

# Results of the NamibRand Nature Reserve Annual Game Count

5 June 2010



Oryx photographed by Buckeye camera trap at Moringa

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## 1. Introduction

This paper provides feedback and results of the annual game count as held on the NamibRand Nature Reserve on 5 June 2010. As usual, this event was combined with the Reserve's annual general meeting, which makes this an ideal opportunity to hold a community participation game count.

As Route 9 (incorporating the Pro-Namib Conservancy) is relatively new the results for the June 2010 count are presented first for Route 1-8, in order to facilitate comparisons with previous years, and then for Route 1-9 in order to include the Conservancy.

Apart from presenting these results, we would also like to review the broader picture in terms of trends in the information we have gathered over the past six years. With rainfall being one of the main drivers of this complex desert system, mean annual rainfall figures provide interesting correlations with game numbers and distribution. This information can then be used for effective management.

Kindly note that the game count method employed is ideal for estimating larger numbers of common plains game, but less suited to other species such as kudu and steenbok. No one 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. camera traps.

## 2. Summary

Data collected by participants of the June 2010 game count were collated and analyzed, bearing our three core objectives in mind:

### Objective 1: Population estimates

Total numbers of game as estimated by the June 2010 game count are summarized below:

<b>Species</b>	<b>Route 1-8</b>	<b>Route 1-9</b>
Oryx	4 262	4 683
Springbok	7 590	8 060
Kudu	24	24
B. zebra*	350	350
Ostrich	550	644
Hartebeest*	110*	110
Steenbok	0	0
Blesbok*	1	19
<b>Total</b>	<b>12 887</b>	<b>13 890</b>
<b>% change</b>	<b>-30.6</b>	<b>-31.5</b>
<i>Giraffe*</i>	8	8
<i>Ludwig's Bustard</i>	160	223

*\*Numbers are known*

- The overall population estimate for all species combined on NamibRand Nature Reserve in June 2010 is 12 887 (Route 1-8). With the inclusion of the Pro-Namib Conservancy, this figure rises to 13 890 (Route 1-9). These totals represent a decrease by 31% from those in June 2009, which corresponds with the lower rainfall in 2010.
- The total estimates for numbers of oryx in June 2010 are 4 262 (Route 1-8) and 4 683 (Route 1-9).
- Numbers of springbok are estimated at 7 590 (Route 1-8) and 8 060 (Route 1-9).
- The Reserve appears to be an important haven for a relatively large population of Ludwig's Bustard, recently uplisted to *Endangered*.
- The total biomass of the Reserve has dropped to 9.0 kg/ha in June 2010 (Route 1-8) and 8.8 kg/ha (Route 1-9).

Just a reminder that population estimates are no more than that – an estimate.

#### Objective 2: Wildlife distribution/density

- Wildlife distribution/density (animals counted per 100 km) decreased by 33% compared to June 2009.
- The highest relative densities were recorded in the north/east, whereas densities were lower in the central vegetated dune belt.

#### Objective 3: Population change over six years

- Overall, animal sightings decreased by 33% to 625 animals/100 km in June 2010.

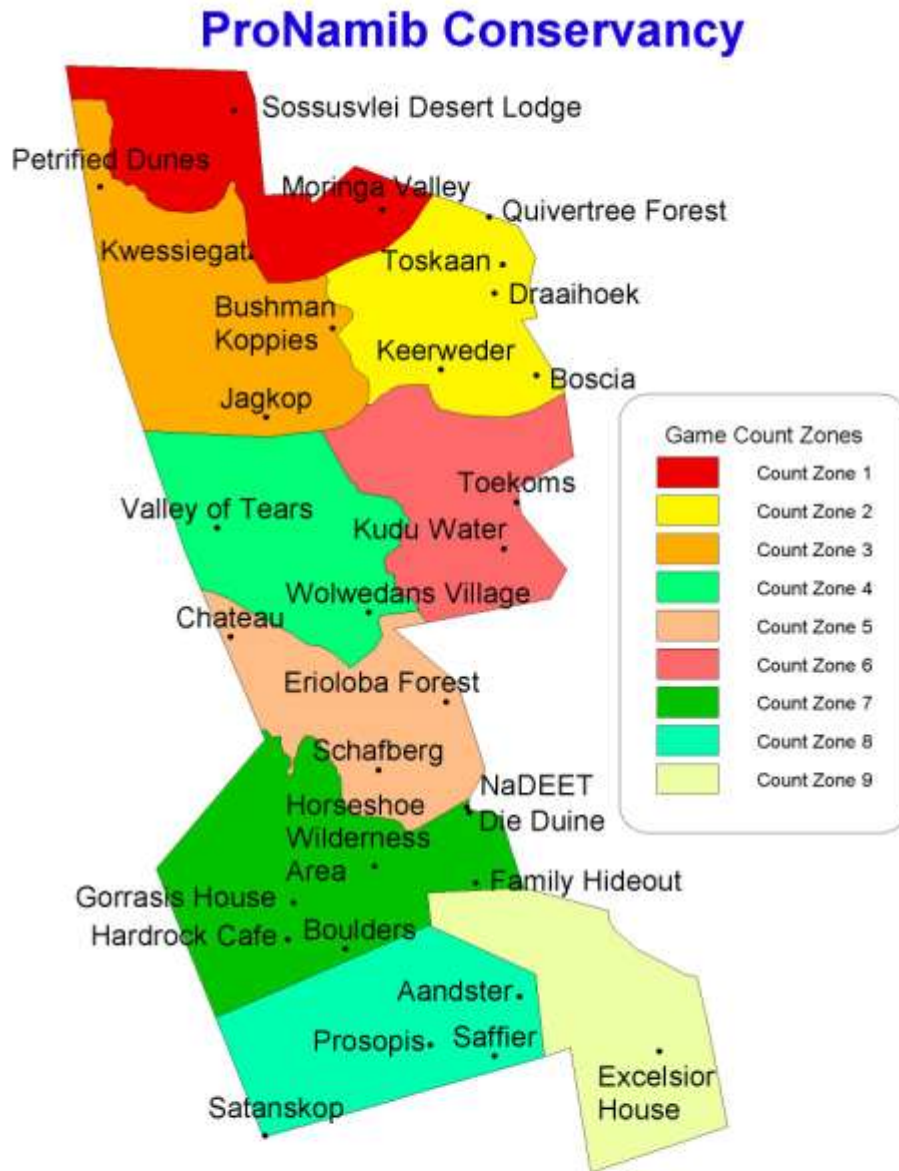
#### General:

Correlations between the above results and average annual rainfall figures indicate that springbok respond very quickly to changing rainfall patterns, whereas the response of oryx and Ostrich is more apparent during the following year.

### 3. Methodology

For the purposes of the count, the Reserve is divided into nine game count zones, each with its own standardized route. The game count zones used in June 2010 are shown in Figure 1. These include a new route (No. 9) that was added in June 2009 in order to include the adjoining farms Excelsior and Dina, now part of the total area available to game through the establishment of the Pro-Namib Conservancy.

Figure 1. Game count zones used in June 2010



The basic survey methodology used is a combination of the *Distance* and the *Strip-Count* census techniques. In layman's terms these can be explained as follows:

1) Distance

The distance to each animal or group of animals counted is recorded at right angles to the vehicle. This distance allows us to apply a *species correction factor* for each type of animal counted. This is done in order to compensate for animals not seen.

For example, the chances of seeing large animals like zebra over a great distance are much higher than the probability or chances of seeing a smaller animal like a steenbok. Therefore a correction factor of 2 can be used for zebra (because you are likely to see most of them over a set distance). A much higher correction factor of 10 can be used for steenbok – over the same set distance you are likely to see only a few steenbok while the rest will be hidden by dead ground or obstacles.

2) Strip-Count

All animals and the distance, at right angles to the vehicle, are counted. A strip-width is then determined – 1000m in our case, so that the area covered can then be multiplied into the overall area. This is known as an *area correction factor* (the number of times a 1000m wide strip will fit into the whole area). Only the animals inside the 1000m (500m on either side of the road) are multiplied by the correction factor to determine the population estimate for the given area.

Table 1 below lists the area and species correction factors used on the NamibRand Nature Reserve in June 2010. Note that the area correction factors are based on the precise odometer readings for the route length, and are thus adjusted each year.

Table 1

Correction factors (June 2010)					
Route no.	Route distance (km)	Area correction factor (a.c.f)		Species	Species' correction factor (s.c.f)
1	52.0	3.10		Oryx	1.4
2	52.0	3.14		Springbok	1.6
3	57.6	4.19		Kudu	2.6
4	48.9	3.84		Steenbok	10.0
5	70.7	2.28		Burchell's zebra	1.2
6	38.5	4.49		Ostrich	1.1
7	55.6	4.56		Red hartebeest	1.5
8	51.2	3.94		Ludwig's Bustard	1.0
9	52.0	3.16			

Bearing the Reserve's objectives for counting in mind, results are thus calculated as follows:

Objective 1: Population estimates (P)

Actual number of animals seen (S)  
Area correction factor (A)  
Species correction factor (B)  
\*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, and the alien blesbok), these known totals are used for the final population estimates in preference to the above calculated estimates.

Objective 2: Wildlife distribution

Data from actual sightings (i.e. not estimates) are "normalized" for all count zones or routes to animals seen per 100km. This is done in order to standardize the results to a value which is uniform for all count zones, thus enabling us to obtain accurate density and distribution figures.

Actual number of animals seen (S)  
Length of route (R)  
Animals seen per 100km driven (K)

**Formula for calculating animals seen per 100 km driven**

$$(S \div R) \times 100 = K$$

Objective 3: Population change

To calculate the change in population, only figures from actual sightings are used (i.e. not estimates). As with distribution above, normalized or standardized data need to be used so that comparisons can be made. The data from each route are then compared to previous data and the percentage change for each route and for the Reserve as a whole can be calculated. The percentage change for the total of each species can also be calculated in the same way.

Previous Value (P)  
Current Value (C)  
Percentage Change (R)

**Formula for calculating percentage change**

$$[(C - P) \div P] \times 100 = R$$

Wildlife and rainfall:

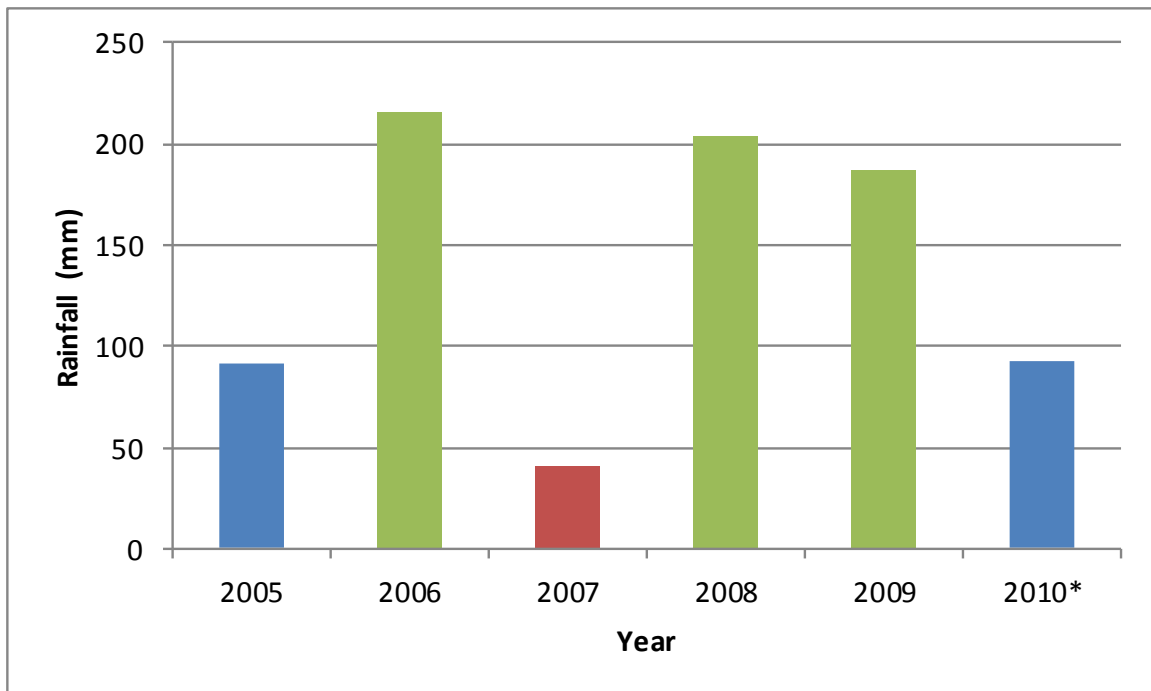
A new set of analyses for June 2010 has been the correlation of the above data with mean annual rainfall figures for the Reserve, to determine responses of the main plains species to rainfall.

## 4. Results

### 4.1 Rainfall

The mean annual rainfall for the count period (2005 to 2010) is presented in Figure 2. As can be expected, the rainfall measured at the 40 rain gauge sites on the Reserve shows considerable variation. The figures below are calculated from available data for each year, and serve as a rough basis for comparison amongst years.

*Figure 2. Mean annual rainfall for NamibRand Nature Reserve, 2005 – 2010 (\*January to June)*





## 4.2 Route Results

### Population estimate using strip count: animals seen x area correction factor x species correction factor

Tables 2.1 – 2.9 list the data collected on each route, which were then analyzed. Numbers seen within the strip width (under 500m) have been multiplied first by the relevant area correction factor (a.c.f.) for each route, and then by the relevant species correction factor (s.c.f.; see Table 1).

Table 2.1

Route 1				
Species	Number seen - total	Number seen under 500m	No. corrected for area (a.c.f. = 3.10)	No. corrected for area + species
Oryx	140	123	381	534
Springbok	210	204	632	1012
Kudu	0			
Steenbok	0			
Burchell's zebra	47	31	96	115
Ostrich	25	19	59	65
Red hartebeest				
Blesbok				
<b>Total</b>	<b>422</b>	<b>377</b>	<b>1 168</b>	<b>1 725.6</b>
Ludwig's Bustard*	2	2	6	6

\*Not included in count

Table 2.2

Route 2				
Species	Number seen - total	Number seen under 500m	No. corrected for area (a.c.f. = 3.19)	No. corrected for area + species
Oryx	111	106	333	466
Springbok	353	353	1108	1773
Kudu	3	3	9	24
Steenbok				
Burchell's zebra				
Ostrich	92	81	254	280
Red hartebeest	7	4	22	23
Blesbok				
<b>Total</b>	<b>566</b>	<b>550</b>	<b>1726</b>	<b>2576.7</b>
Giraffe*	6	6	6**	6**
Ludwig's Bustard*	17	17	53	53

\*Not included in count

\*\*Correction factors do not apply (greater than known maximum)

Table 2.3

Route 3				
Species	Number seen - total	Number seen under 500m	No. corrected for area (a.c.f. = 4.19)	No. corrected for area + species
Oryx	166	144	603	845
Springbok	22	22	92	147
Kudu				
Steenbok				
Burchell's zebra	20	20	84	101
Ostrich	6	6	25	28
Red hartebeest				
Blesbok				
<b>Total</b>	<b>214</b>	<b>192</b>	<b>804</b>	<b>1120.4</b>
<i>Ludwig's Bustard*</i>	5	5	21	21

*\*Not included in count*

Table 2.4

Route 4				
Species	Number seen - total	Number seen under 500m	No. corrected for area (a.c.f. = 3.84)	No. corrected for area + species
Oryx	98	80	307	430
Springbok	31	20	77	123
Kudu				
Steenbok				
Burchell's zebra				
Ostrich	4	4	15	17
Red hartebeest				
Blesbok				
<b>Total</b>	<b>133</b>	<b>104</b>	<b>399</b>	<b>569.9</b>
<i>Ludwig's Bustard*</i>	0			

*\*Not included in count*

Table 2.5

Route 5				
Species	Number seen - total	Number seen under 500m	No. corrected for area (a.c.f. = 2.28)	No. corrected for area + species
Oryx	142	142	324	453
Springbok	152	152	347	555
Kudu				
Steenbok				
Burchell's zebra				
Ostrich	16	16	36	40
Red hartebeest				
Blesbok				
<b>Total</b>	<b>310</b>	<b>310</b>	<b>707</b>	<b>1047.9</b>
Ludwig's Bustard*	0			

\*Not included in count

Table 2.6

Route 6				
Species	Number seen - total	Number seen under 500m	No. corrected for area (a.c.f. = 4.49 )	No. corrected for area + species
Oryx	79	79	355	497
Springbok	161	161	723	1157
Kudu				
Steenbok				
Burchell's zebra	83	83	373	447
Ostrich				
Red hartebeest				
Blesbok				
<b>Total</b>	<b>323</b>	<b>323</b>	<b>1451</b>	<b>2100.4</b>
Ludwig's Bustard*	8	8	36	36

\*Not included in count

Table 2.7

Route 7				
Species	Number seen - total	Number seen under 500m	No. corrected for area (a.c.f. = 4.56)	No. corrected for area + species
Oryx	109	109	497	696
Springbok	132	132	602	963
Kudu				
Steenbok				
Burchell's zebra				
Ostrich	6	6	27	30
Red hartebeest				
Blesbok				
<b>Total</b>	<b>247</b>	<b>247</b>	<b>1126</b>	<b>1689.0</b>
<i>Ludwig's Bustard*</i>	0			

*\*Not included in count*

Table 2.8

Route 8				
Species	Number seen - total	Number seen under 500m	No. corrected for area (a.c.f. = 3.94)	No. corrected for area + species
Oryx	102	62	244	342
Springbok	329	295	1162	1860
Kudu				
Steenbok				
Burchell's zebra				
Ostrich	21	21	83	91
Red hartebeest				
Blesbok				
<b>Total</b>	<b>452</b>	<b>378</b>	<b>1489</b>	<b>2292.7</b>
<i>Ludwig's Bustard*</i>	11	11	43	43

*\*Not included in count*

Table 2.9

Route 9				
Species	Number seen - total	Number seen under 500m	No. corrected for area (a.c.f. = 3.16)	No. corrected for area + species
Oryx	138	95	300	420
Springbok	97	93	294	470
Kudu				
Steenbok				
Burchell's zebra				
Ostrich	27	27	85	94
Red hartebeest				
Blesbok	18	0	0	0
<b>Total</b>	<b>280</b>	<b>215</b>	<b>679</b>	<b>984.3</b>
<i>Ludwig's Bustard*</i>	24	20	63	63

\*Not included in count

#### 4.3 Population estimates

Table 3 presents the total population estimates for plain's game on NamibRand Nature Reserve in June 2010. Final figures have been determined by multiplying all sightings under 500m by both the area and species correction factors; note that for the final estimate (Table 3), known total numbers for species are used in preference to the above estimates.

Table 3

Total numbers of game (June 2010: counts and corrected values)				
Species	No. counted under 500m		Total no. corrected for area + for species	
	Route 1-8	Route 1-9	Route 1-8	Route 1-9
Oryx	947	1 085	4 262	4 683
Springbok	1 390	1 487	7 590	8 060
Kudu	3	3	24	24
Steenbok	-	-	-	-
Burchell's zebra	159	150	350*	350*
Ostrich	153	186	550	644
Red hartebeest	4	4	110*	110*
Blesbok			1*	19*
<b>Total</b>	<b>2 653</b>	<b>2 915</b>	<b>12 887</b>	<b>13 890</b>
Giraffe**	6	6	8*	8*
<i>Ludwig's Bustard**</i>	43	63	160	223

\*Numbers known

\*\*Not included in total

#### 4.4 Wildlife distribution/density

Distribution (density = no counted per 100 km) maps for major individual species (oryx, springbok, kudu, Burchell's zebra, Ostrich and Ludwig's Bustard) are presented below (Figure 3.1 – 3.6). The total density of wildlife on NamibRand Nature Reserve on 5 June 2010 is shown in Figure 3.7. Note that distribution is indicated on the maps on a gradient from dark to light (high to low densities).

Figure 3.1 Distribution of oryx

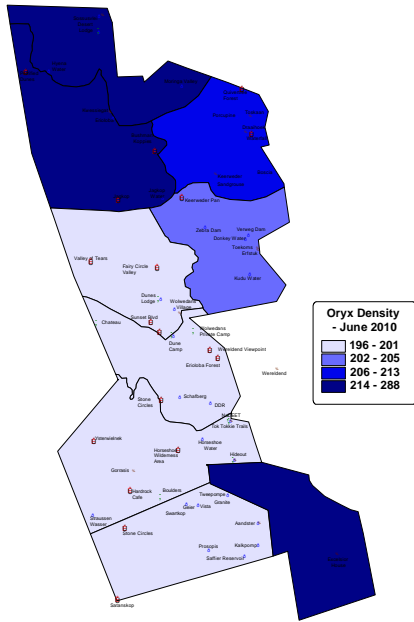


Figure 3.2 Distribution of springbok

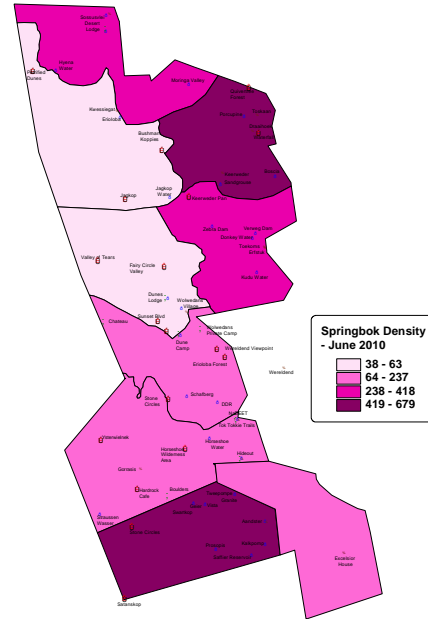


Figure 3.3 Distribution of kudu

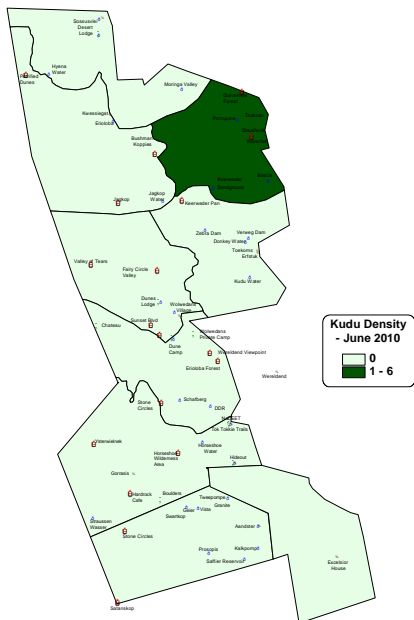


Figure 3.4 Distribution of Burchell's zebra

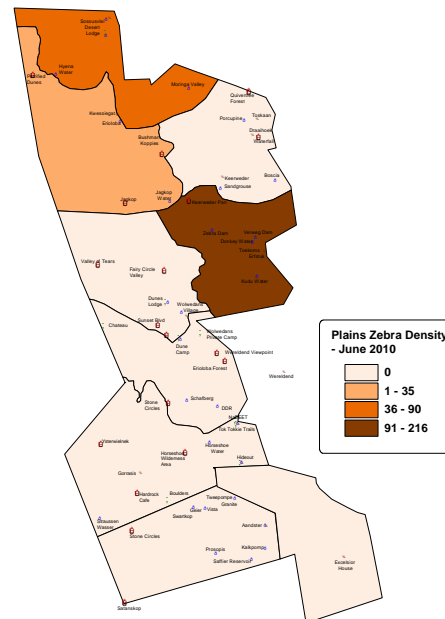


Figure 3.5 Distribution of Ostrich

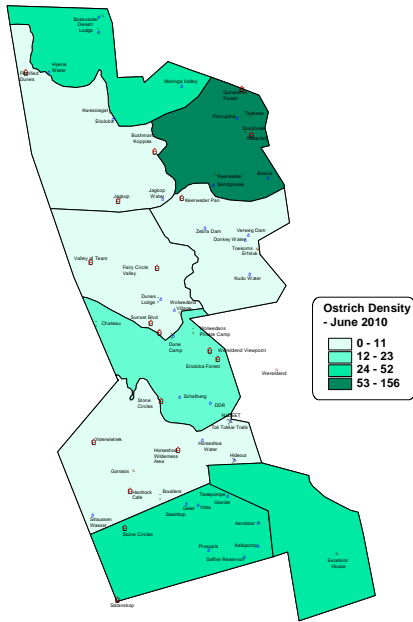


Figure 3.6 Distribution of Ludwig's Bustard

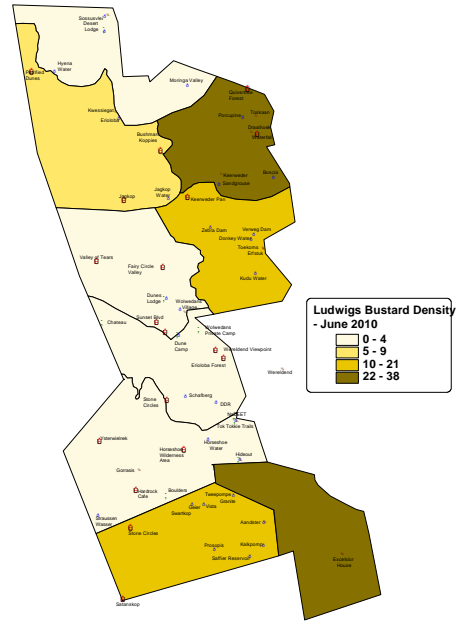
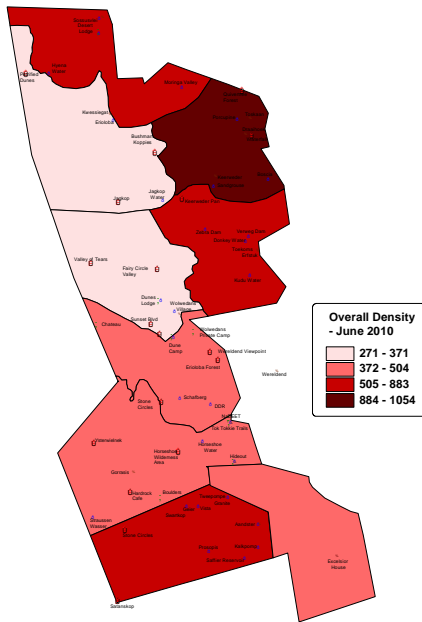


Figure 3. Total wildlife density



## 5. Data analysis

This section provides some analyses of the results data as listed above.

### 5.1 Population estimates

Table 4.1 (below) shows data from the June 2010 count compared to data from the June 2009 count (Routes 1-8 only) and Table 4.2 for Routes 1-9. Table 4.3 and Figure 4.1 depict the data over the longer term (June 2005 – June 2010), including data for both Route 1-8 and Route 1-9 in 2009 and 2010. The same data for species with lower numbers (i.e. excluding oryx and springbok) are presented on a larger scale in Figure 4.2, and actual counts and estimated numbers of Ludwig's Bustards in Figure 4.3.

Table 4.1

Total numbers of game (Route 1-8; Jun 09 – Jun 10)					
Species	Jun-09		Jun-10		Percentage change
	No. seen under 500m	Total no. corrected for area + for species	No. seen under 500m	Total no. corrected for area + for species	
Oryx	947	4 700	845	4 262	-9.3
Springbok	2 207	12 551	1339	7 590	-39.5
Kudu	7	79	3	24	-69.6
Steenbok	0	0	0	0	
B. zebra	76	318	150	350*	10.1
Ostrich	213	829	153	550	-33.7
Blesbok		7*	0	1*	-85.7
Hartebeest	16	80	4	110*	37.5
<b>Total</b>	<b>3 466</b>	<b>18 564</b>	<b>2 494</b>	<b>12 887</b>	<b>-30.6</b>
Giraffe**			6	8*	
Ludwig's Bustard**			43	160	

\* Numbers are known

\*\* Not included in count



Table 4.2

Total numbers of game (Route 1-9; Jun 09 – Jun 10)					
Species	Jun-09		Jun-10		Percentage change
	No. seen under 500m	Total no. corrected for area + for species	No. seen under 500m	Total no. corrected for area + for species	
Oryx	1106	5415	940	4 683	-13.5
Springbok	2372	13 400	1432	8 060	-39.9
Kudu	7	79	3	24	-69.6
Steenbok	1	32			-100
B. zebra	76	318	150	350*	10.1
Ostrich	243	935	180	644	-31.1
Blesbok	0	23*	0	19*	-17.4
Hartebeest	16	80	7	110*	37.5
<b>Total</b>	<b>3 821</b>	<b>20 282</b>	<b>2 718</b>	<b>13 890</b>	<b>-31.5</b>
<i>Giraffe**</i>			6	8*	
<i>Ludwig's Bustard**</i>			63	223	

\* Numbers are known

\*\* Not included in count

Table 4.3

Total numbers of game (Jun 05 - Jun 10)										
Species	Jun-05	Nov-05	Jun-06	Dec-06	Jun-07	Jun-08	Jun 09 (1-8)	Jun 09 (1-9)	Jun 10 (1-8)	Jun 10 (1-9)
<b>Oryx</b>	4 320	5 583	1 447	3 689	4 295	3 258	4 700	5 415	4 262	4 683
<b>Springbok</b>	7 733	9 207	17 900	13 127	9 013	12 451	12 551	13 400	7 590	8 060
<b>Kudu</b>	290	827	583	834	486	75	79	79	24	24
<b>B. zebra</b>	174	311	439	442	677	668	318	318	350*	350*
<b>Ostrich</b>	409	443	213	951	669	262	829	935	550	644
<b>Hartebeest</b>	50	55	70	75	80	80	80	80	110*	110*
<b>Steenbok</b>	53	100	44	88	125	174	0	32	0	0
<b>Blesbok</b>	10	11	15	18	20	20	7*	23*	1*	19*
<b>Total</b>	<b>13 039</b>	<b>16 538</b>	<b>20 710</b>	<b>19 224</b>	<b>15 366</b>	<b>16 988</b>	<b>18 564</b>	<b>20 282</b>	<b>12 887</b>	<b>13 890</b>
<b>% change</b>	-	<b>26.8</b>	<b>25.2</b>	<b>-7.2</b>	<b>-20.1</b>	<b>10.6</b>	<b>9.3</b>	<b>19.4</b>	<b>-30.6</b>	<b>-31.5</b>
<b>Comments</b>	Average rain	Summer	High rain	Summer	Low rain	High rain	High rain	Conser-vancy	Average rain	Conser-vancy
<b>Mean rain</b>	91		215		41	204	187		92	
<i>Giraffe**</i>									8*	8*
<i>L Bustard**</i>									160	223

\* Numbers are known

\*\* Not included in count

Figure 4.1. Total estimates for all plains species, June 2005 – June 2010

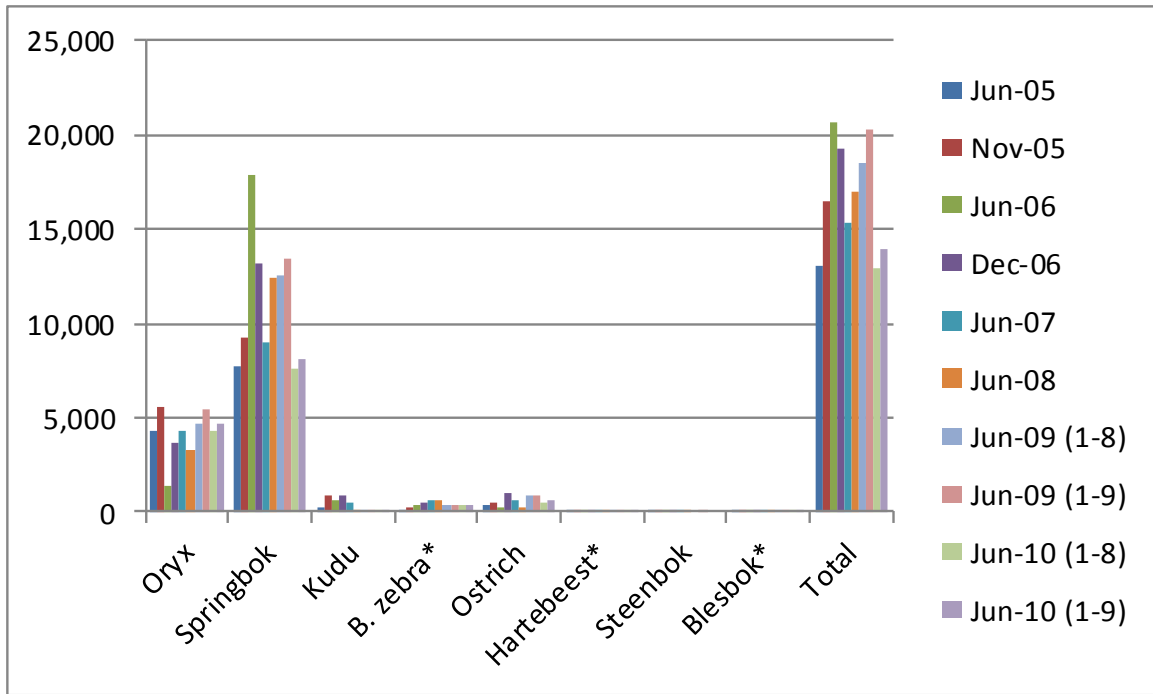


Figure 4.2. Total estimates for all plains species other than oryx and springbok, June 2005 – June 2010

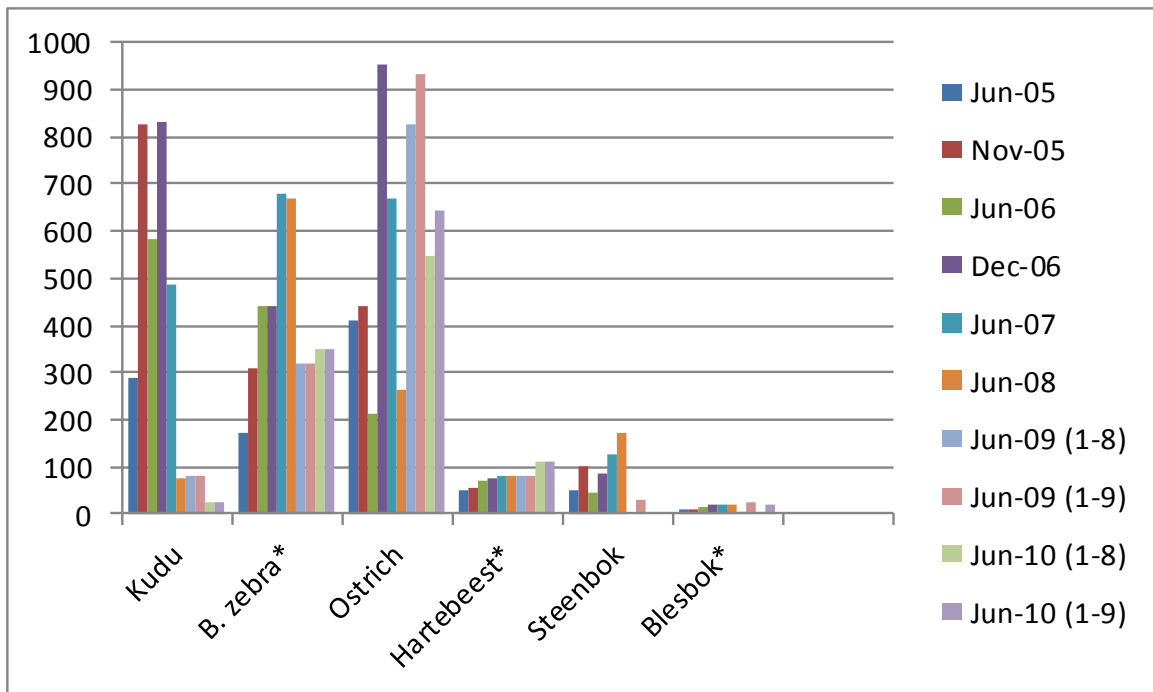
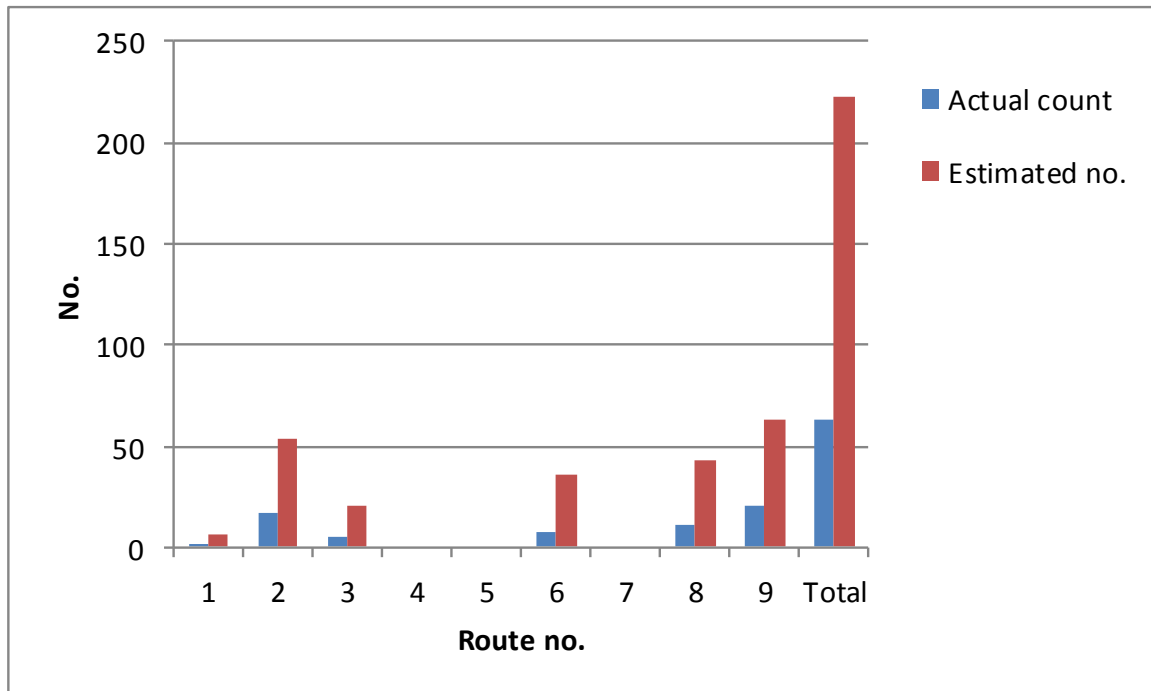


Figure 4.3. Actual counts and estimated numbers of Ludwig's Bustards, June 2010



### Comments

On comparing the data from June 2010 to June 2009 we note that the overall population estimate (for Route 1-8) has decreased by 30.6%. With the inclusion of the Pro-Namib Conservancy area (16 450 ha; Route 9) the total decrease is 31.5%.

Natural fluctuations in wildlife populations are primarily rainfall driven, often evidenced in seasonal migrations. Over the total count period, high mean rainfall (180 - 250 mm) was experienced in 2006, 2008 and 2009, accompanied by an overall increase in game numbers of 25% in June 2006, 11% in June 2008 and 9% in 2009 (Route 1-8; see Figure 2 above). In contrast, low mean rainfall (<75 mm) in 2007 brought about a decrease of 20% in numbers. Rainfall during the last season, namely only 92 mm (January to June 2010) has been closer to the long term average. These increasingly drier conditions are reflected in the dramatic decrease in numbers.

- Looking at the dominant species, estimated numbers of **oryx** increased gradually from a low of 1 447 in 2006 and remained fairly stable at around 4 000, reaching 4 700 (Route 1-8) and 5 415 (Route 1-9) in June 2009 but dropping slightly to 4 262 (Route 1-8) in 2010. With the inclusion of Route 9, the total is now 4 683.
- **Springbok** numbers (in June) peaked at around 12 500 in 2008 and 2009 (a trend linked to good rains), showing an overall increase since the start of the counts (7 733 in June 2005). The maximum of 17 900 in June 2006 has not been reached again. In June 2010, springbok numbers dropped to 7 590 and, even with the inclusion of Route 9, the total at present is only 8 060. It is possible that some of the springbok have moved closer to the foothills in search of better forage, although percentage

change greater than 30% per year is usually attributed to migration of animals in and out of the Reserve.

- **Ostrich** numbers appear to fluctuate widely, with lows of < 270 in 2006 and 2008, but show an overall increase from 409 in 2005 to 829 (Route 1-8) and 935 (Route 1-935) in 2009. With the decrease in rainfall in 2010, numbers have dropped again to 550 (Route 1-8) and 644 (Route 1-9). These changes appear to be related to responses to rainfall in terms of breeding success/survival and migration.
- Numbers of **kudu** showed a marked decrease from a high of 583 (June 2006) to 75 in June 2008 and 79 in June 2009, but dropped further to 24 in 2010. This census method is not considered to be well suited for non-plains game such as kudu, however.
- **Red hartebeest** numbers have gradually increased from 80 in 2007 to 110 in 2010.
- **Burchell's zebra** increased from 174 in 2005 to peak at around 670 in 2007 and 2008. The resident and non-migrating population was reduced by 150 animals during game capture operations in 2006 and 2008, in order to reduce grazing pressure on the environment, resulting in a sharp decrease to 318 in 2009. Numbers are estimated at 350 at present.
- Numbers of **steenbok** increased steadily from 53 in June 2005 to 174 in June 2008, then dropped to 32 in June 2009 and 0 in 2010. This census method is also not considered to be well suited for steenbok.
- Culling operations in 2008 and 2010 reduced the core population of **blesbok** from an estimated 25 individuals to the present total of one (male) for Route 1-8, while a further 18 counted on Route 9 bring the total to 19 in June 2010. As the species is alien to Namibia, efforts to eliminate them will continue.
- The effects of increased natural predation by re-introduced predators, including **cheetahs and leopards**, are probably minimal at this stage as most/all of these re-introduced predators appear to have moved off the Reserve.
- The **giraffe** population increased to nine with the birth of two calves in August and September 2008. One of the original females disappeared in February 2009. Another female gave birth to a calf early in November 2009, but both individuals died shortly afterwards. This brings the total (in June 2010) to eight.
- Actual counts of **Ludwig's Bustards** totalled 63, ranging from 11-20 individuals each in Route 2, 8 and 9. If the area correction factor is applied, the Reserve could be supporting a total population of 223 birds. With its lack of power lines, NamibRand appears to provide a safe haven for this species which is threatened elsewhere mainly by power line collisions.

Worth reiterating at this stage is that management decisions are not based on population estimate increase/decreases, but rather on wildlife trends and distribution (see below). These data are obtained from actual sightings/counts, rather than on population estimates.

## 5.2 Biomass estimates

Biomass estimates were made by multiplying the estimated wildlife numbers with the mean mass per species, then dividing by the total number of hectares for the game count areas (i.e. 154 000 ha for Route 1-8 and 170 730 ha for Route 1-9; 18 220 ha of mountainous habitat was excluded from the total no. of hectares for the Reserve). Table 5.1 (below) shows the change in wildlife biomass on the NamibRand Nature Reserve from June 2009 to June 2010 (Route 1-8), and Table 5.2 for Route 1-9. Table 5.3 and Figure 5 (below) show the total wildlife biomass from June 2005 to June 2010.

Table 5.1

<b>Total wildlife numbers and wildlife biomass on NamibRand for June 2009 and June 2010 (Route 1-8)</b>							
<b>Wildlife species</b>	<b>Mean mass (kg)</b>	<b>Jun-09</b>			<b>Jun-10</b>		
		<b>Estimated wildlife numbers from June 09 game count</b>	<b>Species biomass (kg)</b>	<b>Biomass per ha (kg)</b>	<b>Estimated wildlife numbers from June 10 game count</b>	<b>Species biomass (kg)</b>	<b>Biomass per ha (kg)</b>
				<b>TOTAL</b>			<b>TOTAL</b>
Oryx	220	4 700	1 034 000	6.7	4 262	948 640	6.1
Springbok	38	12 551	476 938	3.1	7 590	264 100	1.9
Kudu	180	79	14 220	0.1	24	4 320	0.0
B. zebra	280	318	89 040	0.6	350*	98 000	0.6
Ostrich	68	829	56 372	0.4	550	37 400	0.2
Hartebeest	130	80	10 400	0.1	110*	14 300	0.1
Steenbok	11	0	0	0.0	0		0
Blesbok	100	7*	700	0.0	1*	100	0.0
<b>Total</b>		<b>18 564</b>	<b>1 681 670</b>	<b>10.9</b>	<b>12 887</b>	<b>1 366 860</b>	<b>9.0</b>

\*Numbers are known

Table 5.2

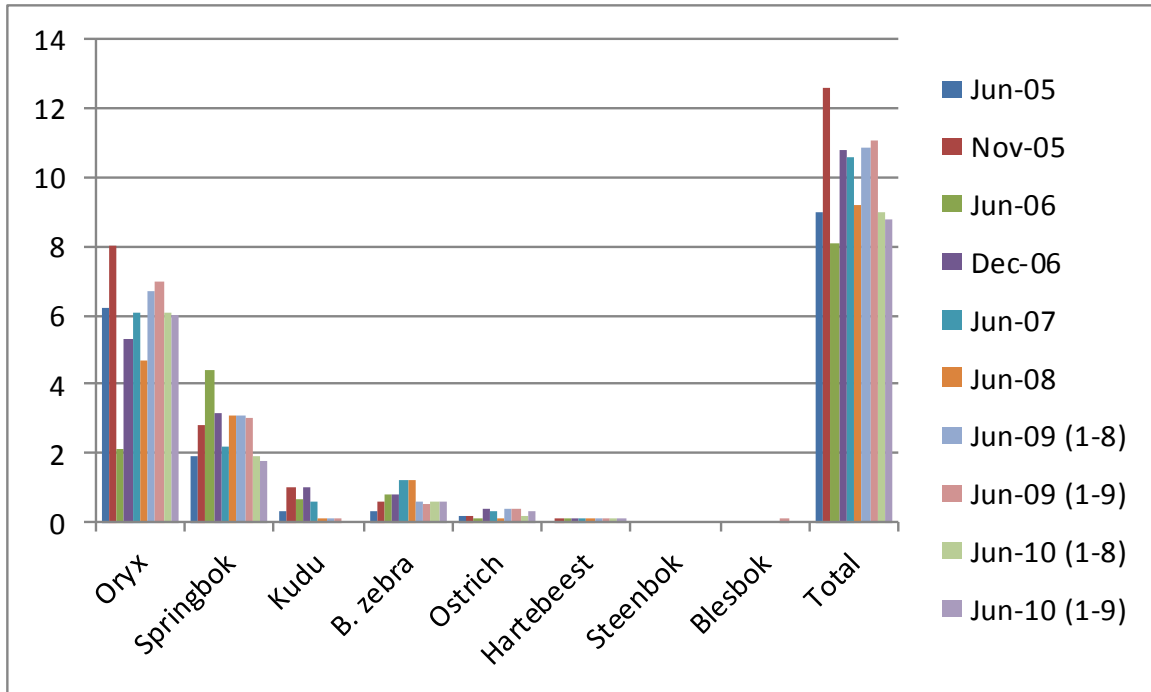
Total wildlife numbers and wildlife biomass on NamibRand for June 2009 and June 2010 (Route 1-9)							
Wildlife species	Mean mass (kg)	Jun-09			Jun-10		
		Estimated wildlife numbers from June 09 game count	Species biomass (kg)	Biomass per ha (kg) TOTAL	Estimated wildlife numbers from June 10 game count	Species biomass (kg)	Biomass per ha (kg) TOTAL
Oryx	220	5 415	1 191 300	7.0	4 683	1 041 260	6.0
Springbok	38	13 400	509 200	3.0	8 060	283 480	1.8
Kudu	180	79	14 220	0.1	24	4 320	0.0
B. zebra	280	32	8 960	0.1	350*	98 000	0.6
Ostrich	68	935	63 580	0.4	644	43 792	0.3
Hartebeest	130	80	10 400	0.1	110*	14 300	0.1
Steenbok	11	32	352	0.0	0	0	0.0
Blesbok	100	23	2 300	0.0	19*	1 900	0.0
<b>Total</b>		<b>19 996</b>	<b>1 800 312</b>	<b>10.5</b>	<b>13 890</b>	<b>1 487 052</b>	<b>8.8</b>

\*Numbers are known

Table 5.3

Total wildlife biomass (kg/ha) on NamibRand, June 2005 to June 2010										
Wildlife species	Jun-05	Nov-05	Jun-06	Dec-06	Jun-07	Jun-08	Jun-09 (1-8)	Jun-09 (1-9)	Jun-10 (1-8)	Jun-10 (1-9)
Oryx	6.2	8.0	2.1	5.3	6.1	4.7	6.7	7.0	6.1	6.0
Springbok	1.9	2.8	4.4	3.2	2.2	3.1	3.1	3.0	1.9	1.8
Kudu	0.3	1.0	0.7	1.0	0.6	0.1	0.1	0.1	0.0	0.0
B. zebra	0.3	0.6	0.8	0.8	1.2	1.2	0.6	0.5	0.6	0.6
Ostrich	0.2	0.2	0.1	0.4	0.3	0.1	0.4	0.4	0.2	0.3
Hartebeest	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Steenbok	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Blesbok	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
<b>Total</b>	<b>9.0</b>	<b>12.6</b>	<b>8.1</b>	<b>10.8</b>	<b>10.6</b>	<b>9.2</b>	<b>10.9</b>	<b>11.1</b>	<b>9.0</b>	<b>8.8</b>

Figure 5. Total wildlife biomass (kg per ha) on NamibRand Nature Reserve, June 2005 - June 2010



### Comments

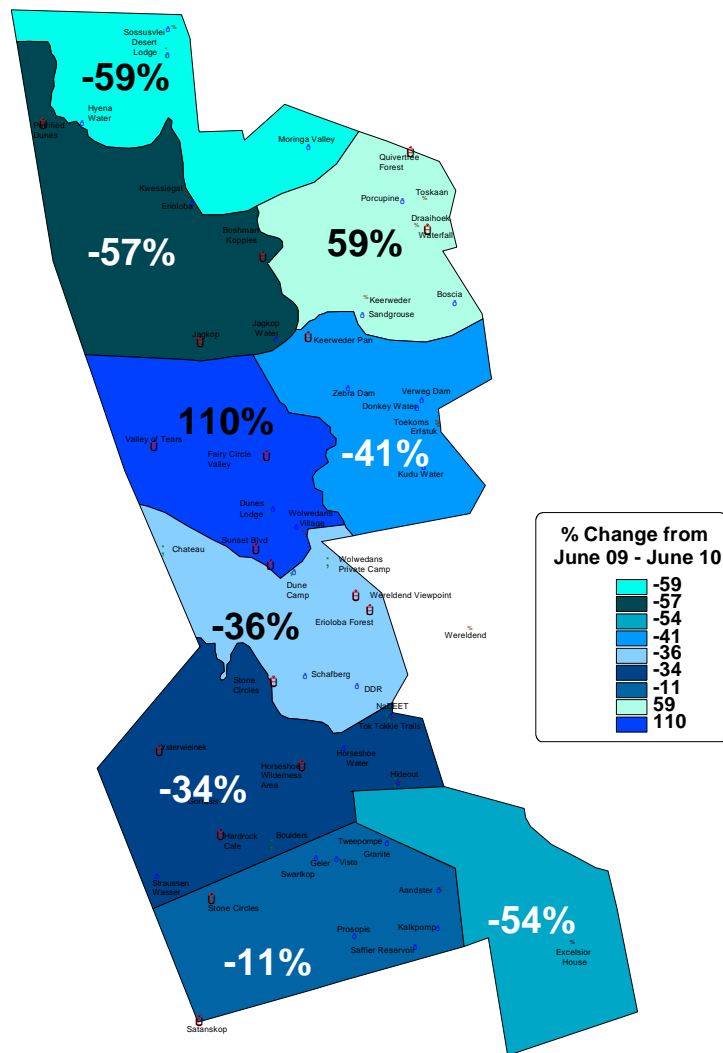
The total wildlife biomass decreased from 10.9 kg/ha in June 2009 to 9.0 kg/ha in June 2010 (Route 1-8). This appears to be largely due to the decrease in springbok numbers. With the inclusion of the Route 9, the biomass for June 2010 was similar (8.8 kg/ha).

The total biomass of the Reserve increased slowly but steadily from 9.0 kg/ha in June 2005 to 10.9 (Route 1-8) and 11.1 (Route 1-9) kg/ha in June 2009. This trend can, in part, be related to good rainfall in 2006, 2008 and 2009. At the same time, the area available to the game has increased with the gradual breaching of fences with neighbouring properties, and especially with the inclusion of 16 450 ha through the establishment of the Pro-Namib Conservancy (Route 9) in June 2009. However, with the lower rainfall in 2010, the biomass dropped accordingly.

### 5.3 Wildlife distribution/density

Figure 6 (below) illustrates the change in wildlife distribution in game count zones between June 2009 and June 2010.

Figure 6. Change in wildlife distribution between June 2009 and June 2010.



### Comments

Compared to June 2009, only the north-western parts of the Reserve showed an increase in wildlife (110% for Route 4 and 59% for Route 2), with an overall decrease in the central/western and southern areas.



## 5.4 Population change

As described in the methodology section above, data need to be normalized in order to make comparisons. Table 6.1 (below) shows this standardized data for animals counted per 100km driven (at a distance of <500m). Table 6.2 (below) compares the total number of animals counted per 100km driven for consecutive game counts held.

Table 6.1

Species sightings per 100km (June 2010)															
Route	Route length (km)	Oryx		Springbok		Ostrich		B. zebra		Hartebeest		Kudu		L. Bustard*	
		No	Per 100 km	No	Per 100 km	No	Per 100 km	No	Per 100 km	No	Per 100 km	No	Per 100 km	No	Per 100km
1	52.0	140	269	210	404	25	48	47	90					2	4
2	52.0	111	213	353	679	81	156			4	8	3	6	17	33
3	57.6	166	288	22	38	6	10	20	35					5	9
4	48.9	98	200	31	63	4	8								
5	70.7	142	201	152	215	16	23								
6	38.5	79	205	161	418			83	216					8	21
7	55.6	109	196	132	237	6	11								
8	51.2	102	199	329	643	21	41							11	21
9	52.0	138	265	97	187	27	52							20	38
<b>Total</b>	<b>478.5</b>	<b>1085</b>	<b>226.8</b>	<b>1487</b>	<b>310.8</b>	<b>186</b>	<b>38.9</b>	<b>150</b>	<b>31.4</b>	<b>4</b>	<b>0.8</b>	<b>3</b>	<b>0.6</b>	<b>63</b>	<b>13.2</b>

\*Not included in total

Table 6.2

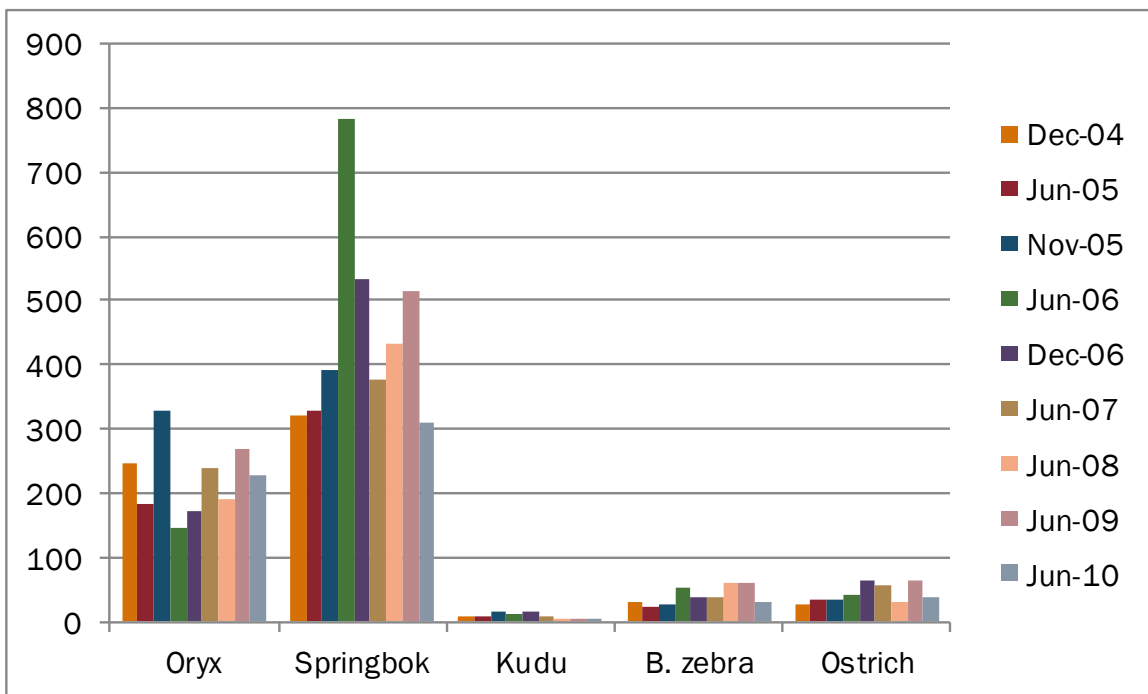
Total no. of animals seen per 100 km per route (June 2005 – June 2010)									
Route	Jun-05	Nov-05	Jun-06	Dec-06	Jun-07	Jun-08	Jun-09	Jun-10	% change (Jun-09 - Jun-10)
1	608	500	1 094	581	1 117	460	1 981	811	-59.1
2	1 491	1 491	1 407	683	1 709	806	670	1 064	58.8
3	387	387	247	1 342	635	454	863	371	-57.0
4	239	239	237	424	350	275	129	271	110.1
5	480	480	416	776	324	633	687	439	-36.1
6	875	875	1 423	2 159	1 127	978	1 414	839	-40.7
7	714	714	596	1 238	516	704	668	444	-33.5
8	822	822	1 943	944	1 487	858	996	883	-11.4
9	-	-	-	-	-	-	1 105	504	-54.4
<b>Total</b>	<b>579</b>	<b>794</b>	<b>1 037</b>	<b>816</b>	<b>716</b>	<b>715</b>	<b>953</b>	<b>625</b>	<b>-33.4</b>

These tables put the game count data into a different perspective and help us to equate the data in a more manageable or understandable format. We can, for example, determine that should we drive 100km, or from the top to the bottom of the Reserve, we will see 311 springbok in that distance. This is the true test of the data and helps us put the huge numbers into perspective.

Percentage change in the last column of Table 6.2 indicates the increase or decrease (-) in wildlife trend from the previous year. The number of animals seen per 100 km per route is now down to 625, a decrease of 33% over the previous year.

Figure 7 (below) shows the population changes (animals observed per 100 km) over the total count period in graph format, for easy interpretation.

*Figure 7. Population changes (animals observed per 100 km), December 2004 – June 2010*



### **Comments**

As mentioned above, only actual sightings are used to analyze these data. For this reason, data from the December 2004 count can also be used. Although count zones, routes and correction factors were adjusted as from the June 2005 game count, data for the actual sighting per 100km driven remain the same and can therefore be used.

Sightings of oryx have dropped from 269/100 km in June 2009 to 227/100 km (Route 1-9). Likewise, springbok sightings have dropped from 514/100 km to 311/100 km (Route 1-9).

The total number of sightings per route is now 625/100 km. This overall decrease of 33% over the previous year appears to be directly related to the decrease in rainfall in 2010.

## 5.5 Wildlife trends in relation to rainfall

Estimated numbers of oryx, springbok and Ostrich in relation to rainfall are shown in Figure 8a, 8b and 8c; biomass per hectare for these species in relation to rainfall in Figure 9a, 9b and 9c; and number of animals counted per 100 km for these species in relation to rainfall in Figure 10a, 10b and 10c. Springbok numbers show a direct correlation with rainfall figures for the same year for each of these parameters, whereas numbers of both oryx and Ostrich show a greater correlation after a lag of one year.

Figure 8a. Estimated numbers of oryx correlated with rainfall by year (i) and one year later (ii)

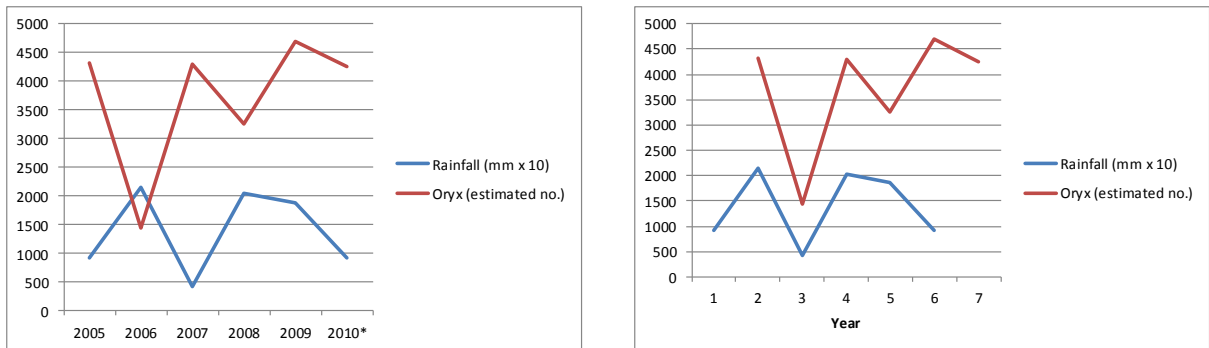


Figure 8b. Estimated numbers of springbok correlated with rainfall by year

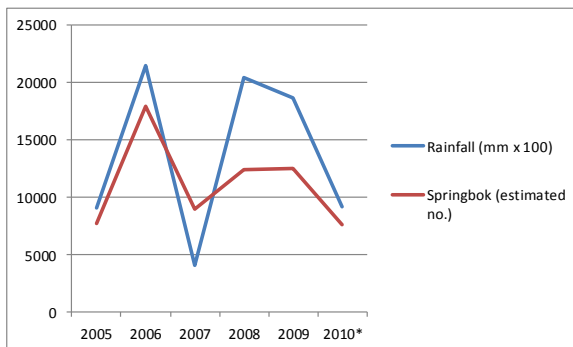


Figure 8c. Estimated numbers of Ostrich correlated with rainfall by year (i) and one year later (ii)

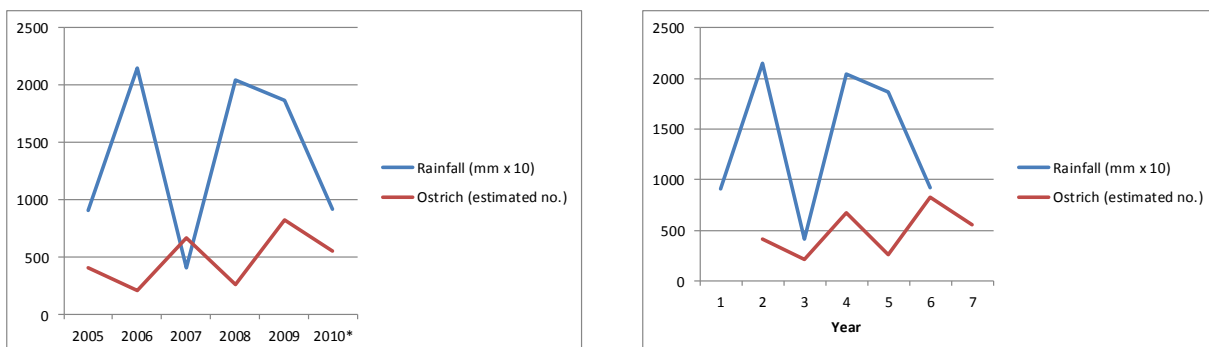


Figure 9a. Biomass of oryx correlated with rainfall by year (i) and one year later (ii)

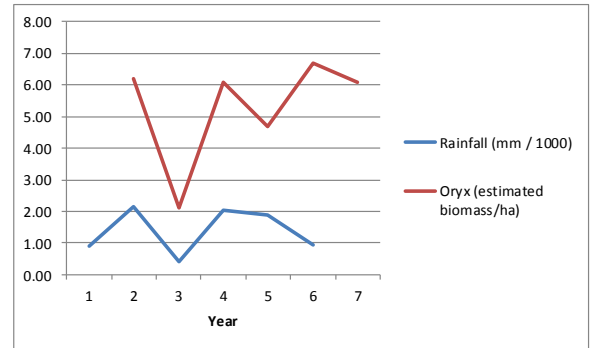
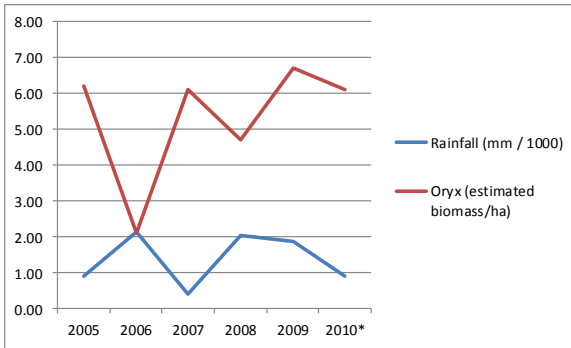


Figure 9b. Biomass of springbok correlated with rainfall by year

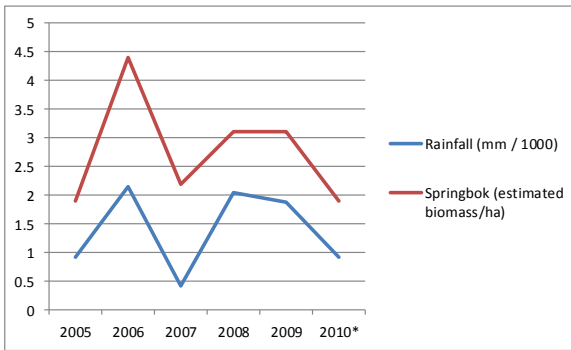


Figure 9c. Biomass of Ostrich correlated with rainfall by year (i) and one year later (ii)

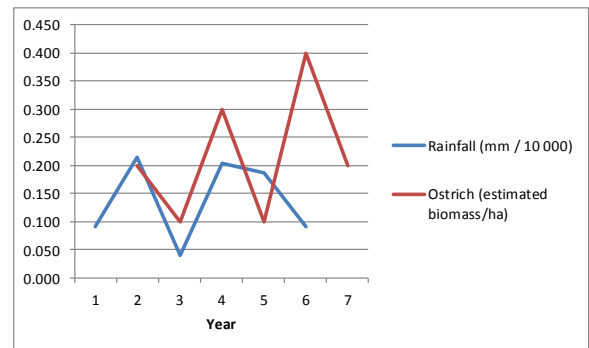
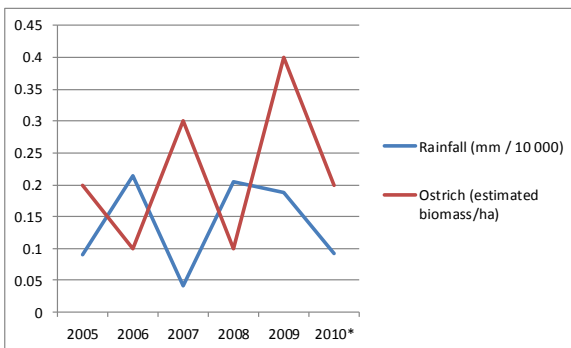


Figure 10a. Number of oryx counted per 100 km correlated with rainfall by year (i) and one year later (ii)

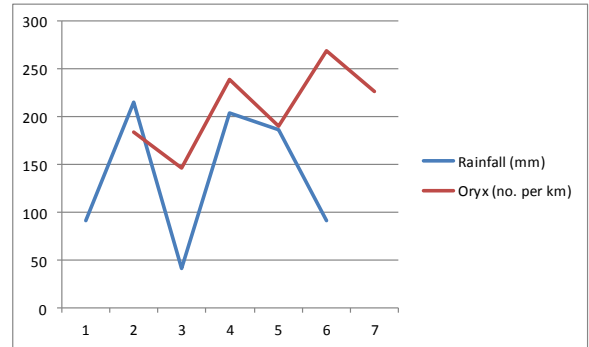
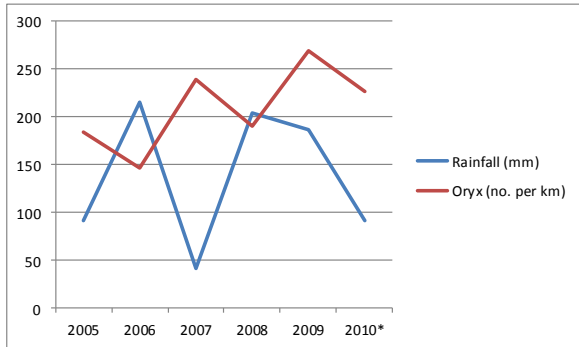


Figure 10b. Number of springbok counted per 100 km correlated with rainfall by year

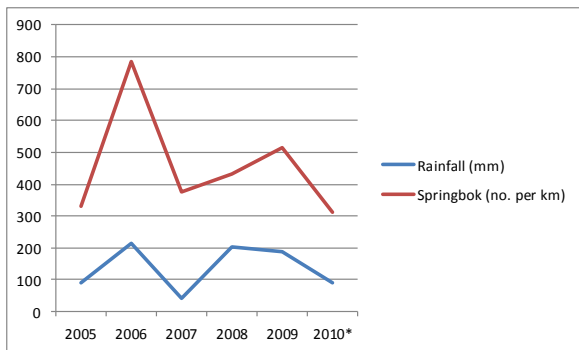
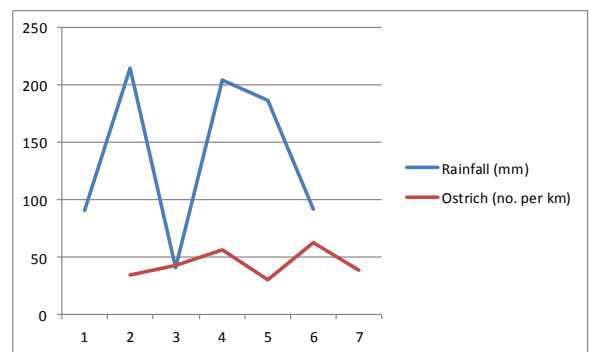
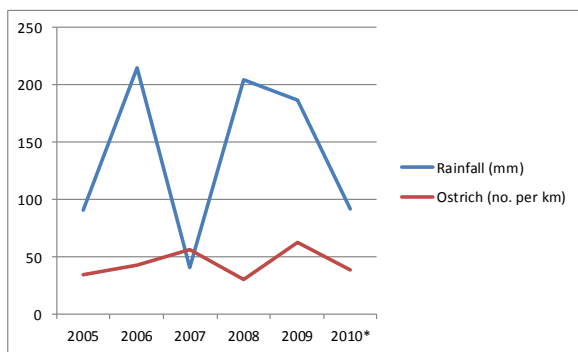


Figure 10c. Number of Ostrich counted per 100 km correlated with rainfall by year (i) and one year later (ii)



## **Comments**

From the above results, it appears that springbok respond very quickly to changing rainfall patterns whereas the response of oryx and Ostrich is more apparent during the following year.

## **6. Conclusion**

Over the total count period, high mean rainfall (200 - 250 mm) was accompanied by an overall increase in numbers of 25% in June 2006, 11% in June 2008 and 9% in June 2009. In contrast, low mean rainfall (< 75 mm) in 2007 was associated with a decrease of 20% in numbers. The overall population estimate for the Reserve (all species combined, Route 1-8 and Route 1-9) in June 2010 has decreased by 31% from June 2009. This trend is associated with the relatively lower rainfall for the first six months of 2010 (92 mm). Estimated numbers of springbok dropped by 40% from 13 400 in June 2009 to 8 060, compared to a decrease of 14% in oryx numbers to 4 683. The Reserve appears to be a safe haven for the Endangered *Ludwig's Bustard*, and numbers of this indicator species should continue to be monitored. The total biomass of the Reserve increased from 9.0 kg/ha in June 2005 to 11.1 kg/ha in June 2009. This trend can be related to factors such as good rainfall and the increasing availability of the area available to the game. With the decrease in rainfall in 2010, however, the total biomass dropped again to 9.0 kg/ha in June 2010. The highest densities of wildlife were in the northern, eastern and south-western parts of the Reserve, while the central vegetated dune belt had lower densities of game. The total number of sightings per route has also dropped to 625 animals/100 km, a decrease of 33% over the previous year. The overall population trends thus correspond with the rainfall patterns. Amongst the key plains species, numbers of springbok respond very quickly to changing rainfall patterns, whereas the response of both oryx and Ostrich is more apparent during the following year.

## **Acknowledgements**

The success of our game count effort is dependent upon the participation and generous time contribution from all our stakeholders. NamibRand would like to thank all the participants for their willing and enthusiastic help with these very important game counts over the years! This year, these participants included Sossusvlei Desert Lodge (including NamibSky Balloon Safaris), Mr Klein's team (including the Brauns and NRNR staff), Christiana Berker and her team, Wolwedans (two teams including Albi Brückner, Peter Koep and Swen Bachran), NaDEET, Tok Tokkie Trails, Aandstêr (including the Family Hideout, N/a'an ku sê and NRNR staff) and the Pro-Namib Conservancy (including Drifter's Desert Lodge). Mike Scott is thanked for his inputs regarding this report.