



An aerial photograph of a herd of buffalo on the Lewa - Borana landscape

AERIAL AND GROUND WILDLIFE COUNT ON THE LEWA - BORANA LANDSCAPE

MARCH 2017

1.0 Introduction

The Lewa - Borana landscape (LBL) hosts diverse and abundant wildlife populations. Determining the numbers and distribution of these populations provide an understanding of their status and performance. One of the methods of estimating the status of wildlife in an area is through regular counts.

Before 2016, when Lewa and Borana Conservancies were fully merged to form one landscape, wildlife counts in the two properties used to be conducted independently using different methods. On Lewa, counts have been completed since 1977, while on Borana, counts have been undertaken since 1991 (apart from 2014 and 2015 when a combined systematic count of the landscape was completed).

In an attempt to harmonise the wildlife counting techniques in the LBL with a view to developing comparable status and trends, both the traditional '*farm/ranch*' and a '*systematic*' count were conducted in March 2017. The methods deployed in these two techniques are described below.

1.1 Methods

In 2017, wildlife counts on the LBL were conducted on two consecutive days. Day 1 combined both the aerial and ground counts (*farm/ranch*). This kind of count has been used on Lewa in all the past years. Day 2 was dedicated to the systematic count where an aircraft with observers was flown along pre-set east - west transect lines. The systematic count was carried out to ensure that the method of counting wildlife in the LBL becomes comparable with other standard counting techniques that are used elsewhere in the country.

Day 1: Combined ground and aerial count (*farm*): This count was completed from 7 to 11:30 am on the 7th March 2017. The landscape was divided into eight ground counting blocks. A similar number of blocks were set aside for the aerial count (Fig. 1). The blocks were demarcated by either roads or other geographical features primarily rivers, valleys and hills. On each ground counting block, wildlife species were counted by a minimum of three observers using one vehicle that traversed all the roads, counting animals seen on the way. All the wildlife sightings were recorded in a Cybertraker. In addition, hand-written data sheets of the same sightings were completed to act as a back-up in case the Cybertrackers malfunctioned. The blocks that were counted from the air had relatively poor accessibility and reduced visibility from the ground.

The aerial counting blocks were counted using a Super Cub (Lewa side) and a Cessna 180 aircraft (Borana side) flown at an average of 300 feet above the ground level. The speed of the aircrafts varied from 70 - 90 knots. Transects were maintained at 500-metres on either side of the aircraft and followed an east - west or north - south direction depending on terrain, and the direction of wind and sun. Large herds of wildlife especially buffalo were photographed from the air and their numbers estimated by counting from a computer. The aerial counting teams used dictaphones and GPS units to record all the wildlife sightings. The voice data was then downloaded onto a computer and transcribed in a Microsoft Excel spreadsheet.

We had concerns with the total number of buffalo and Grevy's zebra that were counted. Therefore, a repeat total aerial count using one aircraft was carried out on the landscape

targeting these two species one week later. Sightings of the two species were similarly recorded in a dictaphone and a GPS unit while large herds of buffalo were photographed from the air. A ground counting team also verified the numbers of large herds of buffalo from the ground.

Day 2: Systematic aerial count: This count was conducted from 8 – 12 pm on the 8th March 2017. A Cessna 180 aircraft served as the survey platform. The team comprised of a pilot, a front seat observer (FSO) and two rear-seat observers (RSO). The aircraft was flown at an average of 300 feet above ground level. The average speed was 90 knots. The pilot and FSO assisted the two RSOs by noting animals on their respective sides. They also assisted with counting large herds of wildlife some of which were similarly photographed (especially buffalo).

The transects followed an east - west direction (Fig. 2). Transects were spaced at 1km intervals with observers counting animals out to 500m on each side of the aircraft. Streamers of narrow copper tubing were placed on each wing strut to mark transect widths of 250 and 500m on each side of the aircraft.

The RSOs used dictaphones and GPS units to record all wildlife observations and whether they were within the 250m transect/marker (inner) or between the 250 and the 500m marker (outer) (for a full description of this method, see Davidson, Z., Eldridge, W., Chege, G., Mwololo, M. and Kisio, E., 2014).

Since the *farm* and systematic counts were completed using two different methods, we will not discuss the numbers of wildlife by species that were counted between the two methods. In addition, 2017 is the only year where similar methods for the *farm* count were used in the entire landscape.

Meanwhile, wildlife has been moving between the two properties since they were merged after the removal of the dividing fence line. Therefore, it will be unrealistic to compare the trends of wildlife on each side of the property with the past years. For example, during the two days of the count, the hills on the central part of Borana Conservancy were relatively green compared to the eastern side of the landscape. Consequently, some Plains zebra had already crossed over to the Borana side to access the new grass. The same scenario was observed with one herd of buffalo that mainly resides on the western side of Lewa and that had also crossed over to Borana. Nevertheless, increased wildlife crossing events are occurring and we continue to look to manage the landscape as one unit. The above notwithstanding, we have presented the status of the wildlife on the landscape in 2017 against the count of 2016.

In future, the *farm* count method will continue to be used across the landscape. The systematic count will also be conducted a day after so that we can be in a position to develop comparable trends over time.

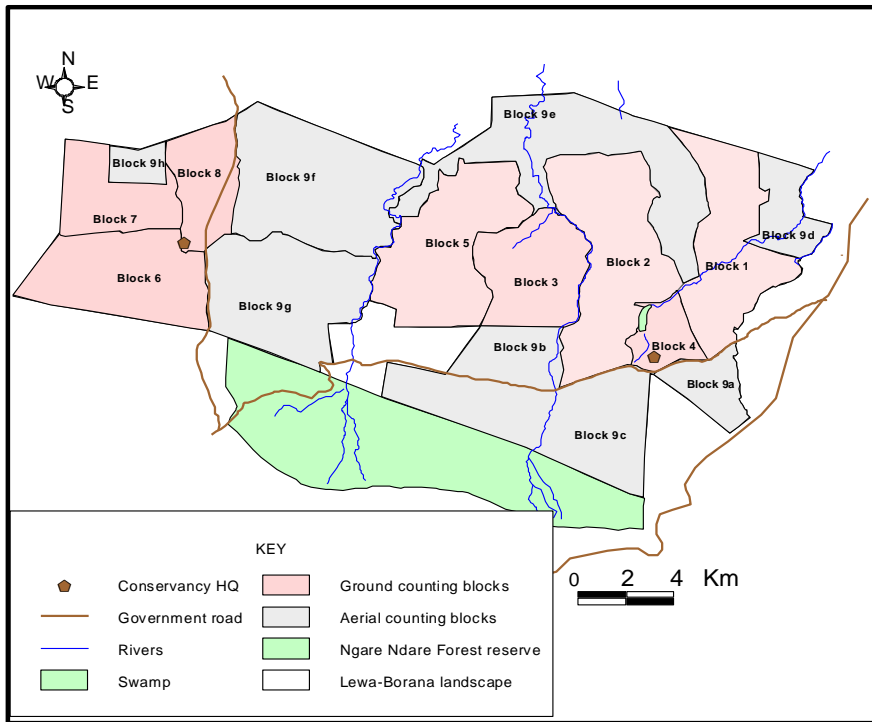


Figure 1: Map of the LBL showing the ground and aerial game counting blocks in 2017

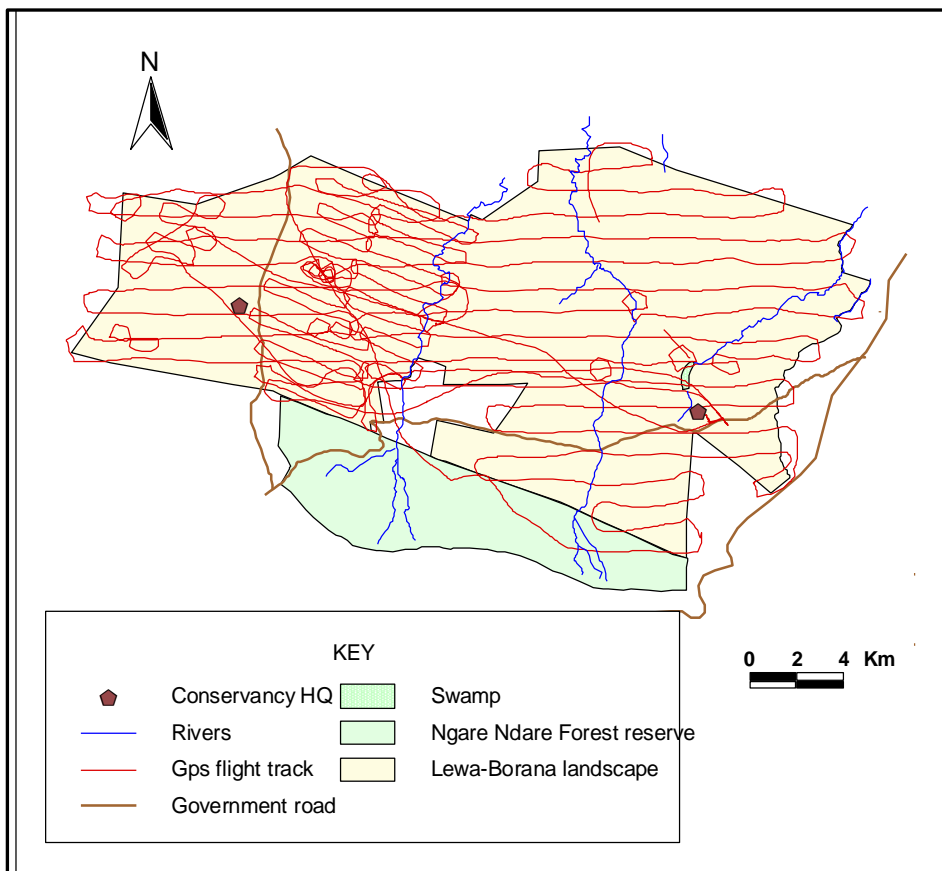


Figure 2: Map of LBL showing flight lines for the systematic count in 2017

1.3 Results and discussion

1.3.1 Combined ground and aerial count (*farm count*)

Wildlife sightings from all the ground counting blocks were summarised per block. Also, the transcribed sightings from the aerial counting blocks were summarised and added onto the total numbers per species from the ground counting blocks. Figure 3 shows the distribution map of all wildlife sightings based on the GPS location of each observation. From Figure 4 to 10, we present the distribution maps of some of the indicator wildlife species based on the GPS locations of each observation.

Table 1 shows the wildlife numbers per species that were counted on the LBL against the 2016 count. Appendix 1 and 2 presents the total number of wildlife counted on each property against the previous years.

Buffalo, impala and Plains zebra recorded high numbers >1,000. A comparison of the population of each species of wildlife counted per property showed that overall numbers have remained more or less similar between 2016 and 2017 except for the Grevy's zebra, buffalo and eland.

During the 2017 count, 170 Grevy's zebra were counted. A repeat total aerial count completed one week later yielded 220 individuals. We realised that this may have been an undercount although this population has continued to decline in numbers in the last several years. On further analysis of the unique individuals that we have recorded in the Image Based Ecological Information System (IBEIS¹) database that is generated from the monthly Grevy's zebra patrols, we realised that between January - February and February - March 2017, we recorded a mean of 286 ± 17 unique Grevy's zebra IDs. Therefore, in this report, we have presented a figure of 286 as the total number of Grevy's zebra in the LBL.

The population of buffalo counted was 1,378 individuals (870 and 508 on the Lewa and Borana side respectively). A repeat aerial count one week later produced 1,391 animals (1,046 and 345 on the Lewa and Borana side respectively).

The removal of the fence line between the two properties has enabled the free movement of wildlife in the landscape. For the first time, six Grevy's zebra were recorded on the Borana side. Increased movements of wildlife across the landscape will continue to be encouraged by creating access points where wildlife can easily go through the Ngare Ndare River that sometimes forms a physical barrier. The first of such access points has already been effected with the hope that most of the wildlife including rhino will use it on a permanent basis.

¹ IBEIS is a computational system that analyses individuals of distinctly patterned species photographic image using their stripe patterns, body spots or wrinkles.

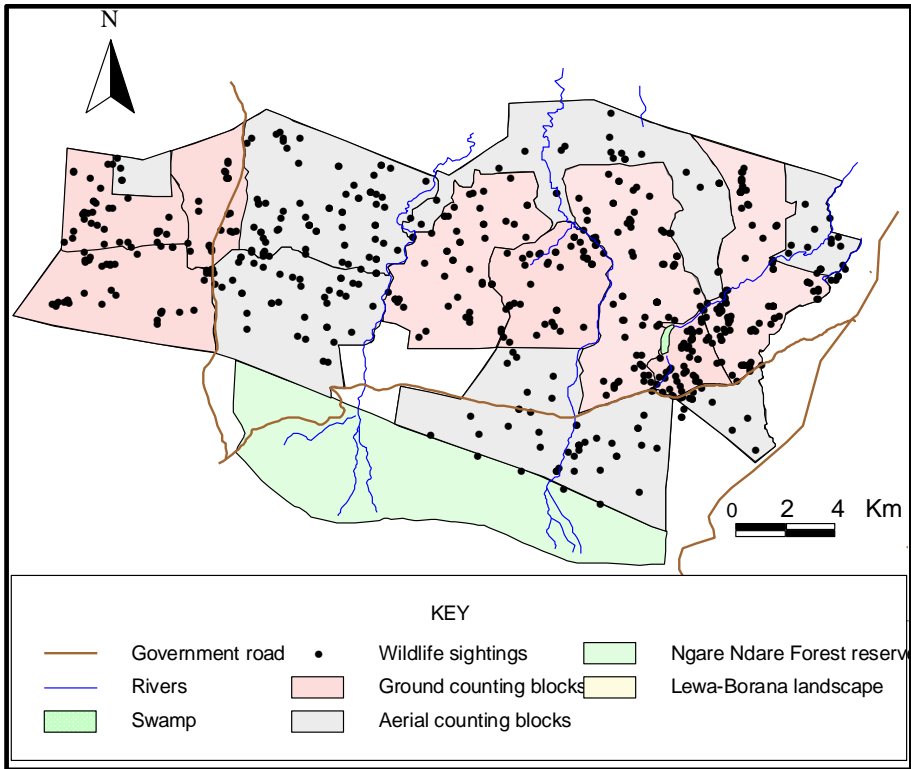


Figure 3: A combined distribution map of all wildlife sightings based on GPS locations of each observation

Table 1: Combined ground and aerial count results on LBL, 2016 - 2017

Wildlife species	2016	2017
Beisa Oryx	179	220
Buffalo	1,220	1,391
Bushbuck	15	17
Cheetah *	8	10
Eland	280	192
Elephant	416	509
Gerenuk*	10	10
Giraffe	273	251
Gazelle, Grants	348	443
Gazelle, Thompsons	27	4
Greater Kudu*	28	35
Hartebeest	30	62
Hippo	2	2
Hyena, spotted *		99
Impala	1,113	1,096
Jackal, silver backed		12
Klipspringer*	8	10
Lion*	34	44
Leopard*	7	7
Ostrich	51	44
Rhino, black*	81	82
Rhino, white*	70	75
Warthog	68	85
Waterbuck	136	168
Zebra, burchells	1,262	1,236
Zebra, Grevy's**	299	286
Grand total	5,965	6,371

Notes: * Numbers correlated from the daily sightings by the field monitoring teams.

** Number derived from the unique IDs of Grevy's zebra generated from the IBEIS database from January to March 2017.

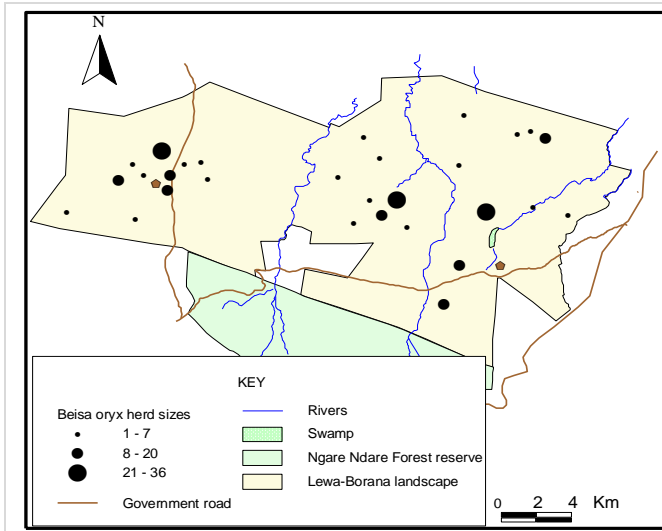


Figure 4: Beisa oryx distribution on LBL

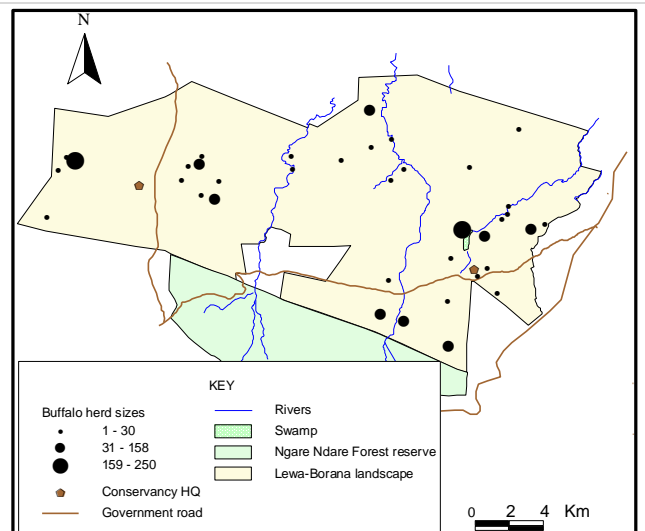


Figure 5: Buffalo distribution on LBL

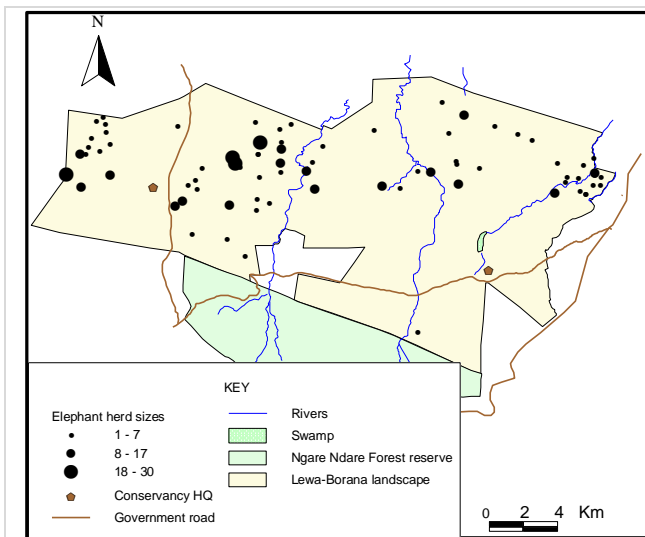


Figure 6: Elephant distribution on LBL

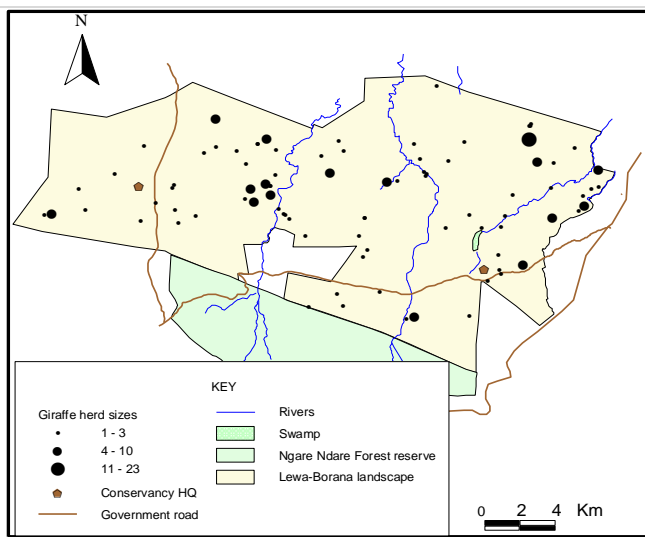


Figure 7: Giraffe distribution on LBL

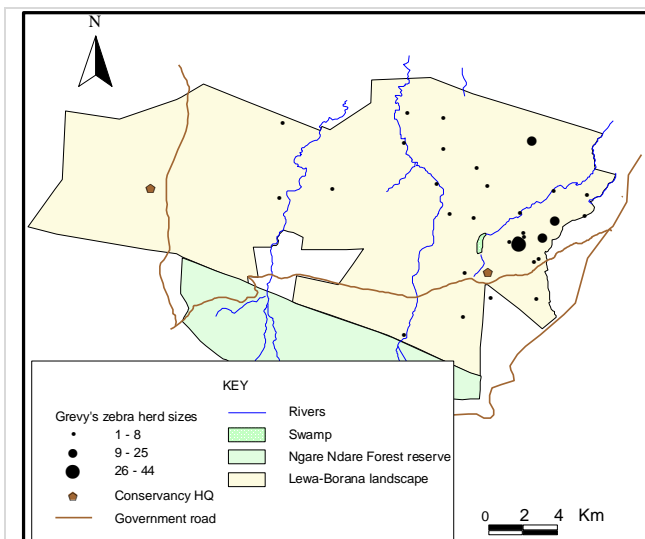


Figure 8: Grevy's zebra distribution on LBL

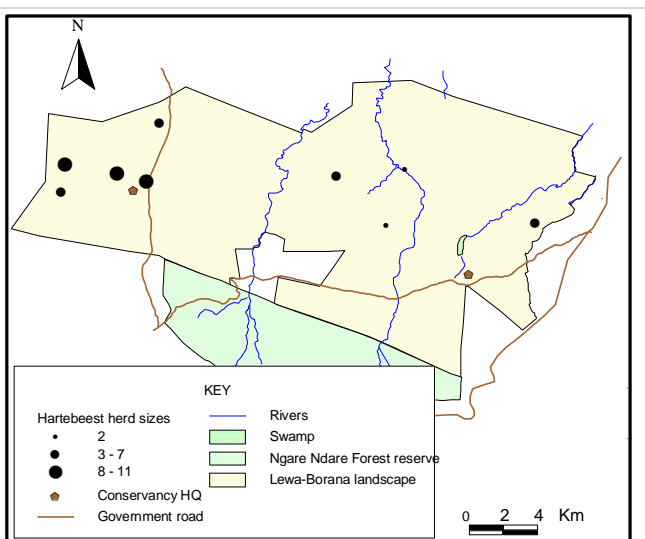


Figure 9: Hartebeest distribution on LBL

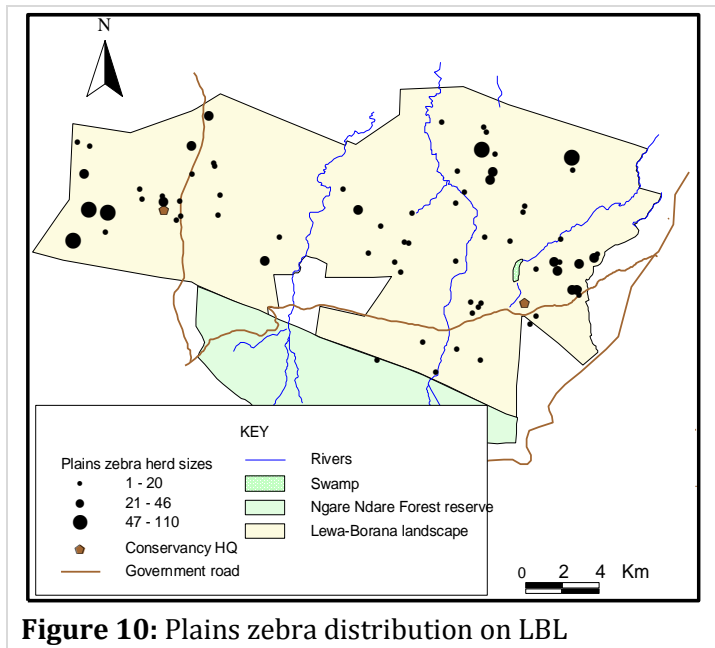


Figure 10: Plains zebra distribution on LBL

1.3.2 Systematic aerial count

Data from the systematic aerial count was transcribed from the dictaphones. The results are presented in Table 2. A map with the tracks of the aircraft is presented in Figure 11. The distribution maps of the key wildlife species based on GPS waypoints of each observation are presented in Figure 12 to 19.

The results in Table 2 indicate far much fewer numbers of wildlife counted compared to those from the *farm count* (Table 1) and hence the two methods are not comparable.

Aerial surveys also tend to be biased against small-bodied animals that in most cases are missed out. Despite this, in future, we shall continue carrying out the two methods concurrently until when we generate trends using the systematic count method.

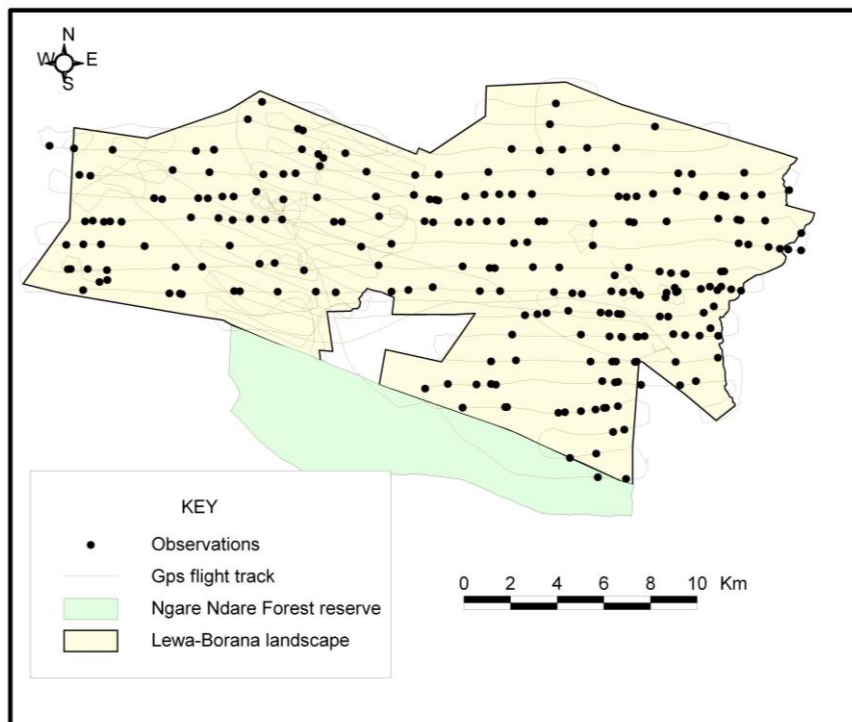


Figure 11: Actual GPS flight tracks and locations of all wildlife observations

Table 2: Systematic count results on LBL, 2017

Species	Numbers
Beisa oryx	98
Buffalo	562
Eland	244
Elephant	407
Giraffe	101
Gazelle, Grants	232
Gazelle, Thompsons	7
Greater Kudu	1
Hartebeest	42
Hippo	2
Impala	297
Ostrich	16
Rhino, black	27
Rhino, white	22
Warthog	27
Waterbuck	111
Zebra, burchells	1,042
Zebra, Grevy's	142
Grand Total	3,380

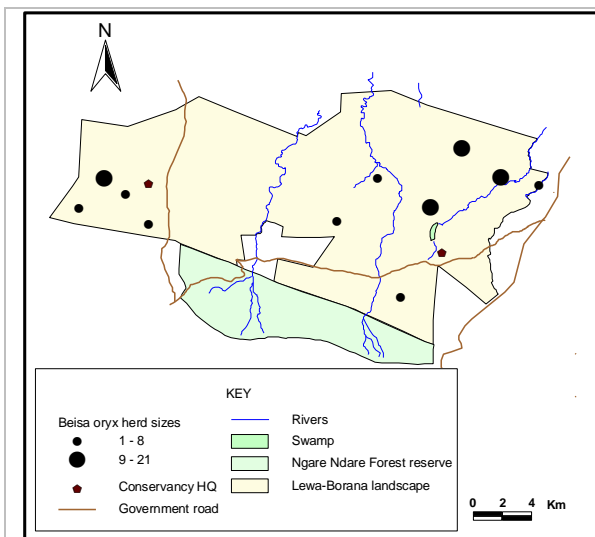


Figure 12: Beisa oryx distribution on LBL

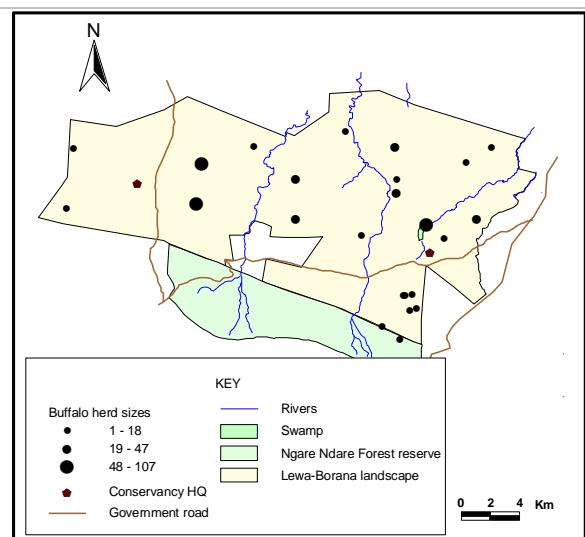


Figure 13: Buffalo distribution on LBL

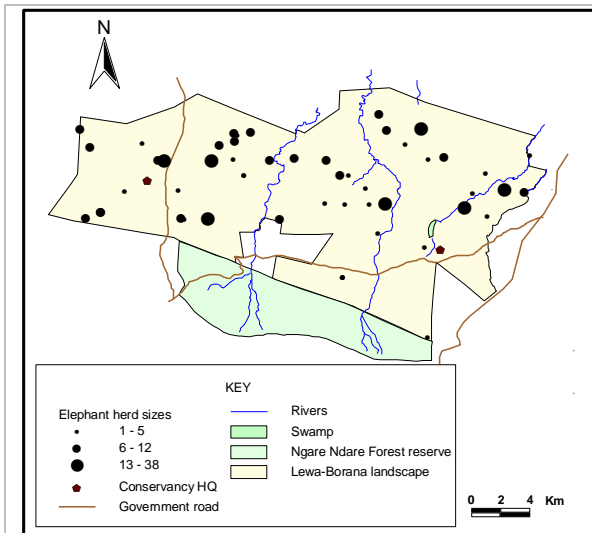


Figure 15: Elephant distribution on LBL

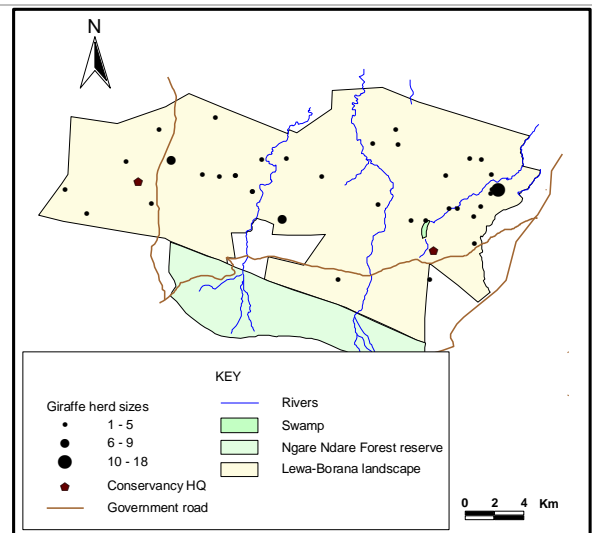


Figure 16: Giraffe distribution on LBL

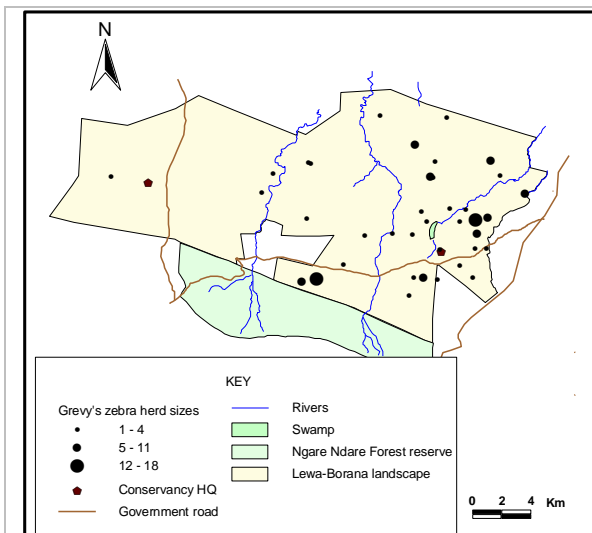


Figure 17: Grevy's zebra distribution on LBL

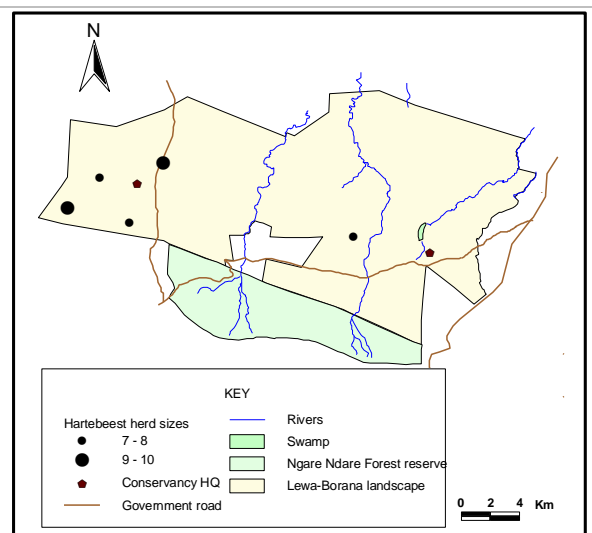


Figure 18: Hartebeest distribution on LBL

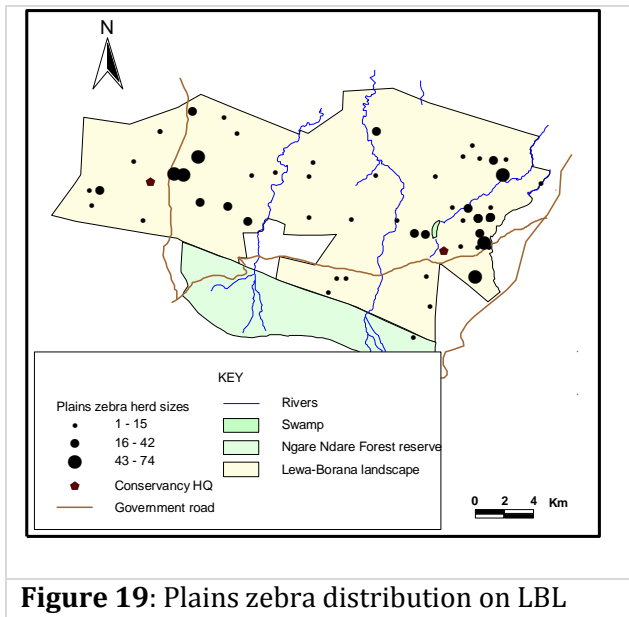


Figure 19: Plains zebra distribution on LBL

1.4 Conclusion and recommendations

In this report, we have presented the total number of wildlife counted in the LBL during the 2017 combined aerial and ground count as well as then systematic count. We have not compared the populations of wildlife by species with the previous years owing to the fact that 2017 was the first time when similar methods of the *farm* count were deployed across the entire landscape. This method will continue to be utilised in future in line with one of our objectives of managing the LBL as one. However, we will also continue to provide the status of wildlife that will be counted on each property irrespective of the fact that some species may have crossed over from one side to the other.

We have also not compared the results from the *farm* and systematic count considering that these are two different methods. However, a quick look at the wildlife numbers derived from the systematic count indicates far much lower populations compared to the *farm* count. In order to reduce this difference, it is recommended that sufficient training on how to undertake systematic surveys continue to be undertaken by a similar team of counters. This will include the use of equipment such as cameras, dictaphones and GPS units.

Appendix 1: Game count figures on Borana, 1991 – 2017

	Total numbers derived from averaged daily ground sightings														Aerial count	Total aerial & ground count
SPECIES	1991	1992	1995	1996	1997	1998	2006	2010	2011	2012	2013	2014	2015	2016	2017	
Beisa oryx	38	112	47	101.5	88	111	70	30	25	19	26	29	33	41	82	
Buffalo	78	66	127	196.5	222	165	380	122	133	141	190	229	228	279	345	
Bushbuck	20	18	6	8				0	1	1	0	1	3	0	2	
Cheetah			1	2			3	0	0	1	0	0	0	0	0	
Eland	105	257	176	203.5	185	372	104	37	34	51	53	60	59	107	58	
Elephant		35	27	91.5	9	29	67	60	59	105	85	106	94	229	323	
Gerunuk								1	1	1	0	1	2	0	0	
Gazelle, Grants	88	140	94	93.5	109	55	74	12	14	16	30	30	26	26	128	
Gazelle, Thompsons								0	2	1	0	0	0	27	4	
Giraffe	77	120	102	166.5	153	151	105	60	61	63	78	56	63	74	94	
Greater kudu	48	36	32	40	32	1	18	5	5	8	9	9	11	7	13	
Hartebeest	18	43	22	23	27	43	11	4	6	5	8	10	12	10	44	
Hyena, spotted	3	13	10	5				0	0	0	0	0	0	0	0	
Impala	77	217	206	176	415	166	311	115	161	198	190	165	174	233	319	
Jackal	11	7	18	8											2	
Leopard	4	7	5	6			6	0	0	0	0	9	0	0	0	
Lion		6	5	7.5	5		20	2	10	8	3	3	2	0	21	
Ostrich					14	14	0							0	2	
Rhino, black								0	0	0	21	21	20	20	22	
Rhino, white								0	0	0	0	0	2		3	
Warthog			19	30	25	51	6	6	7	6	9	9	7	0	52	
Waterbuck	149	110	50	139.5	150	116	51	17	26	25	37	45	43	19	67	
Zebra, burchell	524	1036	867	831	675	714	635	276	265	241	271	297	284	271	583	
Zebra, Grevys				1	2		1	0	0	0	0	0	0	0	6	

Notes:
- 1991 - 2016: Populations were derived from averaged daily sightings mainly from field rangers
- 2017: Populations were derived from ground and aerial total counts using similar methods as those that are used on the Lewa side of LBL

Appendix 2: Game count figures on Lewa, 2000 – 2017

SPECIES	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Beisa Oryx	126	84	86	62	85	49	69	91	115	65	76	72	76	74	102	140	138	138
Buffalo	238	125	161	203	233	255	339	343	349	402	403	332	269	547	695	707	941	1046
Bush buck	0	0	0	>20	>20	>20	>20	>20	>20	>20	>20	>20	20	20	15	15	15	15
Cheetah	4	21	10	7	8	8	8	5	6	6	5	11	12	7	12	5	8	1
Eland	228	151	121	108	137	214	169	248	255	218	165	123	95	162	204	207	173	134
Elephant	193	150	28	157	216	297	392	256	177	211	207	184	297	166	151	150	187	186
Gerenuk	4	17	15	11	7	11	11	~10	~10	~10	~10	9	7	6	7	12	10	10
Giraffe	237	236	245	215	177	173	147	189	243	293	252	243	241	158	163	182	199	157
Gazelle, Grants	132	162	192	167	261	258	320	362	452	376	371	378	386	292	337	288	322	315
Greater kudu	13	38	37	33	36	>20	>20	>20	12	17	16	24	3	8	28	26	21	22
Hippo	0	1**	2**	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Hartebeest	28	9	7	4	2	2	2	2	2	24	5	7	5	10	12	11	20	18
Impala	733	627	749	760	679	836	739	829	922	1029	1227	953	895	563	1021	814	880	777
Jackal (Silver ba	0	0	0	>15	>12	>12	>12	>12	>12	>12	>12	>12	8	3	9	9	9	10
Klipsringer	>8	>8	>8	>8	>6	>8	>8	>8	>8	>8	>8	>10	2	6	8	8	8	8
Leopard	0	1	7	>8	>8	8	8	>8	8	8	8	10	12	6	8	7	7	8
Lion	0	8	20	18	28	24	16	12	12	16	19	17	21	23	22	26	17	23
Ostrich	84	119	98	65	68	48	36	48	74	44	50	20	41	26	37	43	51	42
Rhino, black	26	29	29	32	36	40	48	53	55	64	65	62	71	69	67	72	61*	60
Rhino, white	32	30	31	32	32	39	36*	36	38	45	46	53	58	56	63	65	70	72
Sitatunga	12	21	21	16	16	14	14	<10	<10	<10	<10	2	1	0	0	0	0	0
Warthog	304	88	194	136	129	170	140	163	277	160	162	114	50	31	59	48	68	33
Waterbuck	474	149	170	64*	52	116	134	93	173	175	96	171	102	96	98	92	117	101
Zebra, burchell	1467	1264	1039*	1025	1102	1094	970	1098	1184	1288	1164***	908	1151	946	956	836	991	653
Zebra, Grevy's	497	556	487	462*	435	448	399	430	370	364**	343***	371****	378	296	284	325	299	286~
Notes																		
~	Number derived from the unique IDs of Grevy's zebra generated from the IBEIS database from January to March 2017																	
*	(census after individuals translocated out of Lewa)																	
**	Excludes 56 GZ counted in LMD and Il Ngwesi area on 28/2/09																	
***	Excludes 51 GZ & 102 PZ counted in LMD & IL Ngwesi on 21/03/2010																	
****	Does not include count from LMD area, 16/03/2011																	