GROUND SURVEY FOR MEDIUM - LARGE MAMMALS IN KYANKWANZI CONCESSION AREA

Report by

F. E. Kisame, F. Wanyama, G. Basuta, I. Bwire and A. Rwetsiba,

ECOLOGICAL MONITORING AND RESEARCH UNIT

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Summary

a) Kyankwanzi, Nsambya and Wattuba sub-counties-the known wildlife areas under concession were under considerable threat from habitat degradation that has led to changes in the land uses.

b) The objectives of this survey were; to estimate the population of the medium to large mammals and, to generate information and assess the distribution patterns as well as to providing information for monitoring wildlife in Kyankwanzi wildlife area.

c) The foot-transect survey method was used to collect data along laid out transects. All animals observed along transects were recorded and their perpendicular distances measured and recorded on datasheets. The survey was carried out during the dry season with a total survey effort of 265.95km. Data collected was analysed using program DISTANCE.

d) From the results the mammal population were low. Bushbuck (4,740) had the highest population followed by Duiker (1,945), Reedbuck (545) and Vervet monkey (289) in order of reducing numbers. We also encountered species such as Uganda kob, Black and White colobus monkeys, Red colobus monkeys, Warthogs and Mongoose but their numbers were so small to be analysed using DISTANCE. Bushbucks and duikers were the most widely distributed species in the survey area. Notably, the potential wildlife habitats on public land were being converted into farmlands, livestock ranching schemes, and charcoal burning sites and were recognized as the human factors causing the land use changes.

e) Kyankwanzi was the most species rich sub-county closely followed by Nsambya and Wattuba in order of reducing species richness. Effort therefore, needs to be placed towards protecting the species richness in Kyankwanzi and Nsambya sub-counties.

f) The communities need to be educated about the dangers associated with invasive plants such as *Lantana camara* observed in the survey area and the possible eradication mechanisms to prevent further spread in the already vulnerable wild animal habitats.

g) Habitat destruction and poaching as recorded, are most likely to cause further declines in the observed wild animal numbers and could impact on the present wildlife utilisation schemes. There is need to massively sensitise the communities about the alternative livelihood and the present wildlife utilisation schemes. Nevertheless, the resultant benefits need to be real other than idle talks. If this is achieved, it will go a long way towards conserving the remnant wild animal species in this landscape. Without this package, the future of wildlife management on private/public land is doomed.

1.0. INTRODUCTION

Kyankwanzi District was formerly Kiboga west Constituency until it was declared a full-fledged District by the Act of Parliament of 22nd December 2009 and operationalized on 1st July 2010 (UBOS 2009). Kyankwanzi District constitutes; Kyankwanzi, Nsambya and Wattuba sub-counties-the wildlife areas. The presence of large numbers of wildlife in Kinkwanzi District landscape outside protected areas led to its being referred to as a wildlife management area. However, with the changing livelihood demands, the land use over years started to change considerably. Charcoal burning/firewood collection, livestock rearing and cultivation some of the economic activities started to increasingly claim large expanses of the land area. And now their impacts on wildlife habitats is being realised today. According to UBOS 2009 report, the need for wood fuel and arable land by people has increased to a level that has led to reduced area coverage of the existing natural forest. It was further noted that this negative effect coupled with uncontrolled bush fires may stagnate the increase in forest area coverage.

The formerly rich wildlife habitats have been degraded-trees have been cut down; bushes have been cleared thence, exposing the already vulnerable wild animal species to poaching. The continued influence due to anthropogenic factors observed, could adversely have far reaching implications on the distribution of wild animal species as they compete for food resources and space. The question we ask today is “will the wild animal species numbers observed in this area today survive in the next 4 years?". This question leaves a lot to be desired and poses a challenge to our conservation efforts especially for wildlife outside the protected areas and on public land.

Information on wildlife species abundance, distribution patterns and trends over time periods is necessary to understand the significance and importance of each individual species in the habitat and ecosystem. Routine censuses to monitor changes are important for understanding both population dynamics and effectiveness of conservation strategies.

From 1996, when surveys were intensified in wildlife areas, much has changed in terms of species diversity, vegetation change and the impact of human activities within the areas. The mammal surveys conducted in 1996, 2000, 2004 and 2009 in some parts, for example, Masindi, Luwero, Nakasongora, Nakaseke and Kiboga that form part of the kafu basin have been with little or no consistency characterised with information gaps that needed to be filled. This, particular survey in Kyankwanzi is among the several intended to fast track the gaps in animal surveys and to further establish baseline data for monitoring trends and assess the status of wild

animals in the concession areas. The information gathered will help to assess the effectiveness of the current conservation mechanisms established earlier on in the concession area. The information is vital in evaluating various management interventions aimed at promoting wildlife conservation and economic development also. The survey was carried out in September 2017 under the supervision of Ecological Monitoring and Research Unit, to ensure data quality and control. The activity was solely funded by Uganda Wildlife Authority.

1.1. Survey Objectives

The survey objectives were;

1. To assess and generate the population estimate of medium to large mammal species in Kyankwanzi concession area.
2. To generate information on the population of wildlife species and distribution of mammals in the survey area.
3. To provide baseline ground truthing data for monitoring and further assessments of the effectiveness of current conservation strategies (e.g. sport hunting quota setting).

2.0. DESCRIPTION OF THE SURVEY AREA

The Kyankwanzi district is approximately 2,455.3 km^2 and borders districts of Nakaseke to the east across the Mayanja River, Kiboga to the south-east, Mubende and Kibaale to the south-west across the Lugogo River, and Hoima and Masindi to the north across the River Kafu. The district headquarters is in Butemba Town on the Bukwiri-Kyankwanzi Road approximately 160 kilometers by road from Kampala. Kyankwanzi district was carved out of Kiboga district by the act of Parliament in July 2010, with eight sub-counties in Kiboga North County.

The survey area comprised the sub-counties of Kyankwanzi, Nsambya and Wattuba (Figure 1). These are the concession areas where sport hunting activities are permitted following a concession agreement signed between Uganda Wildlife Authority, Kyankwanzi district local government and the concessionaire (also called the management partner) aimed at improving wildlife management outside protected areas.

2.1. Map of kyankwanzi District showing Nsambya, kyankwanzi and Wattuba sub-counties

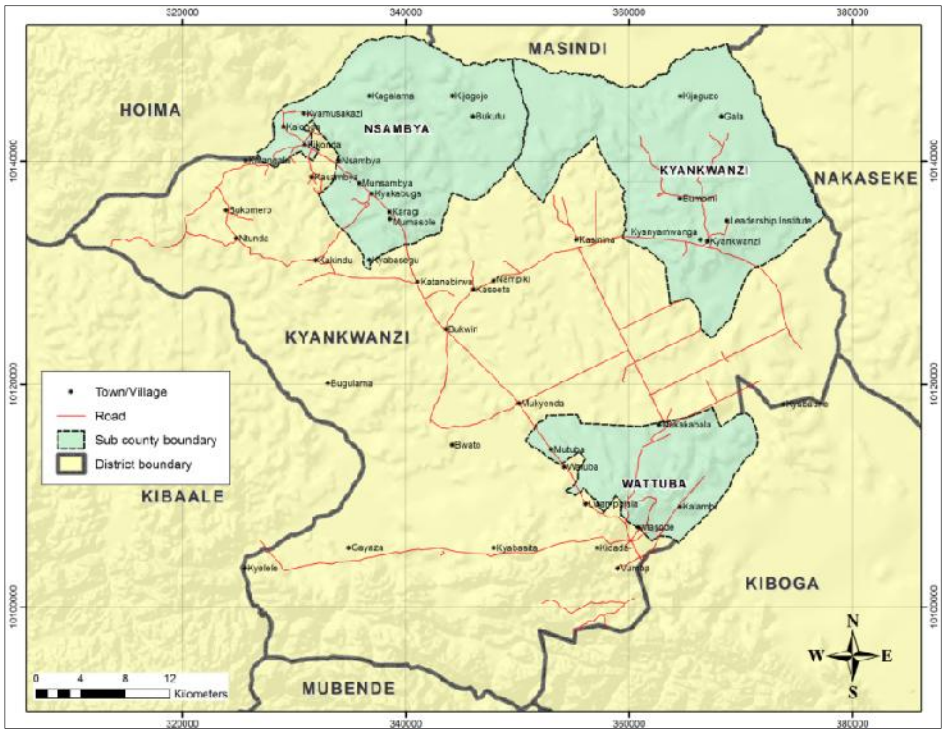


Figure 1: Sub-counties of Nsambya, kyankwanzi and Wattuba in Kyankwanzi District

2.2. Location and Size

Kyankwanzi district lies between latitude 010 12N and longitude 310 48E in the north western part of Uganda. Its approximately 150 Kilometers, by road from Kampala. It's bordered by Masindi District in the north, Hoima District in the northwest, Nakaseke District in the east, Kiboga District in the southeast, Mubende District in the south and Kibaale District in the southwest *Figure 2.* The district covers a total land area of about 2,326 square kilometers

2.2. Climate

Kyankwanzi district has a tropical climate with moderate rainfall and temperature. The rainfall pattern is bimodal with two seasons and annual rainfall varying between 560 mm to 1272 mm. The months of March to May and September to November receive very heavy and well-distributed rains of up to 1200 mm. There are two dry seasons from June to July and December to February. The high altitude ensures favourable climate with medium annual temperatures ranging from 17.2 degrees to 29 degrees centigrade

Figure 2: Location of Kyankwanzi District (*source*-Wikipedia)

2.3 Relief and Vegetation

The relief is generally low and flat characterized by shallow seasonal wetlands and flat-topped hills. Its altitude ranges from 1,000 – 1,200m above sea level. In most cases the interfluves are broad flat or rounded and murram covered, and the valleys are wide. The vegetation is covered with savannah associated with hyparrhenia.

The district has forests with exotic and local tree species and largely savannah reserves with scattered trees mainly Muvule, Musizi and Mugavu. Kyakwanzi has a total of 31,054 hectares of natural forest land, of which 70 percent is Central forest Reserves (CFR) and 30 percent is Tropical High Forest (THF). CFR are further divided into Plantations and woodland each taking 56 percent and 44 percent respectively (UBOS 2009).The district has a total of 7 permanent rivers, namely Kafu, Mpongo, Kitumbi, Nakayenga, Kiyuuni, Kalagala, Nakimpuuli & Mayanja, there exists numerous swamps whose nature is either permanent or seasonal(UBOS 2009). Wetland coverage is continuously declining due to the increasing human settlement, sand mining, animal grazing, papyrus harvesting, brick-laying, bush fires and alcohol distillation.

3.0. METHOD AND MATERIALS

The survey team comprised of 5 members for each of the 6 groups headed by experienced team leaders with knowledge in using distance sampling technique as described by (Buckland *et al* 1993); and had received prior training in census techniques and handling of the survey equipment. The survey started as early as 8:30 a.m. and lasted till 12:30 pm.

A total of 66 transects each measuring approximately 4.03km in length were walked during the survey period giving a total survey effort of 265.95km. Transects (Figure 3) were walked quietly in the North-South direction using a combination of a hand held GPS for marking waypoints and coordinates (Annex III) of animals sighted and a topographic map. Each individual or group of animals sighted on either side of the line transect was counted and the perpendicular distance from the line transect to the individuals sighted measured and recorded on specifically designed data sheets (Annex II)

For purposes of animal identification various methods of counts were used. Direct counts were used to identify common conspicuous species. Indirect counts using spoors such as animal dung and prints were also used where necessary.

Data collected from transect count (Plate 1) was entered into an excel spread sheet and analyses made using DISTANCE to estimate animal species numbers within the survey area.

Plate 1. Team leader and GPS person recording observations in the field

3.1. Survey design

A survey design used for the survey is given (Figure 3).

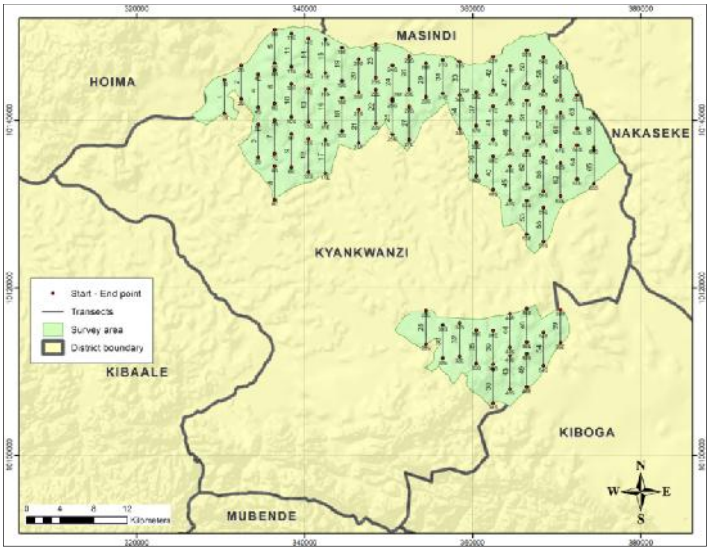


Figure 3: A survey design for Kyankwanzi District showing line-transects in the survey area

4.0. RESULTS

4.1. Fauna

From the results Bushbuck had the highest population followed by Duiker, Reedbuck and Vervet monkey in order of reducing numbers and is given (Table 1). We also encountered species such as Uganda kob, Black and White colobus monkeys, Red colobus monkeys, Warthogs and the common genet however, their numbers were so small to be analysed using DISTANCE.

Table 1: Population estimate of Mammal species in Kyankwanzi Concession area

Species	Density	Population Estimate	SE	95% Confidence interval		Conservation status
				LCL	UCL	
Bushbuck	12.23	4,740	726	3,500	6,420	LC
Duiker	6.48	1,945	359	1,350	2,802	LC
Reedbuck	1.82	545	171	295	1,006	LC
Vervet monkey	3.19	289	110	139	602	LC

4.2 Species distribution in the survey area

Bushbucks, Reedbucks, Duikers, Oribi and Black and White colobus monkey were directly sighted in Kyankwanzi and Nsambya. However, only the bushbuck and duiker were sighted in the 3 survey areas of Kyankwanzi, Nsambya and Wattuba making the bushbuck and duiker to

be the widely distributed wild animal species in the survey area. Uganda kob and Vervet monkeys were sighted in Kyankwanzi and none was sighted in Nsambya and Wattuba areas.

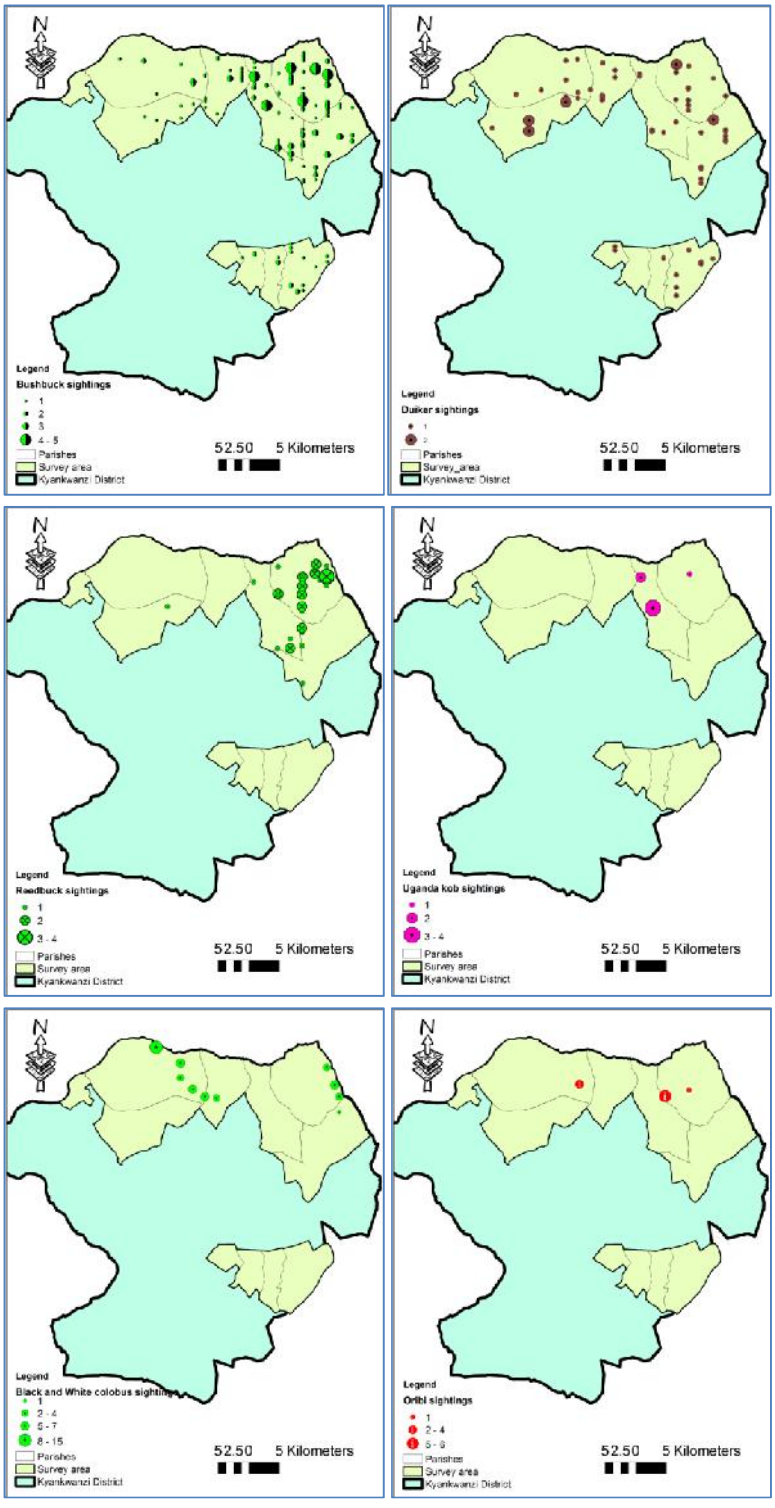
Bush pigs were directly sighted in Kyankwanzi and Wattuba and none was sighted in Nsambya. Eight (8) of the recorded speices were directly sighted in Kyankwanzi area whereas, five (5) of the recorded species were sighted in Nsambya and three (3) of the recorded species were sighted in Wattuba; making Kyankwanzi subcounnty the most species rich in the survey area as given (Table 2).

Table 2. The table below shows distribution of wild animal as sighted per the survey area

Species	**Survey sub-counties**		
	Kyankwanzi	Nsambya	Wattuba
Bushbucks	Yes	Yes	Yes
Reedbucks	Yes	Yes	
Duikers	Yes	Yes	Yes
Oribi	Yes	Yes	
Black and White colobus monkey	Yes	Yes	
Bush pigs	Yes		Yes
Uganda kob	Yes		
Vervet monkeys	Yes		

4.2.1. Density distribution maps

Spatial distribution maps for animal species encounters during the survey were geographically referenced using the GIS computer package Arc GIS 10.2.2 (*see* Figure 4) to reflect the distribution scenarios as observed in the actual space. Density is the average number of species per kilometer. It assumes that the animal species are evenly spread throughout the area being considered. In this report we used density distribution maps to portray concentrations for the different animal species sighted.


N
Legend
Bushbuck sightings
1
2
3
4 - 5
Parishes
Survey area
Kyankwanzi District
52.50 5 Kilometers
N
Legend
Duiker sightings
1
2
Parishes
Survey_area
Kyankwanzi District
52.50 5 Kilometers
N
Legend
Reedbuck sightings
1
2
3 - 4
Parishes
Survey area
Kyankwanzi District
52.50 5 Kilometers
N
Legend
Uganda kob sightings
1
2
3 - 4
Parishes
Survey area
Kyankwanzi District
52.50 5 Kilometers
N
Legend
Black and White colobus sightings
1
2 - 4
5 - 7
8 - 15
Parishes
Survey area
Kyankwanzi District
52.50 5 Kilometers
N
Legend
Oribi sightings
1
2 - 4
5 - 8
Parishes
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Kyankwanzi District
52.50 5 Kilometers

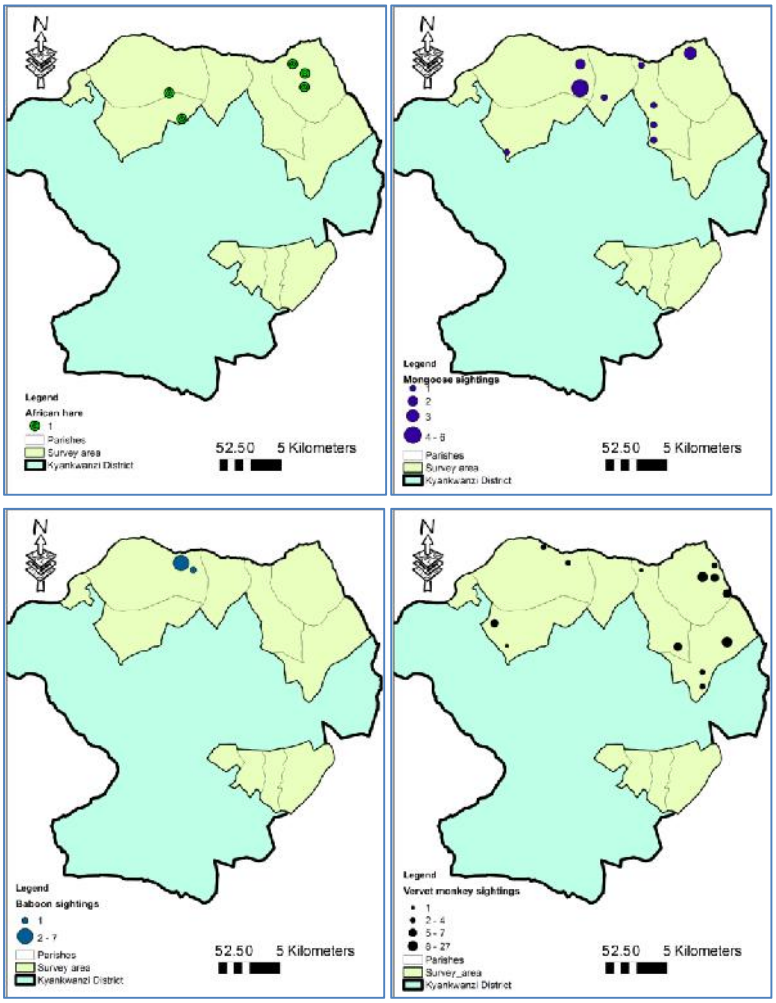

Figure 4: Density distribution maps for sighted species in the survey area.

4.3. Species sightings by spoors

From the results we also recorded the following species by their spoors and they include; Warthogs, Mongoose, Bushbucks, Reedbucks, Duikers, Vervets, Oribi, Black and White colobus, Bush pigs, Sitatunga, Aardvarks, Baboon, Hippopotamus and African hare(Plate 2)

Plate 2. Duiker and bushbuck print (*top*), mongoose den(*bottom left*) and warthog tusk(*bottom right*)

4.4. Human Activities

Human activities recorded during the survey were; Charcoal burning/firewood collection, livestock rearing, cultivation and poaching. Invasive such as *Lantana camara* were also recorded (Plate 1)

Plate 3: Human activities recorded in the survey area

Plate 4: Python skin confiscated from poachers.

4.4.1. Distribution of human activities

Spatial distribution maps for human activities encountered during the survey were geographically referenced us ing the GIS computer package Arc GIS 10.2.2 (*see* Figure 5) to reflect the observations in the actual space.

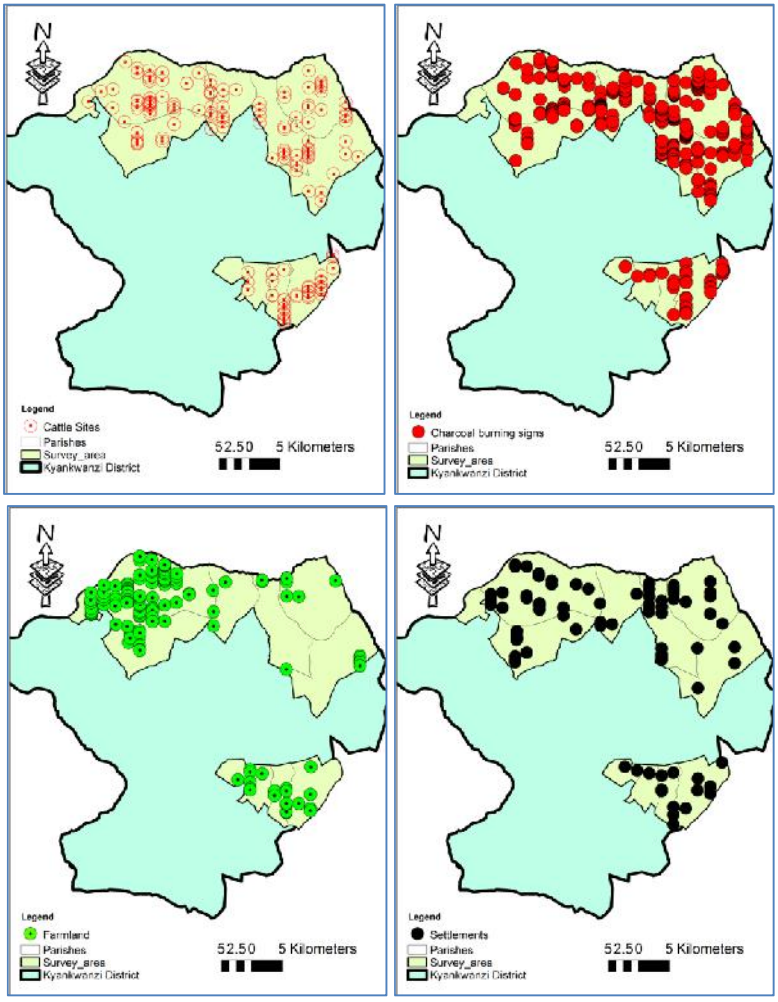

Figure 5: Maps showing distribution of human activities in the survey area

5.0. DISCUSSION

5.1. Population density

The following species i.e. the Bushbuck, Duiker, Reedbuck and Vervet monkey were recorded in order of reducing population numbers as analysed in DISTANCE.

5.1.1. Bushbuck (*Tragelaphus scriptus*)

Bushbucks can reach high densities in localized favorable habitats. In Nairobi National Park in Kenya,78 resident bushbuck individuals were identified within a 2.6 km^2 area of open forest giving a population density of 30/km^2 (East 1999). However, in the survey area, the bushbuck registered population density of 12.23/km^2. In the survey area, the density estimates were nearly half that recorded in Nairobi National Park. This probably is due to the observed human factors. Despite the factors, the bushbuck still manifested itself as the most common species. This could be because bushbucks have the ability to survive in human-dominated landscapes and to withstand heavy hunting pressure (East 1999). Bushbucks can successfully utilize habitats modified by human activities.

5.1.2. Blue Duiker (*Cephalophus monticola*)

Most population surveys report Blue Duiker densities from 5 to 35/km^2 across the species' range (Hart and Kingdon 2013). In the survey area, Blue Duiker population density estimates were recorded at 6.48/km^2. This is a low population could be because of the methodology but most likely, changes in the species habitat and poaching as observed that could have far reaching implications on population densities. Blue duikers were second to bushbucks in being common. Their survival in such disturbed areas could be because Blue Duikers tolerate and even thrive in a range of human-modified habitats, even in the vicinity of settlement, and often persist well in small habitat patches (Hart and Kingdon 2013).

5.1.3. Reedbuck (Bohor Reedbuck, Common Reedbuck)- *Redunca redunca*

The reedbucks registered a population density of 1.82/km^2. The highest concentration of reedbucks was in Kyankwanzi sub-county. Its numbers are in gradual decline over most of its remaining range, apart from some protected areas in East Africa. Some of these key populations are decreasing because of poaching, especially in West and Central Africa. They are surely on the verge of extinction in Akagera, their last known stronghold in Rwanda (Apio and Wronski 2011). About three-quarters of the estimated total occurs in protected areas (East 1999). There is reason to worry about the future conservation status of the reedbucks in this public land

5.1.4. Vervet monkey (*Chlorocebus pygerythrus*)

Vervet monkeys registered a population density of 3.19/km^2. Vervets are regarded as a pest species in cultivated areas in parts of its range.

5.2. Habitat Dynamics

From the results, it is evident that the pattern of land uses in the survey areas have increasingly changed. The critical components causing the changes as observed during the survey are the changing livelihood demands being driven by poverty and increasing population. The settlement patterns and the demand for more arable land have increased with increasing population. For example, the total population of Uganda was 34.6 million persons in 2014 representing an increase of 10.4 million persons from the 2002 census (UBOS 2016). For kyankwanzi, the population had an increase in thousands of 94.1 persons from 120.6 persons in 2002 to 214.7 persons in 2014(UBOS 2016). This is a relatively large population in a period of approximately 12 years. As this happens, several areas have become threatened by land use changes detrimental to wildlife.

Because of the changing livelihood demands due to changing populations and the need to reduce the poverty index as envisaged in the National Development Plan II, quite large areas were being converted to ranching schemes and farmland that necessitated the removal of forest/wood cover from the site and utilised as charcoal or firewood. Two scenarios, could have contributed to this problem. The first issue is related to the land owners who hire out land for a given period of years to desperate community individuals; the individuals then convert the forest/woodland into farmland before the land owner can reclaim it as a potential ranch. The second is that some individuals purposely get engaged in activities such as charcoal burning as alternative livelihood business and cut down all big sizeable trees they come across. It could be the dynamics of these two issues that have accelerated the land use conversion and loss of the current wildlife habitats in the surveyed/concession areas in kyankwanzi District.

Among the 24 districts that form the central region of Uganda, Kyankwanzi district ranks as the fifth (5th) in terms of firewood use as a source of energy for lighting (Annex I) This shows that the demand for firewood is high in the communities also. But also the extractive process for charcoal is devastating first; it compromises the greater part of the biodiversity cover loss and the release of carbondioxide to the atmosphere. The carbondioxide is a component of the green house gases and a major contributor to the global warming world over. The impact of global warming causes a change in the rain fall and temperature patterns leading to changes in

the climatic conditions observed today. Therefore, human activities in kyankwanzi are to a greater extent impacting on the survival of wildlife and could be influencing the species distribution patterns observed. The resulting decrease in the wild animal habitat area is forcing the remaining wild animal populations into small island areas. As observed the sub-counties of Nsambya, kyankwanzi and wattuba the concession areas were very actively impacted on by charcoal burning and ranching potentials. But as mentioned earlier, charcoal burning is probably linked to ranching regimes also. Because, where cattle presence was recorded there were corresponding charcoal burning signs be it old signs or current signs. This could imply that as the ranching schemes were being planned, big sizeable trees were harvested and converted in charcoal.

However, compared to Nsambya and Wattuba sub-counties, the recorded farmlands in kyankwanzi sub-county were minimal though charcoal burning observations were high. This is probably because at the time of the survey, most of the land conversions in kyankwanzi sub-county were still in early stages of bush clearing, tree harvesting and charcoal burning; as well, the few recorded farmlands were actively being planted with maize compared to Nsambya and wattuba sub-counties that had active farmlands.

Interaction with one of the ranch owners in kyankwanzi told us that they had been sensitized about wildlife and its benefits and that is why they have controlled the bush clearing and tree cutting on their ranches in kyankwanzi sub-county. This is a positive attribute from sensitization that has to be emulated on private land if wild animals outside protected areas are to continue surviving. Nevertheless, the sensitization must be followed by real livelihood benefits to the land owners and not simply idle talks.

6.0. CONCLUSION AND RECOMMENDATIONS

From the survey we can ably conclude that the animal population in the survey area is glaringly low and prone to the changing habitat and poaching conditions caused by human factors. These

negative factors are likely to cause further declines in the observed wild animal numbers and their distribution and could impact on the future of wildlife utilisation schemes.

Strategies to conserve

1. There is need to massively sensitise the communities about the livelihood benefits from wildlife utilisation schemes. The benefits need to be real other than idle talks. If this is achieved, it will go a long way towards conserving the wild animal species in this landscape. Without this package, the future of wildlife management on public land is doomed.
2. Strengthen the law enforcement in Kyankwanzi wildlife center to curb poaching activities.
3. The communities need to be educated about the dangers associated with invasive plants such as *Lantana camara* observed in the survey area and the possible eradication mechanisms to prevent further spread in the already vulnerable wild animal habitats.
4. If wildlife is to be seen as a land use, then considerations of both ecological viability and economic value require that wildlife areas be managed as large units. If land ownership units are small, or land is communally owned, then the economic returns from wildlife can only be maintained in the long run if groups of land owners agree to form a single wildlife management unit, or at the least, agree to restrict fences, buildings and cultivation(KWS 1991-1996).

Acknowledgement

We thank UWA for funding this activity. Great thanks go out to all the UWA field staff, Professor from Makerere University and the Kampala based Ecological Monitoring and Research Unit staff, who endured the long walks, and the harsh environment to make the activity a success.

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Annex I: Distribution of Households by source of Energy for lighting for the Districts in the Central region

Table A6: Distribution of Households by source of Energy for Lighting, Sex and District

District	Electricity	Gas	Paraffin-Lantern	Paraffin-Tadooba	Candles	Firewood	Other	Total
Central								
Buikwe	26,984	383	12,170	49,111	4,424	537	4,324	97,933
Bukomansimbi	5,194	100	4,015	22,539	537	259	1,691	34,335
Butambala	4,081	79	3,532	12,468	814	153	474	21,601
Buvuma	1,825	76	1,356	14,951	1,063	221	5,692	25,184
Gomba	4,656	162	2,990	24,041	772	305	2,359	35,285
Kalangala	2,751	41	2,939	9,172	1,299	103	3,795	20,100
Kalungu	8,166	203	5,233	25,672	795	274	1,094	41,437
Kampala	349,178	1,183	19,409	11,511	29,114	95	5,604	416,094
Kayunga	11,395	250	6,675	51,351	2,090	678	3,634	76,073
Kiboga	5,441	128	3,759	18,551	1,334	361	4,498	34,072
Kyankwanzi	5,192	223	3,946	28,168	2,897	726	6,619	47,771
Luwero	28,172	472	15,278	50,894	4,250	614	5,666	105,346
Lwengo	11,184	240	6,702	39,785	1,545	527	1,817	61,800
Lyantonde	4,300	100	3,058	10,565	833	275	1,508	20,639
Masaka	28,225	260	9,936	31,791	2,640	304	2,609	75,765
Mityana	18,414	396	8,071	45,878	2,600	589	4,139	80,087
Mpigi	13,314	388	9,140	31,103	2,398	590	3,588	60,521
Mubende	22,071	772	10,581	100,709	5,452	1,767	9,925	151,277
Mukono	47,918	852	21,597	59,521	6,290	959	7,495	144,632
Nakaseke	8,289	345	6,052	23,811	1,709	414	2,695	43,315
Nakasongola	5,747	215	5,057	15,096	2,052	349	7,862	36,378
Rakai	17,038	668	10,942	79,472	3,226	1,544	3,602	116,492
Ssembabule	7,878	337	6,567	33,631	1,400	766	4,606	55,185
Wakiso	309,133	4,055	63,304	70,528	33,040	1,994	20,035	502,089

Source UBOS 2016

Annex II: Survey Data sheet

Way point	Easting 36M	Northing UTM	Time	Animal species	Perp. Dist (m)	Group size	REMARKS/Habitat

Annex III: Survey Coordinates for the Concession area

Name	Easting	Northing
1S	330440	140830
1E	330440	144830
2S	332440	146559
2E	332440	142559
3S	334440	135535
3E	334440	139535
4S	334440	141535
4E	334440	145535
5S	336440	150826
5E	336440	146826
6S	336440	146030
6E	336440	142030
7S	336440	140030
7E	336440	136030
8S	336440	134511
8E	336440	130511
9S	338440	134385
9E	338440	138385
10S	338440	140385
10E	338440	144385
11S	338440	146385
11E	338440	150385
12S	340440	133806
12E	340440	137806
13S	340440	139806
13E	340440	143806
14S	340440	145806
14E	340440	149806
15S	342440	149678
15E	342440	145678
16S	342440	143678
16E	342440	139678
17S	342440	137678
17E	342440	133678
18S	344440	138715
18E	344440	142715
19S	344440	144715
19E	344440	148715
20S	346440	147305
20E	346440	143305
21S	346440	141305
21E	346440	137305
22S	348440	139647
22E	348440	143647
23S	348440	145094
23E	348440	149094

Name	Easting	Northing
24S	350440	146564
24E	350440	142564
25S	350440	142299
25E	350440	138299
26S	352440	147665
26E	352440	143665
27S	352440	141665
27E	352440	137665
28S	354440	113263
28E	354440	117263
29S	354440	142820
29E	354440	146820
30S	356440	115547
30E	356440	111547
31S	356440	147216
31E	356440	143216
32S	358440	115793
32E	358440	111793
33S	358440	147034
33E	358440	143034
34S	358440	142996
34E	358440	138996
35S	360440	110937
35E	360440	114937
36S	360440	133339
36E	360440	137339
37S	360440	139339
37E	360440	143339
38S	362440	106218
38E	362440	110218
39S	362440	110854
39E	362440	114854
40S	362440	131711
40E	362440	135711
41S	362440	137711
41E	362440	141711
42S	362440	143597
42E	362440	147597
43S	364440	107901
43E	364440	111901
44S	364440	112885
44E	364440	116885
45S	364440	130484
45E	364440	134484
46S	364440	136484
46E	364440	140484

Name	Easting	Northing
47S	364440	142484
47E	364440	146484
48S	366440	117498
48E	366440	113498
49S	366440	112126
49E	366440	108126
50S	366440	148377
50E	366440	144377
51S	366440	142377
51E	366440	138377
52S	366440	136377
52E	366440	132377
53S	366440	130377
53E	366440	126377
54S	368440	110678
54E	368440	114678
55S	368440	125541
55E	368440	129541
56S	368440	131541
56E	368440	135541
57S	368440	137541
57E	368440	141541
58S	368440	143541
58E	368440	147541
59S	370440	117391
59E	370440	113391
60S	370440	146910
60E	370440	142910
61S	370440	140910
61E	370440	136910
62S	370440	134910
62E	370440	130910
63S	372440	143011
63E	372440	139011
64S	372440	137011
64E	372440	133011
65S	374440	132431
65E	374440	136431
66S	374440	136781
66E	374440	140781

Annex IV: Training session prior to the survey

Annex V: Field challenges during the survey