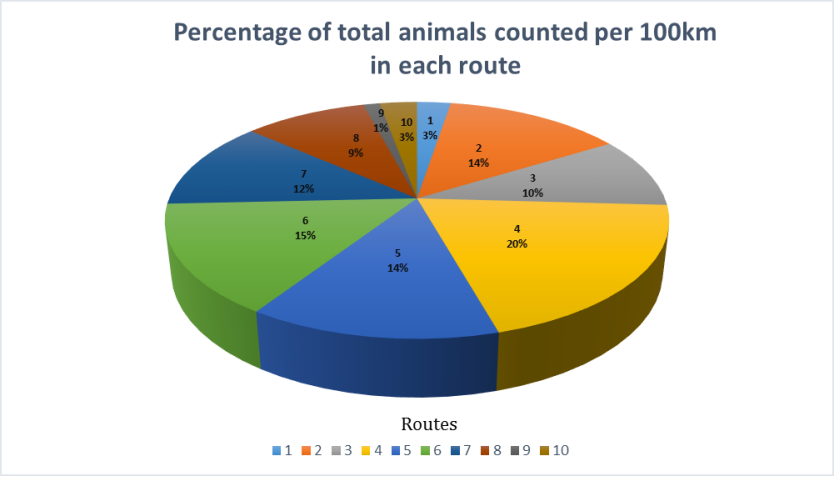
Ruppels Korhaan			
Route	Route length	Actual number seen	Density
1	52	0	0
2	52	0	0
3	58	0	0
4	47	0	0
5	72	0	0
6	34	0	0
7	55	0	0
8	52	11	21
9	50	0	0
10	59	0	0
		11	**21**

The total wildlife density for all game species (including ludwig's bustard and ruppel's korhaan) combined in each count zone in May 2015 shown in table 5 below and the percentage distribution in each zone is showed in figure 6 that follows.

Table 5: Total number of animals counted per 100km per route in 2015

Total no of animals counted per 100 km per route			
Route	**Route length (km)**	**No of animals counted/100km**	**% of total animals counted per 100km**
1	52	155	3%
2	52	817	14%
3	58	579	10%
4	47	1182	20%
5	72	814	14%
6	34	901	15%
7	55	731	12%
8	52	563	9%
9	50	76	1%
10	59	171	3%
Total	**531**	**5989**	

Figure 6: 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 2015, compared to May 2014 and June 2013, is shown in table 6 below.

Table 6: Total number of animals counted per 100km per route in 2015 compared to 2014 and 2013

Total no of animals counted per 100 km per route (June 2013 - May 2015)				
Route	**Jun-13**	**May-14**	**May-15**	**% change (May-14 to May-15)**
1	456	629	155	-75,36%
2	900	574	817	42,33%
3	1213	620	579	-6,61%
4	717	520	1182	127,31%
5	603	514	814	58,37%
6	481	556	901	62,05%
7	353	421	731	73,63%
8	581	1090	563	-48,35%
9	281	396	76	-80,81%
10	702	729	171	-76,54%
Total	**1170**	**1124**	**1128**	**0,37%**

Figure 7.1: Wildlife population density per route from 2013 to 2015

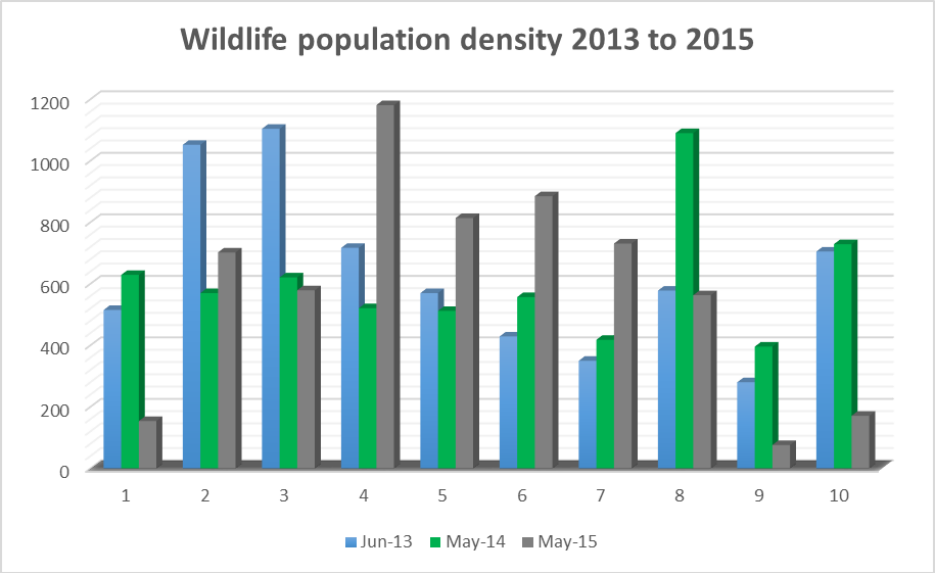
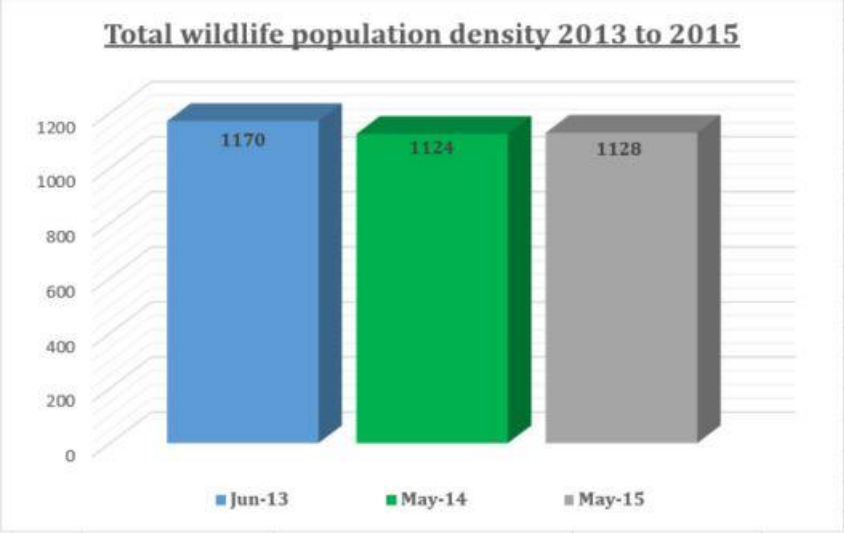


Figure 7.2: Total wildlife density change from 2013 to 2015



Objective 3: Population change

The total estimated numbers of game for the May 2015 count is compared to those from previous years to illustrate the population change. These comparisons are shown in tables below. The overall population estimate is down by 11.33% and the number of animals counted per 100km per route has decreased by 6.58%.

Table 7.1: Population estimates for 2015 compared to 2014

Total estimated numbers of game (Zone 1-10; May 2014 - May 2015)					
Species	May-14		May-15		Percentage change
	No. Counted	Total estimated number	No. Counted	Total estimated number	
Gemsbok	2261	9087	2099	7447	-18,05%
Springbok	626	3024	633	3420	13,10%
Kudu	0	0	2	7	700,00%
Steenbok	0	0	0	0	0,00%
Ostrich	82	220	80	218	-0,91%
Ludwigs Bustard	28	247	13	119	-51,82%
Ruppel's Korhaan	27	229	11	145	-36,68%
B. zebra*	223	352	219	370	5,11%
Hartebeest*	197	197	66	220	11,68%
Total	**3444**	**13356**	**3123**	**11946**	**-10,56%**
Giraffe*	6	6	7	7	16,67%

** Total (estimate) numbers known*

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

Table 8: Population estimates for years 2005 to 2015

Total estimated numbers of game (Jun 05 - May 15)													
Species	Jun-05	Summer Nov 05	Jun-06	Summer Dec 06	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 14 (1-10)	May 15 (1-10)
Gemsbok	4320	5583	1447	3689	3571	2938	5069	3972	6696	7493	8112	9087	7447
Springbok	7733	9207	17900	13127	7704	11705	11938	7359	9968	6225	5828	3024	3420
Kudu	290	827	583	834	151	23	31	10	15	16	5	0	7
Steenbok	53	100	44	88	123	151	40	0	0	0	0	0	0
Ostrich	409	443	213	951	550	312	733	448	365	748	183	220	218
L Bustard	0	0	0	0	286	45	53	693	286	285	381	247	119
R Korhaan	0	0	0	0	127	0	224	210	335	468	388	229	145
B.zebra*	174	311	439	442	677	668	318	350	370	470	320	352	370
Hartebeest*	50	55	70	75	80	80	80	110	125	177	204	197	220
Giraffe*	0	0	0	0	0	0	4	8	6	6	6	7	7
Total	**13029**	**16526**	**20696**	**19206**	**13269**	**15922**	**18490**	**13160**	**18166**	**15888**	**15427**	**13363**	**11953**
Blesbok*	10	11	15	18	20	20	23	19	18	7	3	0	0
%change			58,85%		-35,89%	19,99%	16,13%	-28,83%	38,04%	-12,54%	-2,90%	-13,38%	-10,55%
* Numbers are known													

The graph in figure 8 on the next page show the total long term individual species estimate change. Please note that these figures are taken from the population estimates from the maximum number of routes counted in each year (i.e. 2007 to 2008 route 1 – 8, 2009 – 2011 route 1 to 9, and 2012 to 2015 route 1 to 10)

Figure 8: Species population change 2007 to 2015

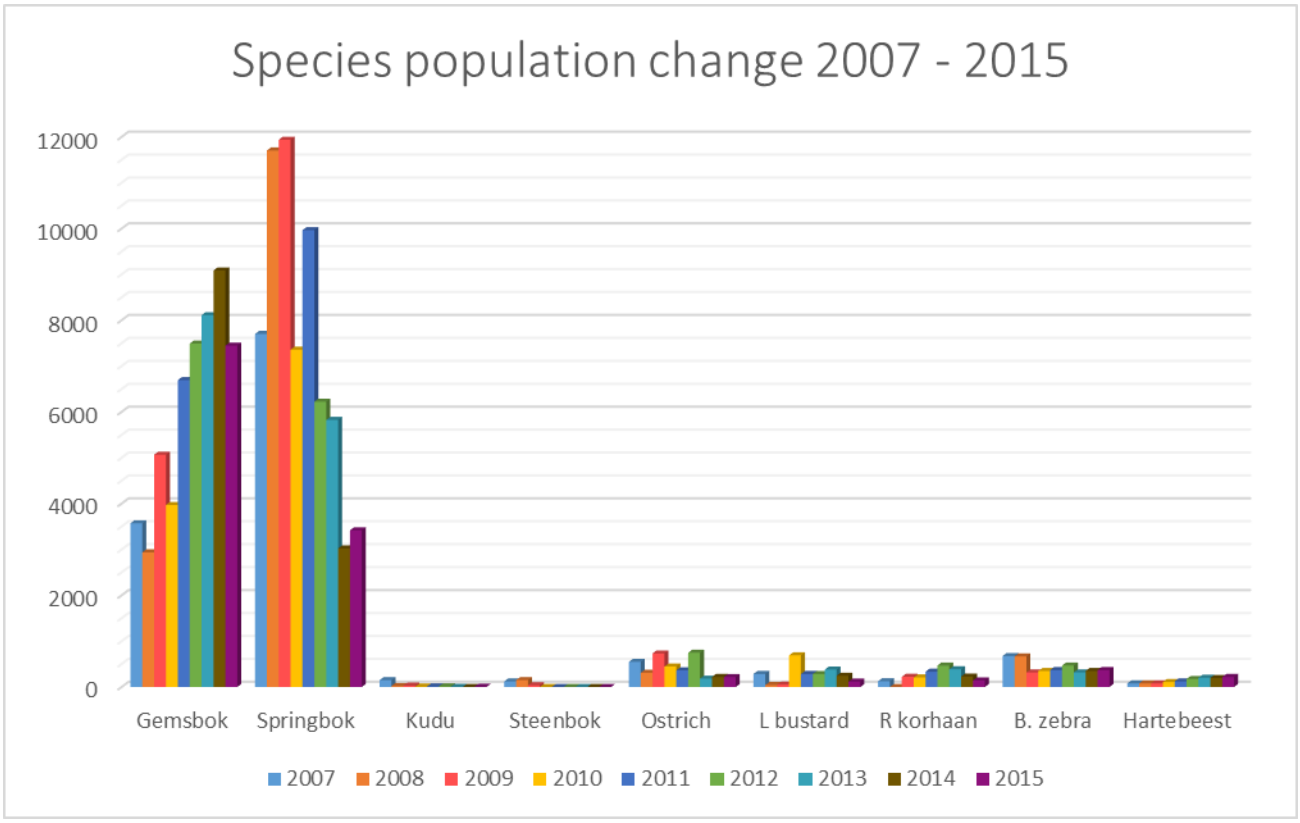
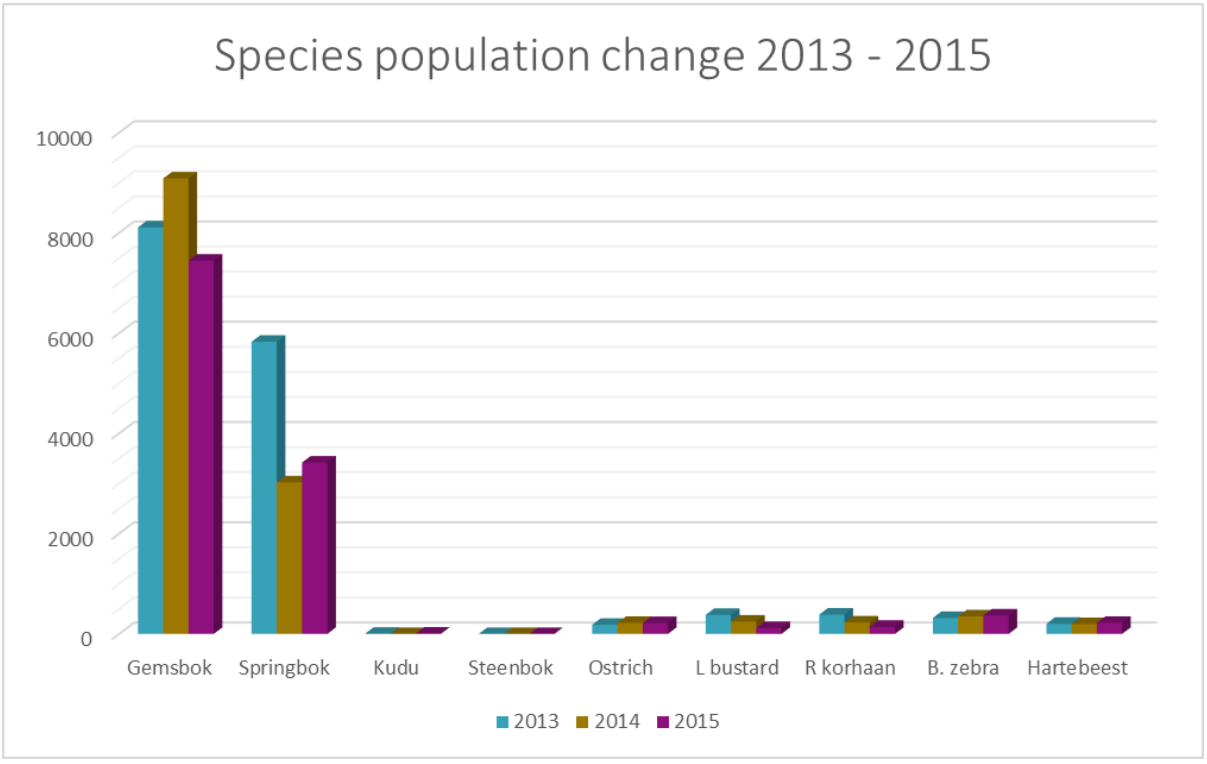


Figure 9 below shows the comparison of the total species estimates from 2013 to 2015 (routes 1 to 10).

Figure 9: Species population change 2013 to 2015



The graphs in figure 9 and 10 below show the total long term individual estimate changes. Please note that as with the previous graphs, the figures of these graphs are taken from the respective species estimates from the maximum number of routes counted in each year.

Figure 10.1

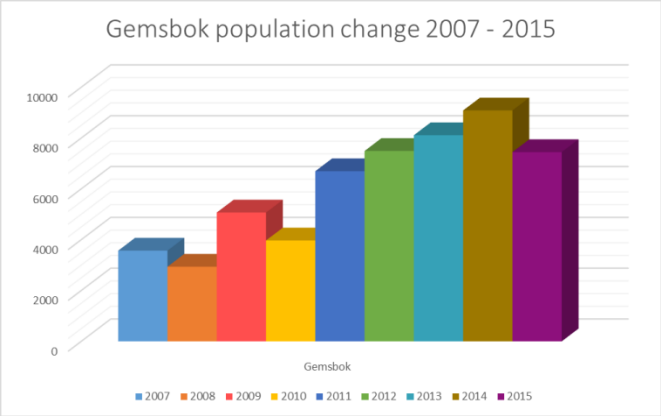


Figure 10.2

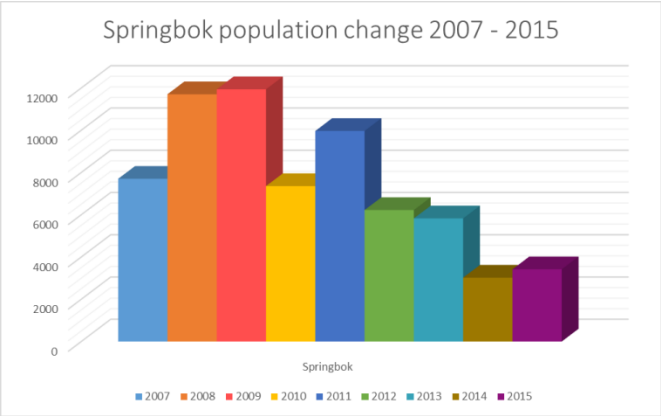


Figure 10.3

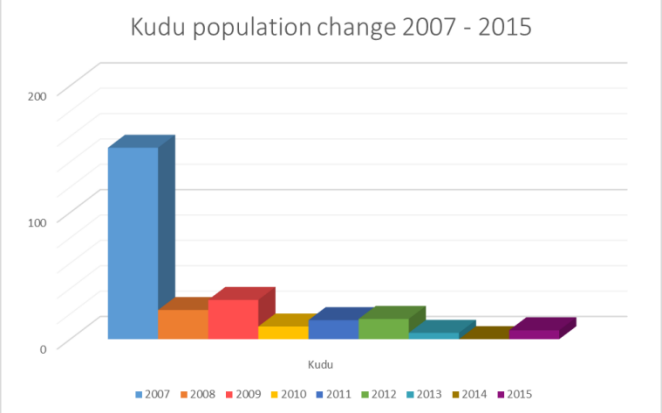


Figure 10.4

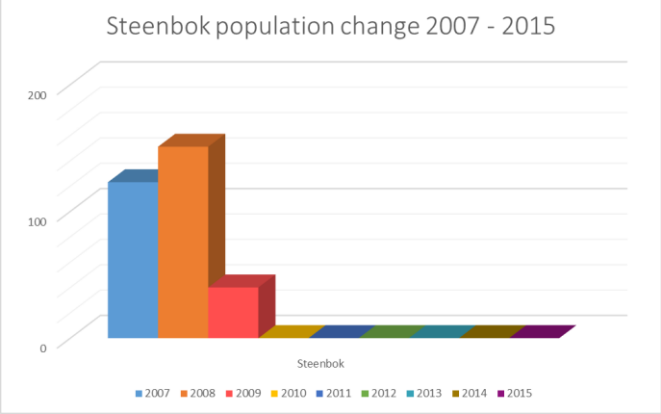


Figure 10.5

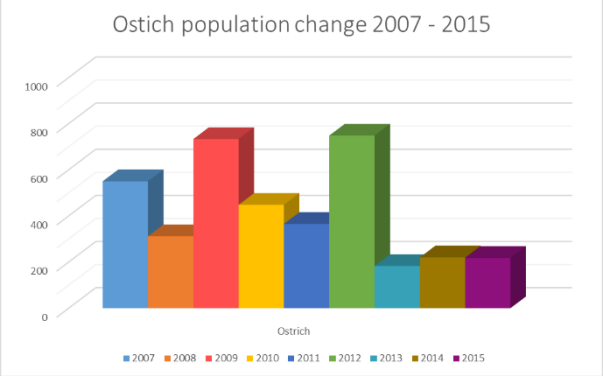


Figure 10.6

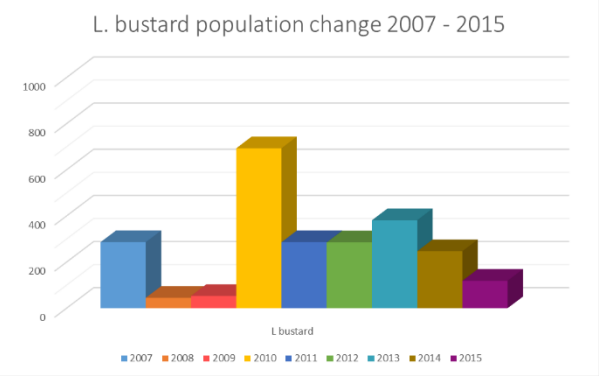


Figure 10.7

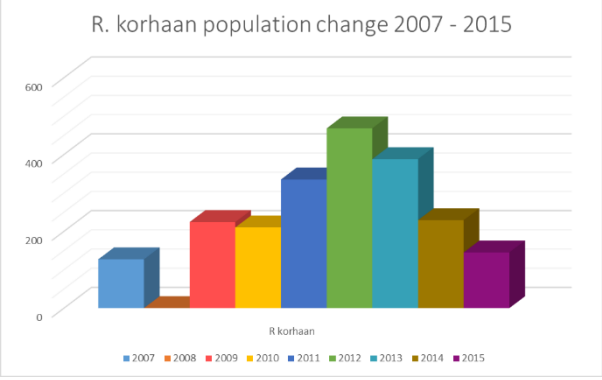


Figure 10.8

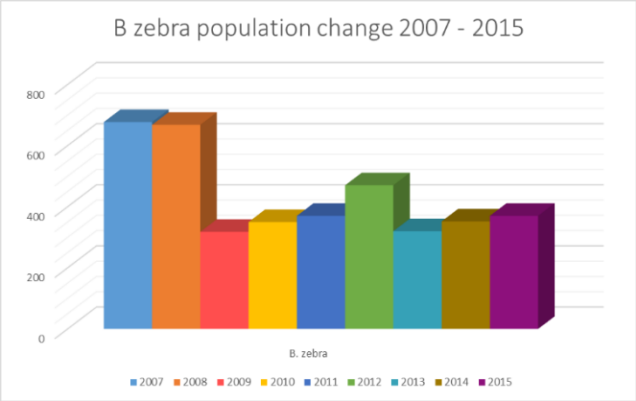
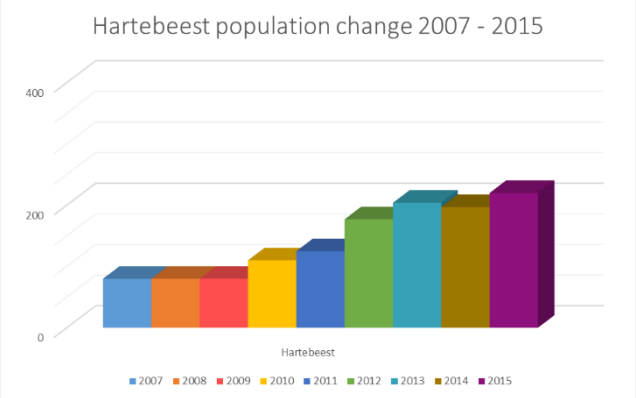
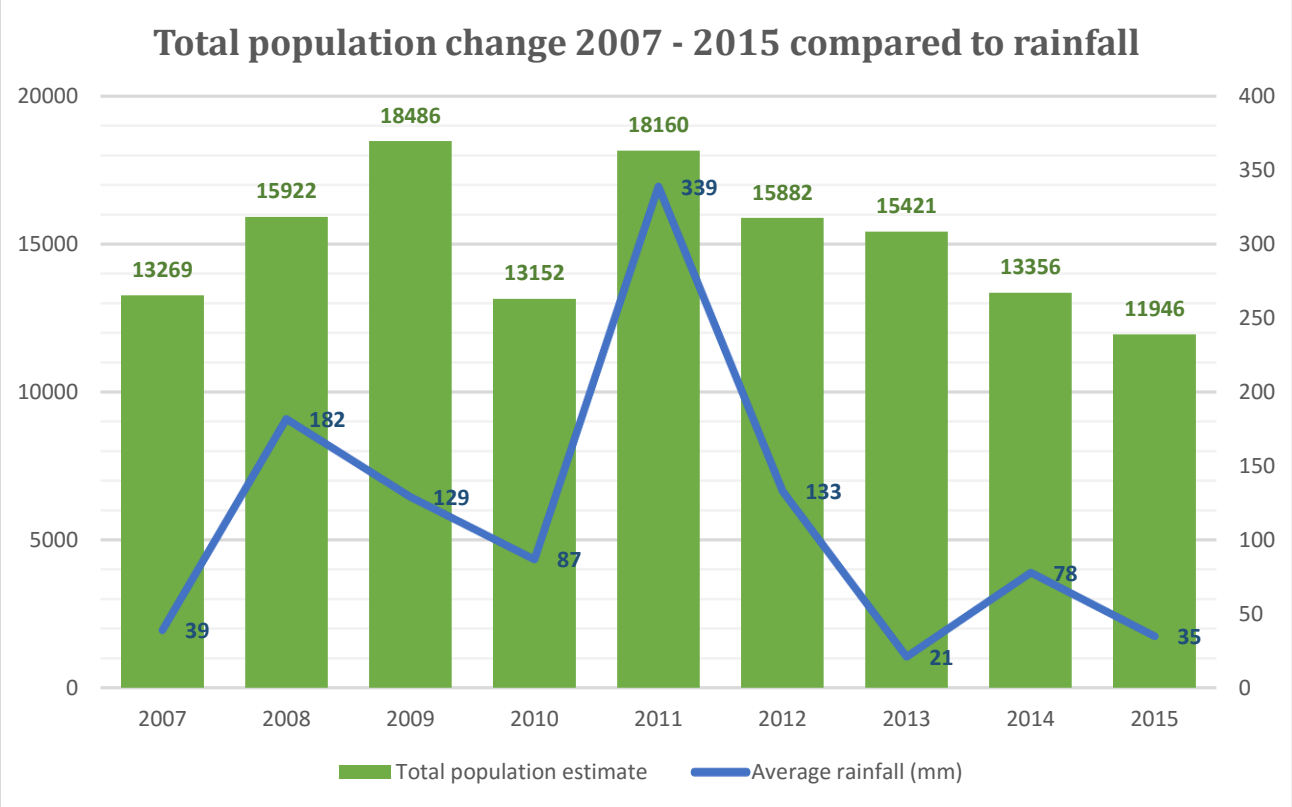


Figure 10.9



The graphs in figure 11 below show the total 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 figures for these graphs are taken from the total population estimates from the maximum number of routes counted in each year.

Figure 11: Total population change 2007 to 2015 compared to average rainfall



5. Discussion and conclusions

Population estimates shown in this report are only that - an estimate, while density and distribution are based on actual numbers seen. We use the latter to make managements decisions.

Please also note that, as mentioned in the Introduction on page 3, due to incorporation of the database and the subsequent revaluation of the past methodology and results, the (incorrect) figures from the part game count results have been corrected and the corrected figures are used in this year's report.

Gemsbok

The results of the 2015 gemsbok population estimates (7447) show a decline of 18.05% from last year's estimate (10087). This is the first decline in gemsbok estimate numbers since 2010. The 2015 estimate number decline can be attributed to the three poor rainfall seasons prior to the decline in the estimate number this year. The gemsbok population estimate seem to have a delayed response to rainfall received. The gemsbok population estimate peaked three years after the 2011 record high rainfall, and subsequent only declined two years after the poor rainfall received in 2013.
The actual number of gemsbok counted decreased by 7.7% (from 2261 to 2099) this year. Of the 2099 gemsbok counted this year, 1239 we recorded in Zone 3 (274 gemsbok), Zone 4 (541(, and Zone 5 (424). This amounts to 59% of all the gemsbok counted were recorded in these three zones, which predominantly covers the central to north-western dune habitat of the Reserve. The lowest gemsbok density was recorded in Zone 9, with a density of 34 gemsbok per 100km, while the afore mentioned Zones 3, 4 and 5 had the highest densities, with 472 per 100km, 1151 per 100km and 589 per 100km respectively.
The gemsbok distribution/rainfall correlation map on page 13, shows there is a link between the gemsbok distribution and rainfall received, especially in the Die Duine-Stellarine-Aandster parts of the Reserve (Zone 5, 7 and 8). Some of the rain gauges in these areas recorded rainfall of up to 53mm in April 2015, which most probably prompted the concentration of gemsbok in these areas and this substantiates the high density recorded in Zone 5.

Springbok

The estimated number of springbok for this year is 3420, which is an increase of 13.1% from last year's estimate of 3024. More importantly, from a resource management perspective, the actual number of springbok seen and counted only increased by 1%. This year, 633 springbok were counted in the count area and last year, 626 were counted.
The springbok were predominantly concentrated in Zones 2, 6 and 7. Of the 633 springbok counted, 509 (80%) were counted in these three zones. The respective densities in Route 2, 6 and 7 were 488 springbok per 100km, 408 springbok per 100km and 213 springbok per 100km. No springbok were seen in Zone 3 and Zone 10, and three springbok were recorded in Zones 1 and 4 each.
The springbok distribution/rainfall correlation map on page 13 shows an obvious link between the two. The springbok were clearly concentrated in the area that have received better rain, as can be seen in the Draaihoek, Toekoms, and Die Duine areas.

Kudu

Only two kudus were counted in this year's game count, one in Zone 2 and one in Zone 3. With the number counted corrected with the relevant area and species correction factors, the estimate amounts to seven kudu in the total count area. This does not give a true reflection of the kudu numbers, as sightings and camera trap images throughout the year suggest that there are more kudus on the Reserve. One should remember that this census method is not well suited for kudu and thus we have to rely on actual sightings and camera trap images to get a better indication of the kudu population.

Steenbok

As in the case of kudus, the census method is not well suited for steenbok. No steenbok were counted in this year's game count as was the case last year as well. This thus cannot reflect the actual number of steenbok in the count area. For that we rely on actual sighting reports.

Ostrich

The ostrich population estimate this year is 218. This is a decrease of only 0.9% from last year's estimate of 220, and the actual number of ostrich seen decreased, correspondingly, by 2.4%. The ostrich population has, historically, always been sporadic from year to year, showing no real correlation to rainfall received or veld condition. However for the last three years, the ostrich population has been consistently lower compared to past years, which does indicate some correlation to the drought of the last three years.
The ostrich densities were highest in Zones 6, 7 and 9, although the distribution was fairly widespread though the count area, apart from Zone 10 where no ostriches were seen.

Ludwig's bustard

The estimated number of ludwig's bustard decreased by 51.8% this year compared to last year. This is the second consecutive year that the l. bustard population estimate has decreased after it peaked in 2012. The population estimate for this year is 119, while the actual number counted is only 13. These were all counted in Zone 4 (three l. bustard), Zone 6 (four l. bustard) and Zone 8 (six l. bustard)

Ruppel's Korhaan

The estimated number of ruppel's korhaan decreased by 36.7% this year compared to last year. This is the third consecutive year that the r. korhaaan population estimate has decreased. The population estimate for this year is 145, while the actual number counted is only 11 and these were all counted in Zone 8.

Burchell's Zebra

We are yet to accurately incorporate the burchell's zebra into the species estimate calculation, and thus in past years we did a total count of the burchell's zebra to supplement the game count data. This was a fairly easy and precise exercise as the whole population of b. zebras were concentrated only in the north of the Reserve (Zones 1 to 4). The b. zebra have however expanded their home range to the south of the Reserve, and thus a total count of them have become a lot more difficult to do. We now have to the rely on individual sightings reported close to the game count date, the number of juveniles counted last year, the mortalities recorded in the past year and past population trends to calculate an estimate of the total population. For 2015, this estimate is 370. This is an increase of 5.1% from last year. We plan to more accurately integrate the b. zebra into game count population estimates for next year to get more consistent results going forward.

Of the 219 b. zebra counted during this year's game count, 126 (58%) were counted in the South of the Reserve, in Zone 5 (63 zebra), Zone 7 (42 zebra) and Zone 8 (21 zebra). This is remarkable because in past years, the b. zebra only roamed in the north of the Reserve and they only started moving (and staying) south after we relocated 14 b. zebra to Springbokvlakte (Zone 10) in 2013. In 2014, 73 b. zebra we counted in the South of the Reserve, in Zone 5 (45 zebra), Zone 7 (22 zebra) and Zone 8 (6 zebra). The greatest densities of b. zebra was found in Zone 3 (86 zebra per 100km) and Zone 5 (88zebra per 100km), while no b. zebra were counted in Zones 4, 9 and 10.

Red Hartebeest

As in the case of the b. zebra, we are yet to accurately incorporate the hartebeest into the species estimate calculation. The hartebeest have now also, together with the zebra, expanded their home range to the South of the Reserve, and thus a total count of them, as we had done in the past, haS become more difficult. We now have to the rely on individual sightings reported close to the game count date, the number of juveniles counted last year, the mortalities recorded in the past year and past population trends to calculate an estimate of the total population. Given that the herd concentrated in a few big herds, this is reasonably easy and precise to do. For example, a group of 140 hartebeest were constantly seen in the Horseshoe - Schafberg area (Zone 7) in the months before and after the count. Unfortunately this group was not seen during the count, as only six individuals we counted during in the South of the Reserve during the game count. During the game count, all 66 hartebeest counted, we recorded in the north of the Reserve, in Zone 2 (66 hartebeest), Zone 4 (one hartebeest) and Zone 6 (five hartebeest). The total population of hartebeest is estimated to be 220. We plan to more accurately integrate the hartebeest into game count population estimates for next year to get more consistent results going forward.

Giraffe

During the game count three giraffe (all males) were recorded in Zone 2 (Draaihoek area), and five giraffe were recorded in Zone 8 (two cows, two sub-adult bulls and a young calf). A few weeks after the game count, we discovered that one of the cows in the South had another calf. So we now have nine giraffe in the count area. The herd in the South, of which the cows and two young bulls were relocated to excelsior (Zone 9) in 2013, is often seen roaming in Zones 5, 7, and 8. The males in the North of the Reserve also migrate a lot through Zones 2 and 6, stick close to the Nubib Mountains in the East of the Reserve.

Total population change, distribution and densities

The total population estimate decreased by 10.56%, while the number of animals counted per 100km per is down by 0.37% from last year. The total wildlife population estimate this year is 11946 and the total number of plains game counted is 3123. The higher deficit in total population estimate, as opposed to the lower density deficit, compared to last year could be as a result of the wildlife concentrating in certain zones which then is influenced by various area correction factors. For resource management purposes though, we use the actual numbers seem instead of the estimates, as these give a better reflection of where and how many animals there are.

The long term total population estimate shows that the total estimated wildlife population has been on a decline since 2012, having last peaked in 2011, with 18160 estimate game in the total count area. This trend is directly proportional to the annual average rainfall received in the total count area over the given years as shown in figure 11 on page 21. The total wildlife distribution compared to rainfall map (figure 5.1) on page 12 also shows a correlation between the wildlife distribution this year and the rainfall received through the count area in the last year.

49% of the total wildlife population density was recorded in Zones 4, 5 and 6 and the lowest densities were recorded in Zones 1, 9 and 10 as can be seen in figure 5.2 on page 12 and figure 6 on page 16.

6. Acknowledgments

The NamibRand Nature Reserve would like to thank all its concessionaires, stakeholders, neighbours and all the participants for their enthusiastic involvement to make this year's game count another success. Participants were: Mbambo Alfred, John Bernstein, Ruben Bonefatius, Hendrick Boois, Albi Bruckner, Andreas Brückner, Mandy Brückner, Nicole Dangelo, Dominic Fitzpatrick, Josia Hangula, Mckenzie Hauger, Frans Haupindi, David Henderson, Juliana Herero, Alli Hough, Franziska Keresztesi, Paulus Kambathi, Paige Klage, Erib Klein, Kerstin Klein, Kieth Malkie, Johannes Moongela, Miranda Michalak, Hamok Miller, Frans Mweshi, Titus Nangolo, Sarah Nadskor, Rudolf Naibab, Manie Nel, Cecilia Nghifitikeko, Nils Odendaal, Charles Pekier, Larkin Powell, Willem Rooi, Elia Shikukumwa, Francina Simon, Lauren Southard, Thomas Soutschka, Sara Spier, Frederik Steufmehl, Ricardo Tjiho, UNL Students led by Professor Larkin Powell, Murray Tindall, Abraham Tsaobeb, Eben Tsaobeb, Charlotte van Cutsen, Elton Vries, Amakali Wilhelm and Peter Woolfe. All your help is immensely appreciated.

7. Appendix

Results per count route per Zone

Tables 9.1 to 8.10 list the data collected on each route in May 2015, which were used as a basis for the analysis.

Table 9.1

Route 1			
Species	Total number counted	Density	Estimated population
Gemsbok	70	135	215
Springbok	3	6	11
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	5	10	9
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. zebra*	2	4	0
Hartebeest*	0	0	0
Total	**80**	**155**	**235**
H. Zebra **	5	0	0

* Numbers known

** Not included in count

Table 9.2

Route 2			
Species	Total number counted	Density	Estimated population
Gemsbok	89	171	380
Springbok	254	488	1489
Kudu	1	2	3
Steenbok	0	0	0
Ostrich	4	8	8
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. zebra*	17	33	0
Hartebeest*	60	115	0
Total	**425**	**817**	**1880**
Giraffe*	3	0	0
H. Zebra **	8	0	0

* Numbers known
** Not included in count

Table 9.3

Route 3			
Species	Total number counted	Density	Estimated population
Gemsbok	274	472	1348
Springbok	0	0	0
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	12	21	41
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. zebra*	50	86	0
Hartebeest*	0	0	0
Total	**336**	**579**	**1389**
Scrub Hare**	1	0	0
Bat Eared Fox **	10	0	0
Jackal**	3	0	0

* Numbers known
** Not included in count

Table 9.4

Route 4			
Species	Total number counted	Density	Estimated population
Gemsbok	541	1151	1943
Springbok	3	6	14
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	8	17	27
Ludwig's Bustard	3	6	32
Ruppel's Korhaan	0	0	0
B. zebra*	0	0	0
Hartebeest*	1	2	0
Total	**556**	**1182**	**2016**
Bat Eared Fox **	4	0	0
Ground Squirrel **	6	0	0
Lappet Faced Vulture**	13	0	0
Secretary Bird**	2	0	0
White Backed Vulture**	7	0	0
Jackal**	3	0	0

* Numbers known
** Not included in count

Table 9.5

Route 5			
Species	Total number counted	Density	Estimated population
Gemsbok	424	589	954
Springbok	90	125	336
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	9	12	16
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. zebra*	63	88	0
Hartebeest*	0	0	0
Total	**586**	**814**	**1306**
Lappet Faced Vulture**	30	0	0
Leopard**	1	0	0

* Numbers known
** Not included in count

Table 9.6

Route 6			
Species	Total number counted	Density	Estimated population
Gemsbok	125	368	394
Springbok	138	406	680
Kudu	1	3	4
Steenbok	0	0	0
Ostrich	9	26	23
Ludwig's Bustard	4	12	33
Ruppel's Korhaan	0	0	0
B. zebra*	24	71	0
Hartebeest*	5	15	0
Total	**306**	**901**	**1134**
Jackal**	2	0	0

* Numbers known
** Not included in count

Table 9.7

Route 7			
Species	Total number counted	Density	Estimated population
Gemsbok	228	415	767
Springbok	117	213	762
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	15	27	39
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. zebra*	42	76	0
Hartebeest*	0	0	0
Total	**402**	**731**	**1568**
Klipspringer**	1	0	0

* Numbers known
** Not included in count

Table 9.8

Route 8			
Species	Total number counted	Density	Estimated population
Gemsbok	230	442	703
Springbok	20	38	89
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	5	10	14
Ludwig's Bustard	6	12	54
Ruppel's Korhaan	11	21	145
B. zebra*	21	40	0
Hartebeest*	0	0	0
Total	**293**	**563**	**1005**
Aardwolf**	1	0	0
Giraffe**	5	0	0
Lappet Faced Vulture**	4	0	0
Secretary Bird**	2	0	0
Bat Eared Fox**	4	0	0

* Numbers known
** Not included in count

Table 9.9

Route 9			
Species	Total number counted	Density	Estimated population
Gemsbok	17	34	90
Springbok	8	16	39
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	13	26	41
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. zebra*	0	0	0
Hartebeest*	0	0	0
Total	**38**	**76**	**170**

* Numbers known
** Not included in count

Table 9.10

Route 10			
Species	Total number counted	Density	Estimated population
Gemsbok	101	171	653
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
Total	**101**	**171**	**653**
Brown Hyena**	1	0	0
Lappet Faced Vulture**	1	0	0
Secretary Bird**	1	0	0
Jackal**	6	0	0

* Numbers known
** Not included in count

Table 9.11

Total number of Game			
Species	Total number counted	Density	Estimated population
Gemsbok	2099	3948	7447
Springbok	633	1298	3420
Kudu	2	5	7
Steenbok	0	0	0
Ostrich	80	157	218
Ludwig's Bustard	13	30	119
Ruppel's Korhaan	11	21	145
B. zebra*	219	398	370
Hartebeest*	66	132	220
Total	**2838**	**5989**	**11946**
Jackal**	14		
Bat Eared Fox**	18		
Aardwolf **	1		
Brown Hyena**	1		
Giraffe**	7		
Ground Squirel**	6		
Lappet Faced Vulture**	48		
Leopard**	1		
Scrub Hare**	1		
Secretary Bird**	5		
White Backed Vulture**	7		
H. Zebra**	13		

* Numbers known
** Not included in count