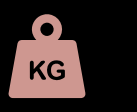
SITATUNGA

Tragelaphus spekei

DID YOU KNOW?

Only the males possess horns; which are spiral in shape, have one or two twists and are 45–92 cm long



3.1.9 Sitatunga Antelope

The Sitatunga (Tragelaphus spekei) is a specialized semi-aquatic antelope adapted to living in swampy or permanently marshy wetlands in African tropics. Sitatungas occur in tall and dense vegetation of perennial and seasonal swamps, marshy clearings within forests, riverine thickets, and mangrove swamps. This medium sized antelope is highly adapted to spending the greater part of its life in papyrus swamps.

The most physical adaptation to their marshy environment is the long, splayed hooves, which enable the animal to stand and walk on mud and floating islands of vegetation without sinking. The shaggy, water-resistant coat varies in colour among populations, but is generally greyish-brown in males and rufous-brown in females and juveniles.

The species is listed in CITES Appendix III and classified as Least Concern in the IUCN Red List (IUCN 2017). This is attributed to species poaching and loss of habitat. The species copes well with high hunting pressure in much of its range, but is most threatened by drying out of its aquatic habitat caused by changes in hydrology.

Sitatunga has specialized habitat requirements, hence their distribution range in Kenyan wetlands is patchy and discontinuous. Most of their habitats are situated outside protected areas and are facing immense anthropogenic pressure and impacting negatively on the survival of the species. The situation is compounded by limited national comprehensive studies on the species.

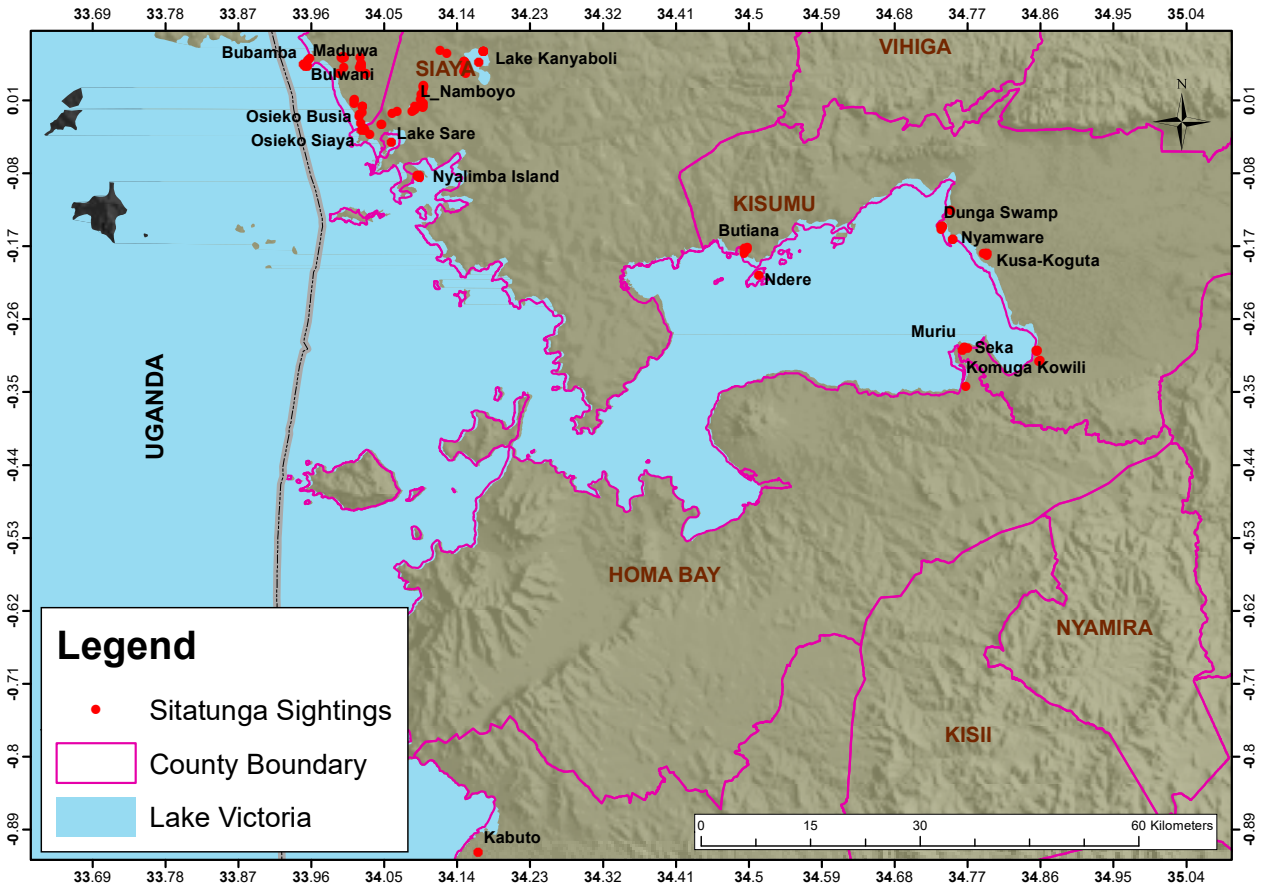


Figure 11: Distribution of Sitatunga's in Western conservation Area

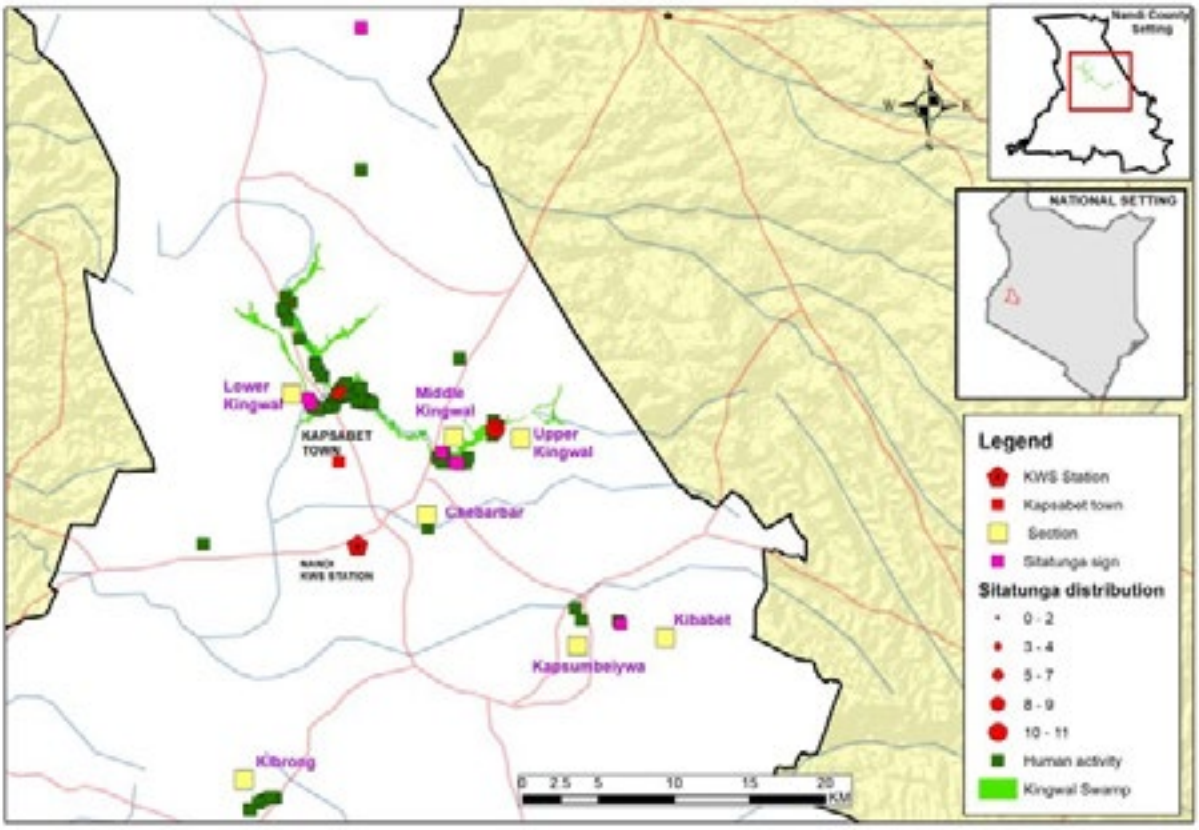


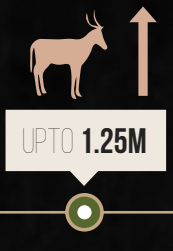
Figure 12: distribution of Sitatungas in Central rift conservation area

HIROLA

Beatragus hunteri

DID YOU KNOW?

Both sexes have **ringed horns which hatch backwards,** in females this can reach 61 to 102 cm while in males they are 81 to 165 cm long.



3.1.10 Hirola Antelope

i. Introduction

The hirola's natural range – which pre-historically probably extended all the way from the Cape to the Horn of Africa (Bunderson, 1985) – has contracted over the millennia to the point where the species now occurs largely in Garissa County Kenya (Ali et al. 2017). Currently, Beatragus (uniquely represented by the hirola) exists only in the Ijara and Fafi sub-counties of Garissa County, between the Tana River and the Kenya–Somalia border. An area no more than 1,500 km^2 and another small translocated (ex situ) population established within Kenya's Tsavo East National Park in 1963 (Hofmann, 1996; Andanje & Ottichilo, 1999; East, 1999; Butynski, 1999; Andanje, 2000a, b).

The current population estimates of hirola are from the National Wildlife Census 2021 data, The Northern Rangelands Trust (NRT) Ishagbin hirola status report 2020 and Hirola Conservation Program (HCP) hirola monitoring data 2020. The Ishaqbini community conservancy scouts using the Wildlife-CoMMS monitoring system collected data from The NRT. Similarly, HCP has a network of community scouts who collect hirola-monitoring data at the community areas. The National Wildlife Census 2021 employed the Total Aerial Counts methodology to collect data on the Hirola.

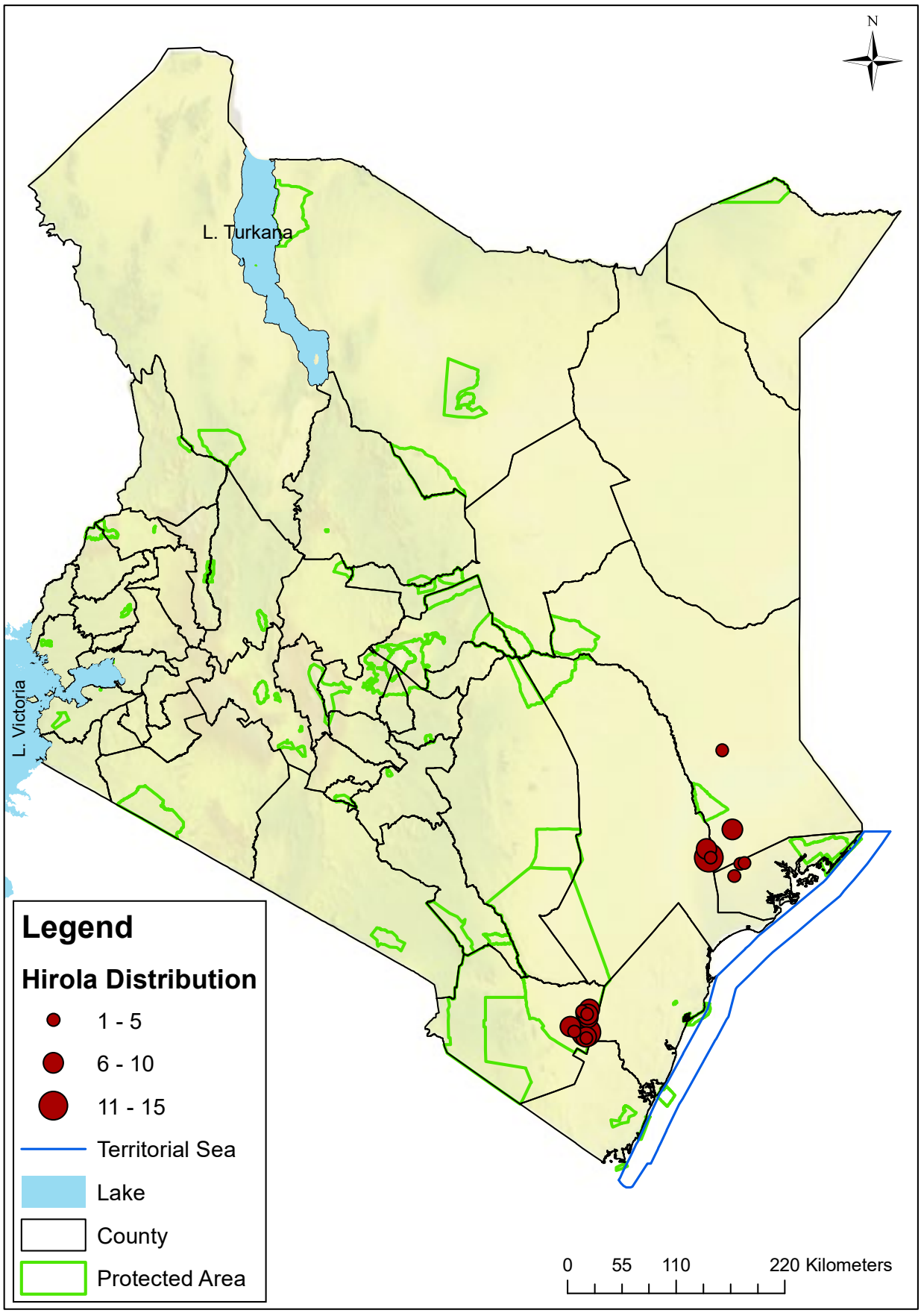


Figure 13: Map showing the distribution of hirola in Kenya

AFRICAN LION

Panthera leo

2,589

DID YOU KNOW?

That lions are **the most sociable large cat**, living in prides of between 3 and 30 individuals.

UPTO 1.2M

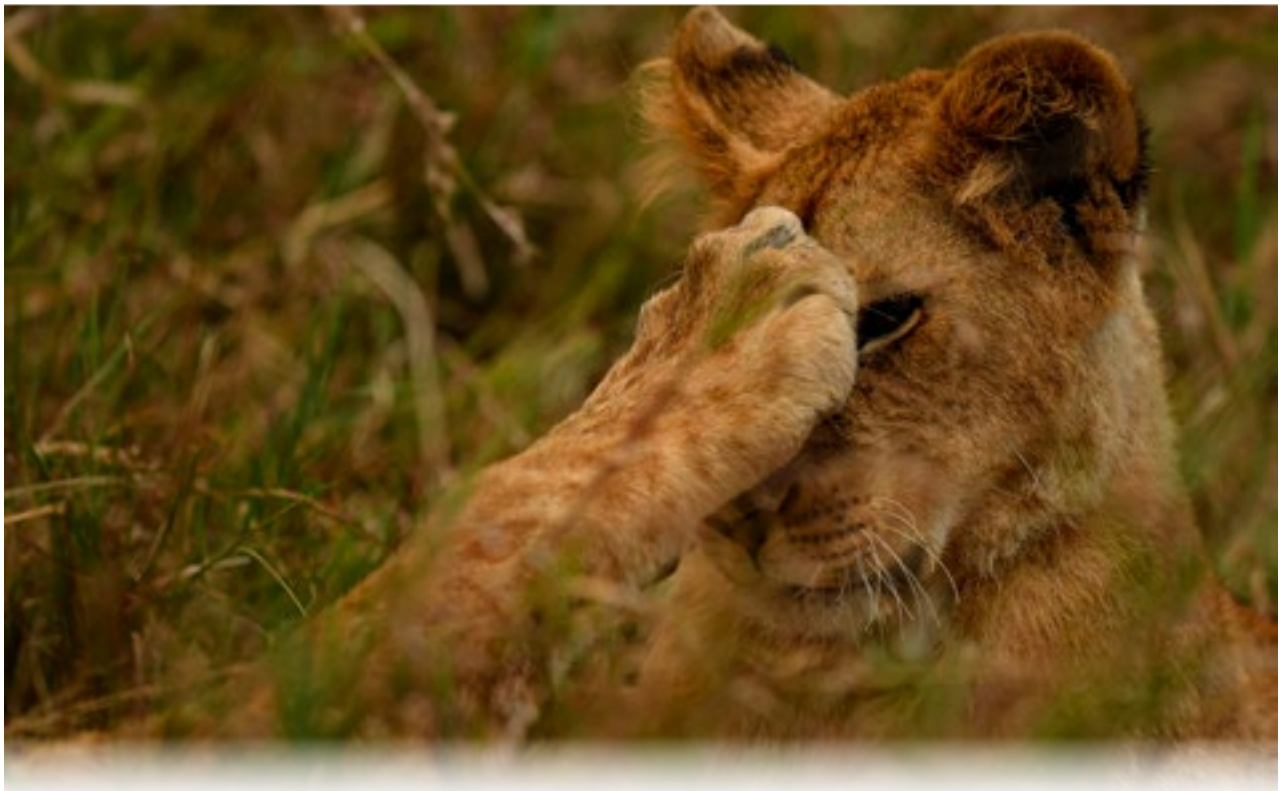
KG
UPTO 189KG

IUCN RED LIST
EN

(Source: https://drewsproule.com/)

3.1.11 The African Lion

i. Introduction



The lion population in Africa has been on the decline in the last 100 year with the lion population in Africa declining by 96.5 percent. According to IUCN red list, in 1900, the lion population in Africa was about one million and by the 1940s, the numbers had dropped to 500,000. In 1975, the continent had 200,000 lions, but in 1990 there were just 100,000. By, the year 2000, the population had declined drastically to only 35,000. Today there are about 20,000 lions with the number continuing to drop. The African lion is CITES listed and ranked as 'Vulnerable' by the IUCN Red List (Bauer, Nowell, and Packer, 2008). Population of lions in Kenya has been on a downward trajectory with current estimate being just over 2,000 individuals.

Kenya is currently implementing the 2nd edition of the National Recovery and Action Plan for the Lion and Spotted Hyena in Kenya (2020-2030) whose vision is to sustain viable populations of lions and spotted Hyenas in healthy ecosystems as a world heritage valued by the people of Kenya while its goal is to restore and maintain viable populations of lions, spotted Hyenas and their wild prey while minimizing conflict and maximizing value to local communities.

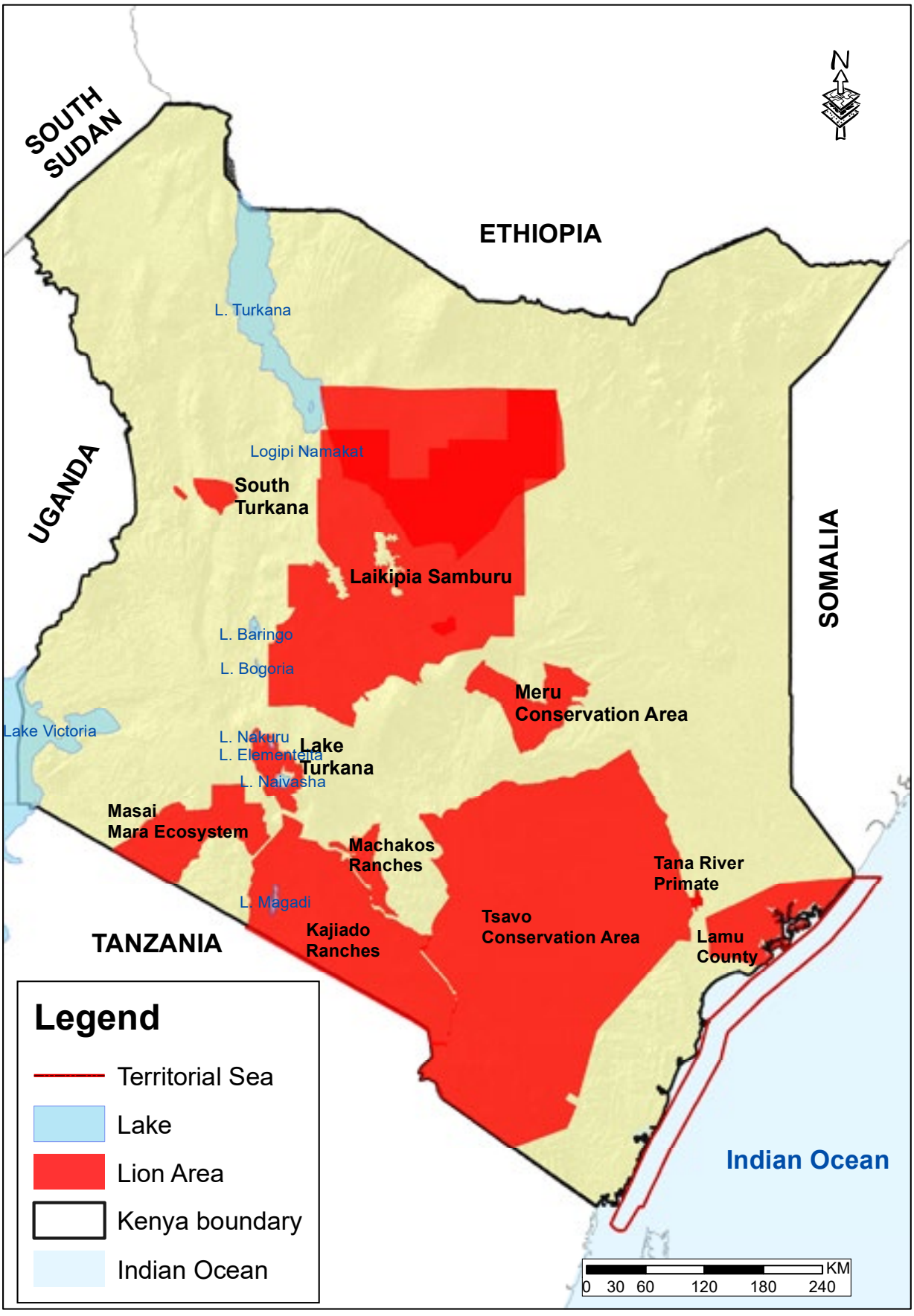


Figure 14: Map of lion range in Kenya

SPOTTED HYENA

Hyaenidae

5,147

DID YOU KNOW?

The milk of a spotted hyena is very rich, and cubs can last for a few days between feeds, unlike wild dogs and lions.

UPTO 0.92M

UPTO 90KG

IUCN RED LIST

EN

3.1.12 Spotted Hyena

i. Introduction

Spotted Hyenas do better in many human-dominated landscapes than lions and can thrive where lion densities are lower. The IUCN redlist assessment estimates 27,000 to 47,000 spotted Hyena occur across sub-Saharan Africa. Hyenas suffer from many misconceptions, including associations with witchcraft in many parts of their range, which often make them feared or disliked by people. Largest known populations in Serengeti (Tanzania, Kenya) and Kruger National Park. Most stable populations in protected areas in southern Africa; also several populations in eastern Africa. Population declining in eastern, central and western Africa

They are listed by IUCN red list as of Least Concern (2014 assessment) (Bohm and Höner 2015) being widespread in Africa. Decline experienced outside protected areas is not sufficient to warrant listing in a threatened category with global population exceeding 10,000 mature individuals. Within Kenya, spotted hyenas are listed as vulnerable under WCMA, 2013, though scanty information exists on their range or population numbers. They are not CITES not listed.

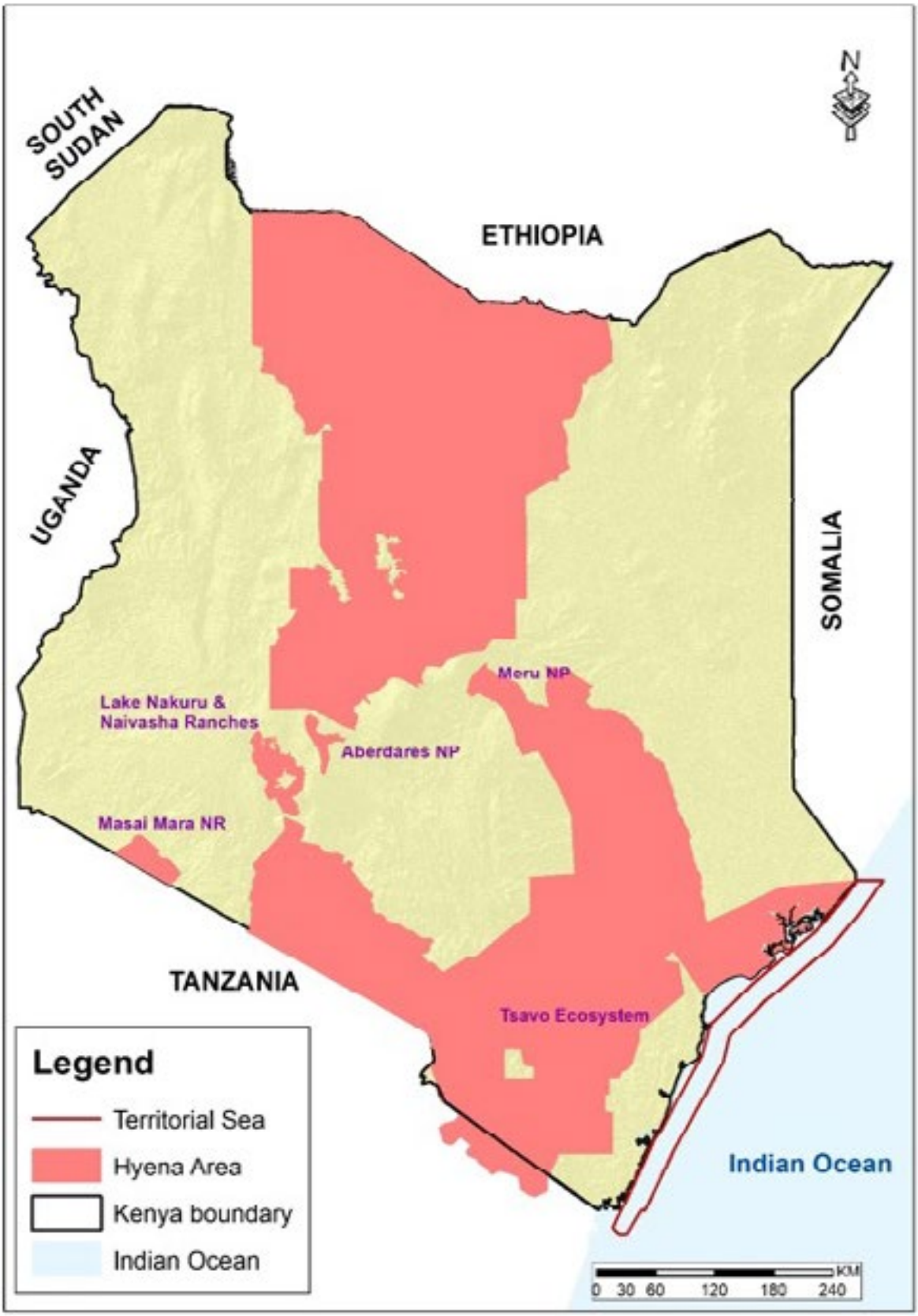


Figure 15: Map of Hyena range in Kenya

CHEETAH

Acinonyx jubatus

1,160

UPTO 0.9M

KG
UPTO 72KG

IUCN RED LIST
EN

DID YOU KNOW?

Cheetahs must hunt to feed on small to medium sized animals like hares, impalas, wildebeest calves, and gazelles and can attain a full speed of 130 km/ hr and **they don't scavenge.**

3.1.13 Cheetah

i. Introduction

Global population size has been 'guesstimated' at 14,000 (Myers, 1975) and 'less than 15,000' (Marker, 2002). The species is listed as vulnerable according to IUCN red list criteria (IUCN, 2006a). The most recent estimate by the International Union for Conservation of Nature puts the figure at 6,600 – mainly in eastern and southern Africa – amid fears that the fastest land mammal is racing to extinction. Cheetahs are now extinct in 20 countries and occupy only 17% of their historic range. The remaining populations that are of global importance are found in southern Africa Botswana, Namibia and South Africa and in East Africa Kenya and Tanzania. Scanty information is available about cheetahs in Kenya.

Important populations of cheetahs occur in Tsavo, Mara-Serengeti and Laikipia-Samburu ecosystems. However the species' status in other areas is not well understood. Although both cheetahs are economically important to Kenya's tourism industry, the majority of these animals reside outside the protected areas which are the focus of most tourism. Over 80% of cheetah geographic range, occur on community and private lands. Populations in the protected areas would not be viable if isolated from those outside the protected areas. As such, conservation activities outside protected areas is critical for the long-term survival of the species. Some cheetah populations are transboundary especially along Mara- Serengeti and Tsavo-Mkomazi conservation areas. Transboundary management is key to secure the future of the species in the long term

Figure 16: Map of known cheetah populations

WILD DOGS

Lycaon pictus

865

DID YOU KNOW?

Wild dogs have very strong social bonds, stronger than those of sympatric lions and hyenas thus live in permanent packs consisting of two to 27 adults.

(Source: https://drewsproule.com/)

UPTO 1.1M

KG

UPTO 36KG

IUCN RED LIST

EN

3.1.14 Wild dog

i. Introduction

African wild dogs are highly social members of the canid family. Packs cooperate to hunt their prey (Creel & Creel, 1995), which consists mainly of medium-sized ungulates. Packs also cooperate to breed, with usually only one female and one male being parents of the pups (Girman et al., 1997a), but all pack members contributing to pup care (Malcolm & Marten, 1982).

Unlike most carnivore species (other than cheetahs), wild dogs tend to avoid areas of high prey density (Mills & Gorman, 1997), apparently because larger carnivores prefer such areas (Creel & Creel, 1996). Lions and hyaenas are the main causes of death for adult and juvenile wild dogs (Woodroffe et al., 2007a). Probably because of this tendency to avoid larger predators, wild dogs live at low population densities and range widely. Population densities average around 2 adults and yearlings per 100km^2 (Fuller et al., 1992a) and home ranges average 600-800km^2 per pack in eastern Africa (Woodroffe & Ginsberg, 1998), with some packs ranging over areas in excess of 2,000km^2 (Fuller et al., 1992a). Wild dogs occupy home ranges larger than would be predicted on the basis of their energy needs.

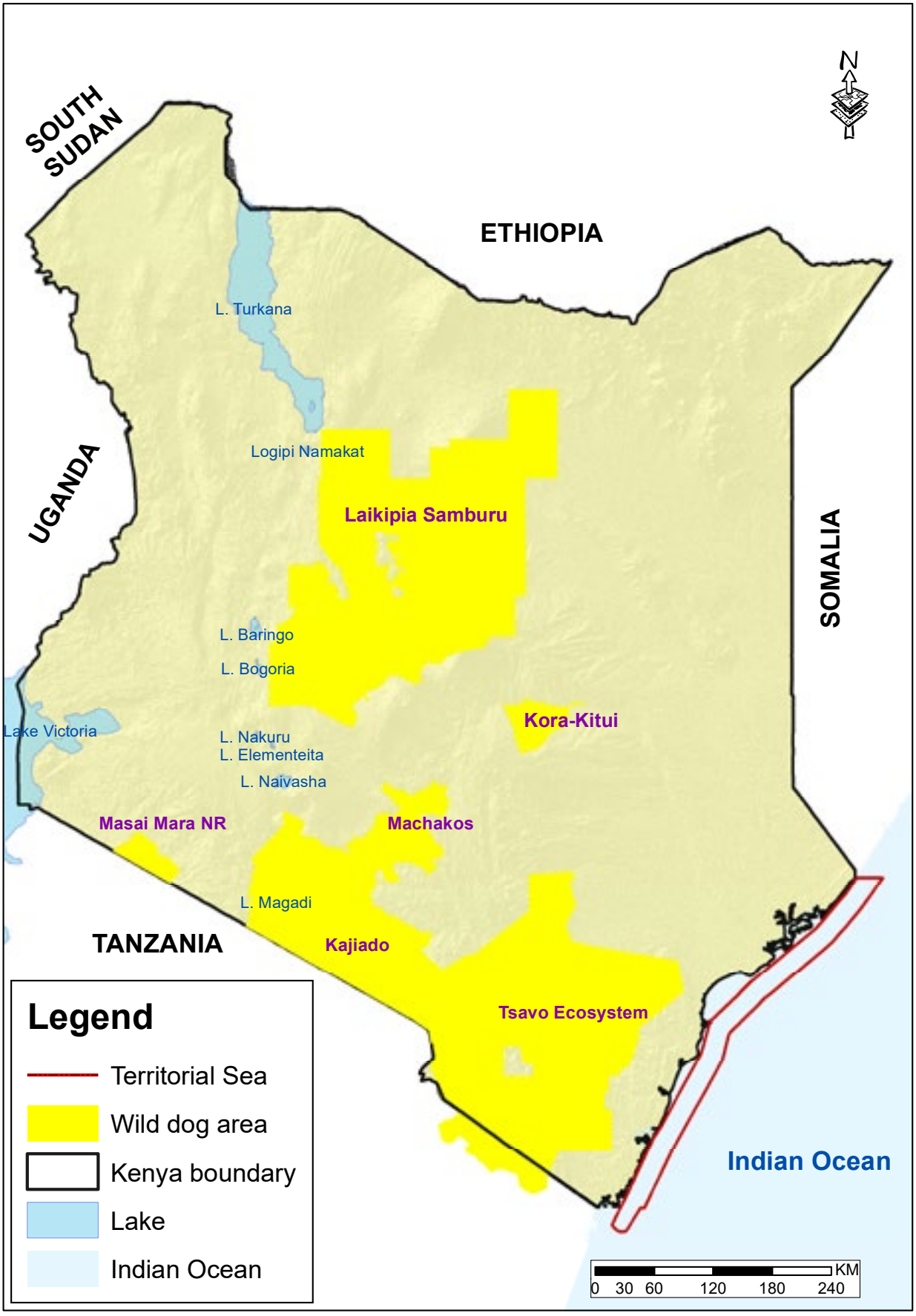


Figure 17: Map of wild dog range in Kenya

WATERFOWLS

(FLAMINGOES)

Phoenicopterus roseus

255,936

UPTO 1.5M

KG

UPTO 4KG

IUCN RED LIST

LC

DID YOU KNOW?

Flamingos pink colour is obtained from its diet. **Each flamingos' shade of pink varies by species,** with the Caribbean species a vivid pink and the Greater species a pale pink

3.1.15 Waterfowls

i. Introduction

Kenya has one of the most rich avian species diversity in the world with approximately 1,100 species recorded. Out of these, about 170 are Palearctic migrants, moving from Eastern Europe, Russia and Middle East to winter in Kenya, while about 60 are migrants within the African continent. Some 23 are forest dependent species, preferring pristine undisturbed forest habitats. Such species diversity and distribution can be attributed to a diverse habitat type resulting from topographical and climatic variation, resulting from high mountains, the scenic Rift Valley, flat arid and semi-arid landscapes to humid coastal ecosystems. The Kenya's Important Bird Area (IBA) programme has identified 67 important for bird conservation (Birdlife 2021; Figure 34). Most of these sites have also been identified as Key Biodiversity Areas (KBAs), because they are important for the conservation of other biodiversity besides birds.

To enhance our understanding and knowledge on bird distribution in Kenya, The Kenya Bird Map (KBM), a citizen science tool based on reporting of bird sightings across the country has helped map out distribution of birds using bird watchers, including both the local citizen birders and visiting foreign birders at different sites in the country. This method has shed light on bird occurrence and distribution in Kenya from 2013 to date. However it may not bring population status, especially rare birds. The IBA monitoring programme is carried out by individuals, institutions, Site Support groups at IBA sites helps to better understand the conservation status of species and their habitats. However, Bi-annual water bird census has been a key tool in understanding population trends and conservation status of water birds by looking at species and their numbers over the past 30 years. Such information has helped in designating such sites as IBAs by Birdlife International, Wetlands of international importance (RAMSAR site) as well as UNESCO World Heritage Sites. Information from the biannual waterbird population estimates is used to prepare monitoring reports for the internationally recognised sites. For example, besides being IBAs, Lake Bogoria, Nakuru, and Elementaita are World Heritage Sites using the data, reports and publications from the annual water bird census.

Water birds are key indicators of wetland ecosystem health. They show fast response to changes in wetland habitat quality. Wetlands provide both feeding and breeding sites for both congregating and solitary water birds. Kenya has a rich and diverse wetland habitat ranging from saline lakes within water lakes within the Rift Valley, to fresh water lakes within Lake Victoria forming the larger area. The marine ecosystems along the coastal shore line provide important flyways for migratory birds. The annual water bird census takes place in more than 150 countries around the world, with the sole purpose of monitoring water bird species and population for sound conservation and sustainable management of wetlands. The counts have been on for more than 50 years under the umbrella of the International Water bird Census (IWC) Water bird census in Kenya dates back 30 years of continuous data collection. The counts have taken place on Rift Valley lakes (Lake Bogoria, Lake Nakuru, Lake Naivasha, Olobolosat and Lake Bogoria), the north coastal marine wetlands and constructed wetlands in both Nairobi and central Kenya in Limuru and Thika. This report covers the avian fauna that is found in Kenya Rift Valley lakes of Magadi, Naivasha, Olbollosat, Elmentaita, Nakuru and Bogoria. The water bodies are divided into Freshwater (Lake Naivasha, Nairobi Park, Manguo Swamp,

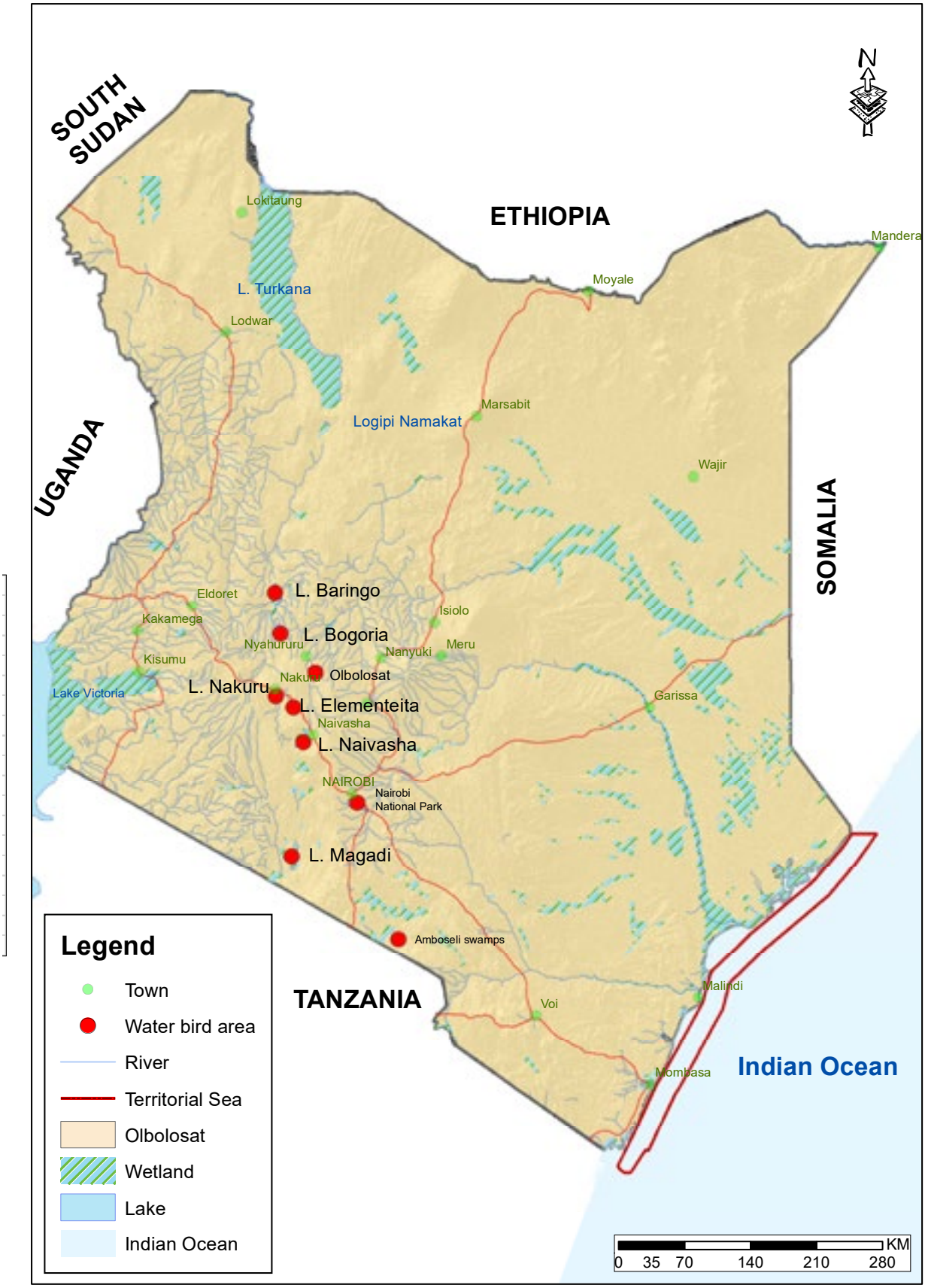


Figure 18: Important Bird Area sites in Kenya (Source: IBA 2019)

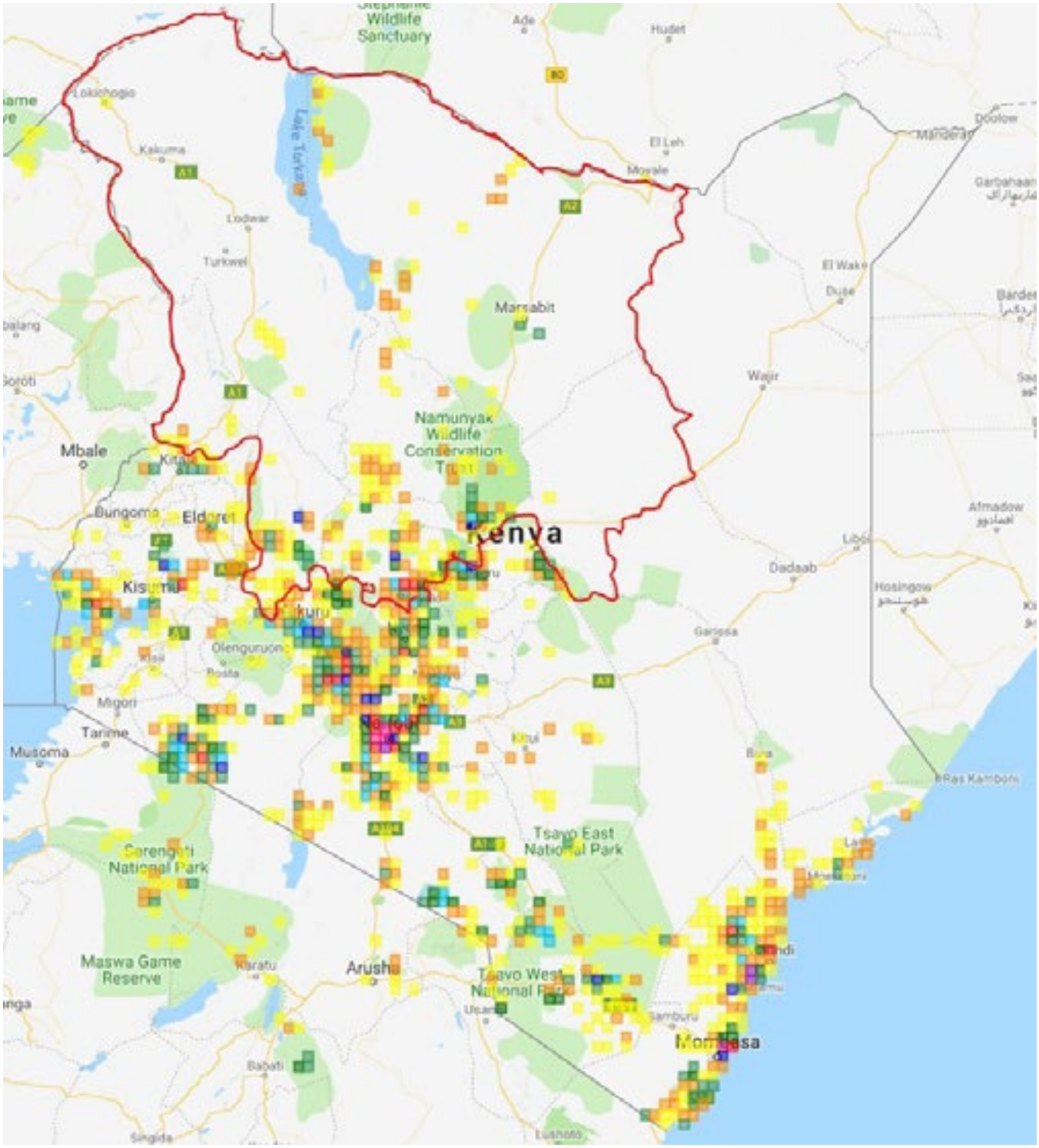


Figure 19: A map showing the distribution of birds' sightings in Kenya using citizen science (Source: Kenya Bird Map, July 2021)

3.2 | RESULTS BY ECOSYSTEMS

3.2.1 Tsavo Ecosystem

17,964 Common zebra	14,964 Elephant	8,051 Buffalo	4,314 Giraffe
4,635 Eland	3,997 Oryx	2,660 Impala	2,604 Hartebeest
2,172 Grants gazelle	823 Wildebeest	698 Lesser kudu	688 Warthog
516 Hippo	510 Ostrich	376 Gerenuk	203 Waterbuck
74 Hirola	55 Grevy's zebra	47 Crocodile	

In this section we provide results of the Tsavo ecosystem during the 2021 total aerial census. The ecosystem covers an area of approximately 49,611 km^2. It is the largest continuously savannah range in Kenya representing approximately 38% of the known elephant range in the country. The ecosystem occupies parts of Taita Taveta County, Kilifi County, Kwale County, Makueni County and Kitui County. It borders Kitui County to the north, Tana River County to the east, Kilifi County to the south east, Kwale County to the South, Kajiado County to the west and Makueni County to the northwest. It also borders Tanzania's' Mkomazi National Park to the South East forming a key trans-boundary conservation area in Africa (Figure 40).

Previous censuss in the ecosystem indicate it host more than one third of the national elephant population (Chase et al., 2016; Ngene, et al., 2017). The ecosystem therefore significantly contributes to the continental range of the African elephant (Thouless et al., 2016). Updates of wildlife populations in the ecosystem have been done over the years using total aerial census (Thouless et al., 2016).

Total aerial census have been implemented in the Tsavo ecosystem since 1962. While not always regularly implemented, the censuses provides a sound long term trend of elephant and other wildlife populations, which has been used for their conservation and management (Ngene et al., 2017). It is important to also mention that the number of wildlife species counted during the censuses have been changing, where in some cases only two (elephant and buffalo), three species (elephant, buffalo and giraffe) and all species larger that did dik have been counted (Omondi et al., 2002; Kyale et al., 2014; Ngene et al., 2017). The higher number of species counted has been possible because of rigorous training including the use of voice recorders and taking of aerial photos. During the census, data quality was ensured by having a compulsory training of observation, recording and transect test flight for the flight crew. This year's census is the 19th such census in the ecosystem. A good description of the history of the Tsavo aerial census, the methods used over time and the summarized results are outlined by Kyale et al. (2014), Ngene et al., (2013) and Ngene et al., (2017).

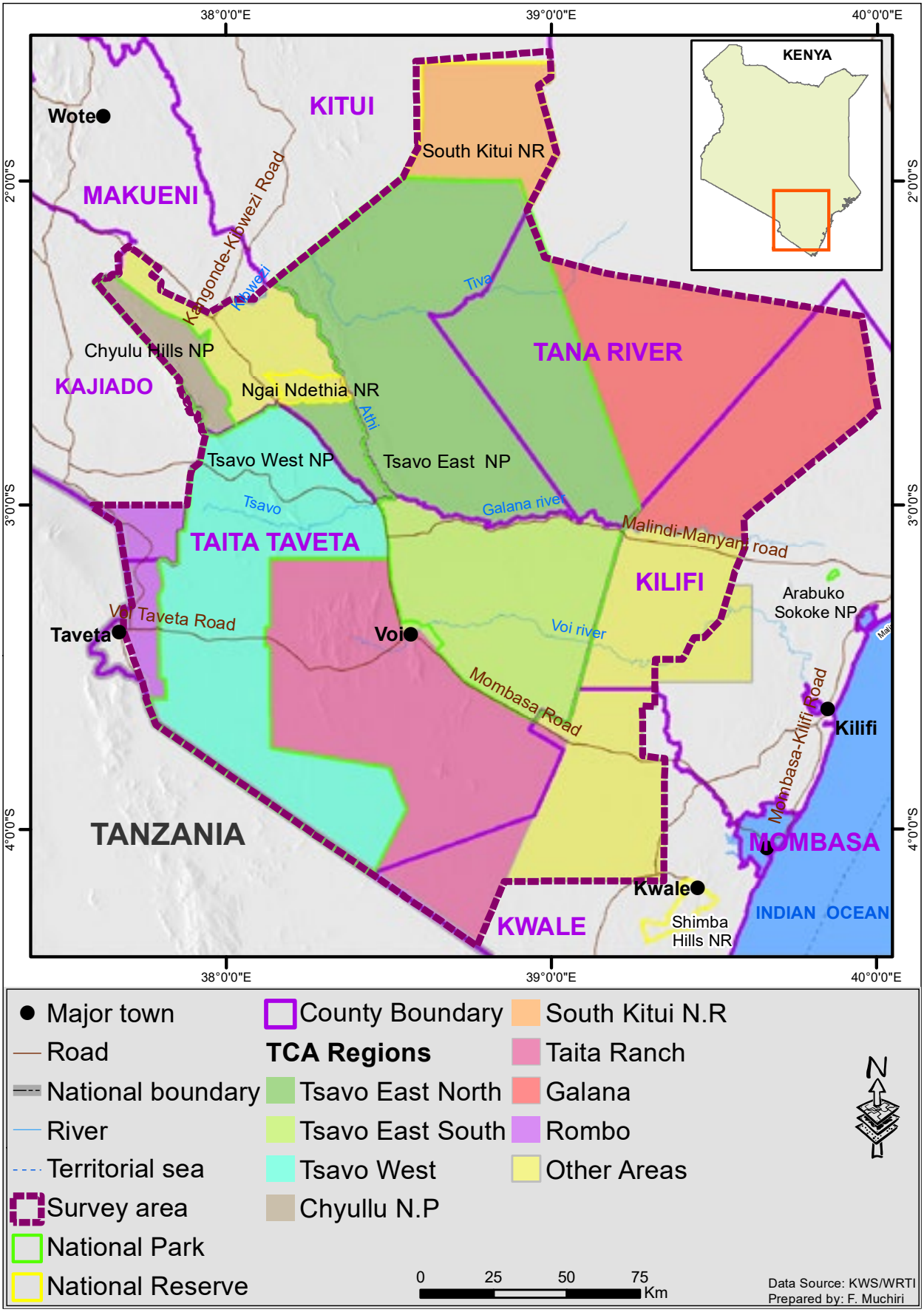


Figure 20: A map showing the aerial census area during the Tsavo Ecosystem census, June 2021

3.2.2 Laikipia-Samburu-Marsabit-Meru Ecosystem

24,507 Zebra common	10,022 Grant's gazelle	8,999 Buffalo	7,475 Elephant
4,777 Impala	4,531 Giraffe	2,561 Grevy's Zebra	2,414 Oryx
2,085 Baboon	1,862 Thomson's gazelle	1,543 Eland	842 Gerenuk
693 Warthog	486 Rhino	373 Waterbuck	272 Dik dik
202 Hippo	147 Hartebeest	85 Lesser kudu	11 Klipspringer
2 Duiker			

Kenya Wildlife Service undertakes wildlife censuses in various ecosystems across the country every 3 to 5 years. The focus for such routine censuses have been within traditional wildlife hotspot areas with various methodologies being employed depending on the target taxa. Aerial counts have been conducted in Kenya since 1960's to count large mammals across selected ecosystems using standard methods (Douglas-Hamilton, 1996, Kangwana, 1996). The Laikipia-Samburu-Marsabit-Meru Ecosystem is home to second largest population of elephants in Kenya (Omondi et. al., 2002). The ecosystem generally referred to as Laikipia-Samburu extends far north to Marsabit and South East as far as Meru national park.

Unlike other ecosystems in Kenya, the Laikipia-Samburu ecosystem comprises of predominantly non-formally protected land units; with the community and private land ownership accounting for 97% of the elephant range, making it a human dominated landscape (Ihwagi et al., 2015). In these landscapes dominated by humans, the home range of elephants comprises distinct home ranges connected by migratory corridors though areas (Douglas-Hamilton et al., 2005, Ngene et al., 2010). Loss of habitat through infrastructural developments and change of land use is the most significant threats to elephants in the long term (Nellemann et al., 2013). The increasing human foot print i.e., settlement of nomadic pastoral communities along known historical elephant routes is a major concern. Efforts involving the government, communities and private researchers are under way towards a joint spatial planning that would secure the elephant connectivity. Elephant are the umbrella species and protecting its connectivity routes caters for the needs of other species of top concern in the Laikipia-Samburu ecosystem (Didier et al., 2009). The Laikipia – Samburu population is subject to a long-term GPS (Douglas-Hamilton, 1971, Thouless and Dyer, 1992, Douglas-Hamilton, 1998, Douglas-Hamilton et al., 2005). Despite the increasing human settlement, elephants are still able to roam freely within Marsabit, Isiolo, Laikipia, Meru and Samburu Counties (Thouless, 1998, Didier et al., 2009, Ngene et al., 2010). However, due to increased human presence often perceived as a risk by elephants, their movement behavior has been shown to shift to moving more at night than during the day when they move into high risk areas (Ihwagi et al., 2018).

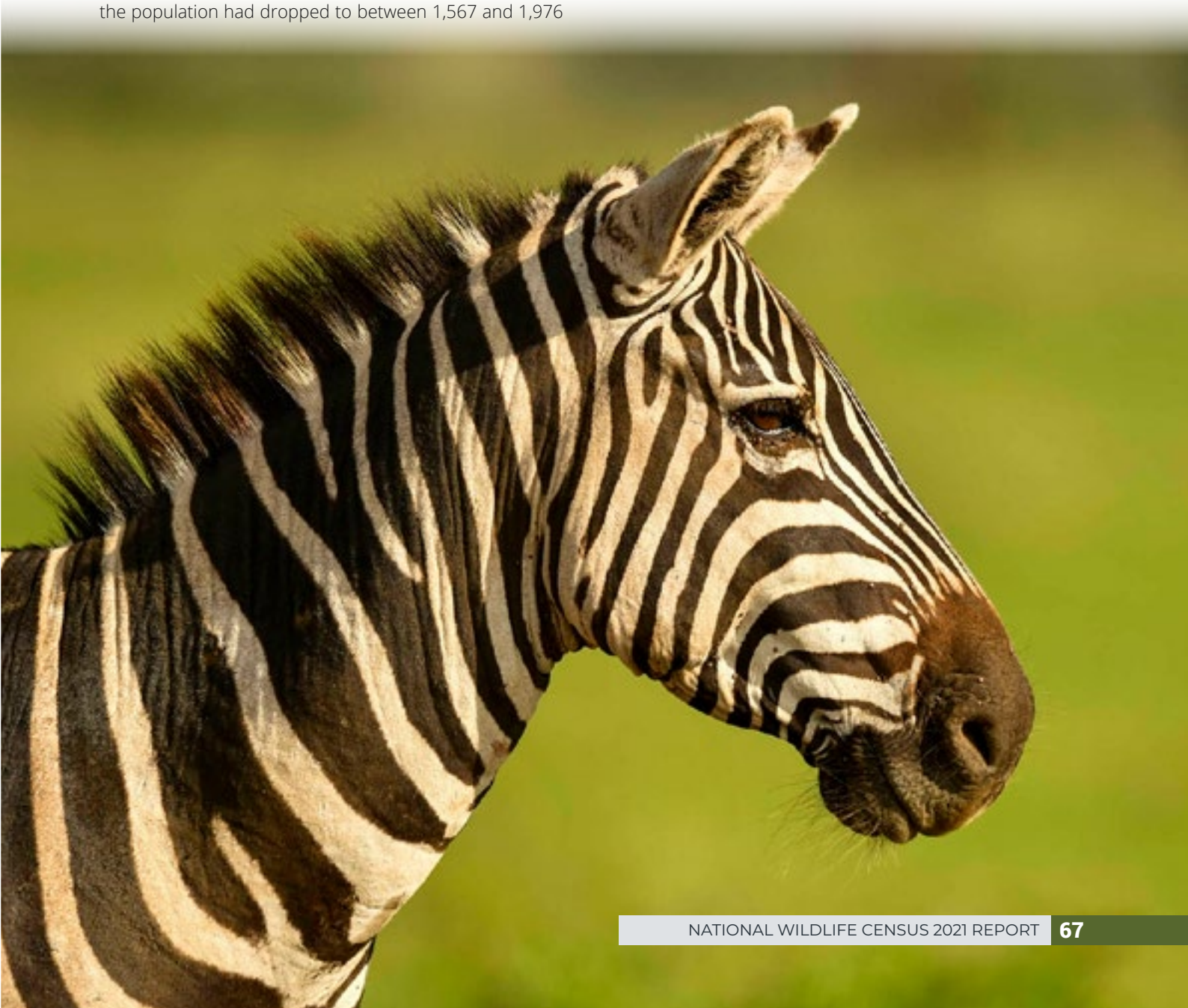
The population of elephants in the ecosystem is routinely monitored through periodic total aerial counts (Omondi et al., 2002, Litoroh et al., 2010, Ngene et al., 2013, Ngene et al., 2017). The total aerial elephant censuss in Kenya are undertaken every three-four year subject to availability of resources, and the past total counts were conducted in 2002, 2008, 2012, and 2017. The area of coverage in 2008 was 46,391km^2, 2012 was 55,000km^2 and in 2017 it was extended to cover Meru and Marsabit areas; a total 65,516 km^2. In addition to these counts covering the entire landscape, a partial-coverage total count focusing on community areas was conducted in 2005 by African Wildlife Foundation. The June 2021 census was conducted as part of the national wildlife census.

Land tenure in Laikipia-Samburu ecosystem is predominantly privately and communal, with only a few land units under formal protection as forest and national reserves (Ihwagi et al., 2015). Land ownership has a significant effect on the potential use of an area for wildlife conservation (Newmark and Hough, 2000, Fitzsimons and Wescott, 2007, Petrzelka and Marquart-Pyatt, 2011), while land use also typically influences the distribution and

abundance of herbivores (Blom et al., 2005, Georgiadis et al., 2007, Ogutu et al., 2009, Ogutu et al., 2014). In turn, animal distribution and abundance can determine the location and intensity of illegal hunting activities (Waltert et al., 2009, Maingi et al., 2012). Land under an official conservation status is traditionally associated with higher protection and abundance of wildlife and is recognized as critical for the conservation of species (Hedges et al., 2005, Pia et al., 2013). In the Laikipia Samburu ecosystem, the Samburu, Buffalo Springs National Reserves and the private sanctuaries in Laikipia on account of their higher projection status host the majority of wildlife population (Ihwagi et al., 2015).

The Laikipia-Samburu ecosystem is home to 93% of global population of Grevy's zebra (Equus grevyi), a population that had experienced 85% decline over the last between 1990 and 2017 years (Nelson, 2003; Rowen & Ginsberg, 1992). The last comprehensive census of Grevy's zebra in Kenya was undertaken in the year 2000 (Nelson & Williams 2003), resulting in an estimated national population of about 2,571. In 2004, information contributed by various Grevy's zebra conservation stakeholders suggested that the population had dropped to between 1,567 and 1,976 (Williams & Low 2004). A second stakeholder workshop in 2007 suggested that the number of Grevy's zebra in Kenya was between 1,838 and 2,319 (Mwasi & Mwangi, 2007). However, both the 2004 and 2007 estimates were guesses based on summing tallies over different Grevy's zebra populations. The census conducted in June 2001 incorporated the results from the innovative Gravy Zebra Rally; citizen science entailing taking pictures of all encountered animals and processing the photos through a custom photo recognition database (Rubenstein, pers comms).

The census is designed to sustain the long term aerial monitoring of large mammals while at the same time enrich the species status database. The specific objectives for the aerial census were to: Determine the present status of population of elephants, Determine changes in the elephant population and their distribution since the last aerial census of 2017, Determine population abundance, distribution and trends of other large wildlife within the landscape, Map out various activities in order to assess current pressures on wildlife conservation and provide baseline wildlife data for the country.



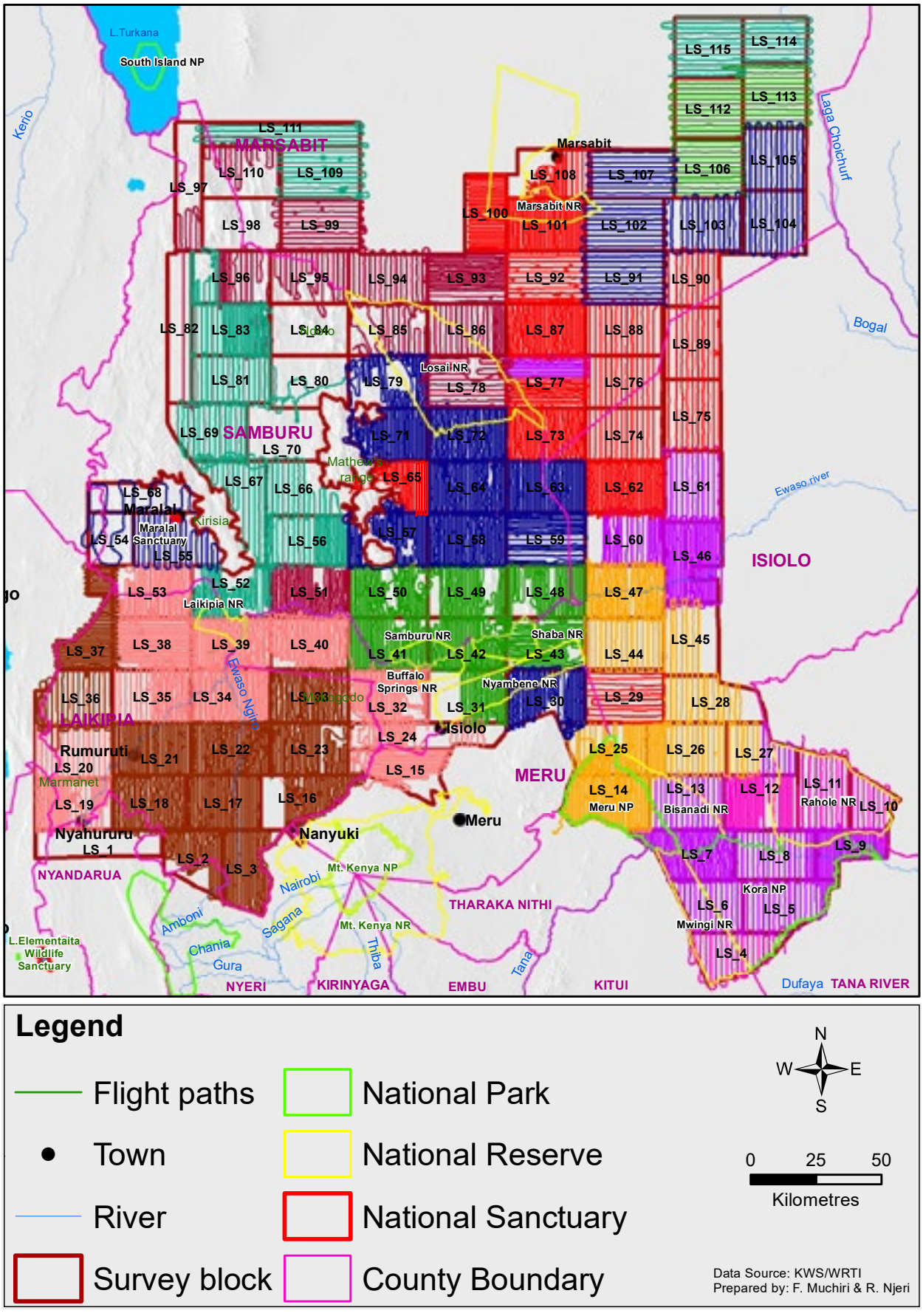


Figure 21: LSMM Ecosystem aerial census census blocks, June 2021

3.2.3 Maasai Mara National Reserve (MMNR)- Ecosystem

37,281 Wildebeest	32,358 Zebra Common	11,604 Buffalo
10,610 Impala	8,278 Thomson's gazelle	6,923 Topi
3,893 Grant's gazelle	2,595 Elephant	2,109 Giraffe
1,280 Eland	764 Hartebeet	574 Warthog
534 Hippo	215 Ostrich	162 Baboon
161 Water buck	30 Lesser Kudu	

The 2021 aerial total count of elephant and other large wildlife including the buffalo, giraffe amongst others within the Maasai Mara Ecosystem (MME) was conducted between 6th and 10th May 2021. This report therefore gives a status update of the large mammals populations in relation to human activities within the Kenyan side of the MME. The last status report was produced in 2017, and it documented an estimate of 2,493 elephants, 9,466 buffaloes and 2,607 giraffes in the Mara ecosystem (Mwiu et al., 2017).

The Mara ecosystem being part of the 30,953Km^2 greater Serengeti - Mara ecosystem is one of Kenya's rich wildlife resource areas and an important agricultural production area. The ecosystem is a major tourism destination due to the diverse wildlife which includes the great wildebeest migration and charismatic wildlife. The wild animals in the Mara ecosystem utilize the PA as well as the surrounding conservancies and dispersal areas (Otichillo et al., 2000).

The ecosystem falls under Narok County which borders Kisii, Nyamira, and Bomet counties to the west, Nakuru County to the north and Kajiado County to the east. The study area borders Serengeti National Park (SNP) in the Republic of Tanzania to the south, Nyakweri forest to the western region, community owned land coupled with cultivation to the north and loita forest to the eastern regions. The census area is comprised of one PA (Maasai Mara National Reserve (MMNR), community conservancies such as Naboisho, Mara north, Oloisukut, Lemek, Pardamat, Olkinyei, Olarro, Olare orok, Mara Siana, Olderkersi, Enoonkishu and Motorogi which lie in the former community group ranches, and Olchoro oiruwa private conservancy among other adjacent community owned land and group ranches . These conservation areas outside the PA include several community and private conservancies demarcated from the former larger group ranches and current existing group ranches that are at various intermediate and advanced stages of land sub-division and human habitation. A detailed review of the historic perspective of aerial census in the ecosystem and a description of the study area is provided by Mwiu et al. (2017).

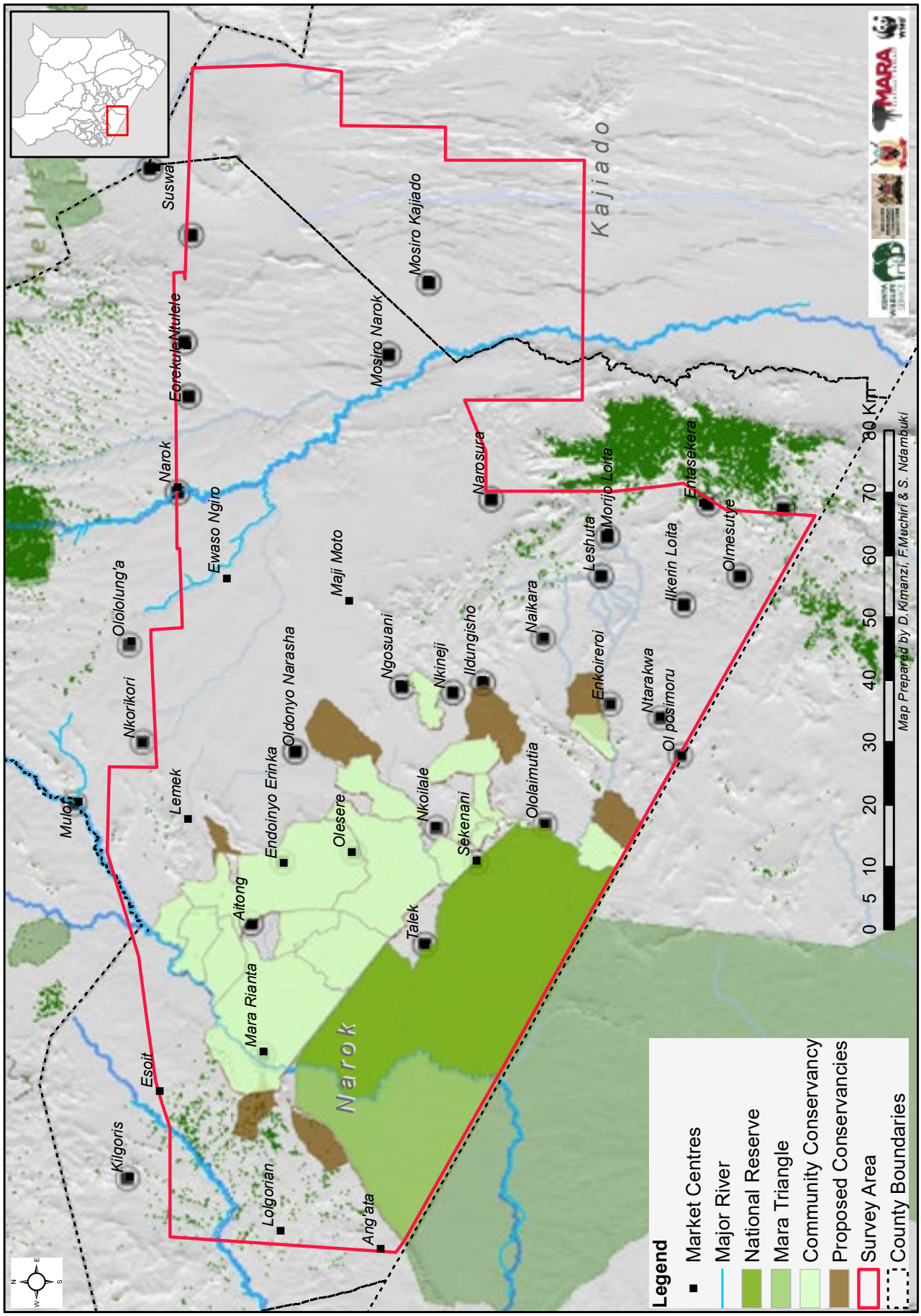
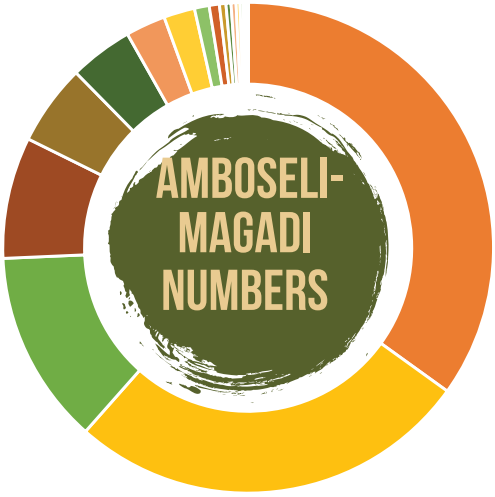


Figure 22: Map showing the location of Maasai Mara ecosystem

#COUNTTOCONSERVE

3.2.4 Amboseli-Magadi Ecosystem



28046 Common Zebra	21357 Grants gazelle	10257 Wildebeest	6425 Giraffe
4274 Eland	3358 Impala	2108 Thomson gazelle	1641 Elephant
781 Ostrich	537 Buffalo	344 Lesser kudu	266 Gerenuk
263 Coke's Hartebeest	207 Oryx	165 Warthog	97 Hippo
63 Grey-crowned Crane	32 Waterbuck	15 Dik dik	12 Kori bustar
11 Lion	10 Vervet monkey	8 Reedbuck	6 Secretary b
2 Bushbuck	1 Duiker	1 Hyena	1 Leopard

The Amboseli-Magadi aerial census area falls in the Kenyan portion of the larger Amboseli-West Kilimanajaro-Magadi-Natron (AWKMAN) Cross-border Ecosystem that covers parts of Southern Kenya and Northern Tanzania. The Amboseli-Magadi aerial census area is located between latitudes 35058' and 3806' south and longitude 1024' and 301' east covering an area of 14,143Km^2. The study area falls in Kajiado County, which borders, Makueni and Taita Taveta Counties to the East, Narok County to the West, Tanzania to the South and Athi-Kapiti plains to the North. The census area was divided into three sub-regions namely, the Amboseli National Park (ANP) which is the protected core zone, the areas adjoining the park that serve as dispersal areas hereby referred to as the Amboseli dispersal area and Magadi region.

Regular monitoring of wildlife populations is an important activity in conservation of biodiversity. Adaptive management and conservation of landscapes require regular censuss of wildlife abundance, their distributions, and their relation to human activities (Lindenmayer & Likens, 2009). Aerial censuses are efficient and rapid means of acquiring data from large areas of conservation interest and have been extensively used in generating vital information for monitoring wildlife populations. These censuses are aimed at deepening the understanding of spatial and temporal variations in distribution and abundance of wildlife populations as well as some selected human activities in the ecosystem.

From the year 2010, Kenya Wildlife Service (KWS) and Tanzania Wildlife Research Institute (TAWIRI) in partnership with other institutions initiated a collaborative partnership of conducting integrated or synchronized aerial censuses in the Amboseli-Kilimanjaro-Magadi–Natron cross-border landscape. Under this arrangement, regular wet season (March to May) and dry season (September to October) censuses are conducted with a frequency of every three years (KWS & TAWIRI 2010; Kenana et al. 2010; Kenana et al. 2013) using similar methods. Five censuses have so far been done under this arrangement, constituting two dry and three wet count datasets. To bridge the methodology differences that existed between the two countries, a common methodology has been adopted.

The Kenya Government through KWS and Wildlife Research and Training Institute (WRTI) initiated a National wildlife census in the month of April 2021. This census was therefore done on the Kenyan side of the greater cross border ecosystem which comprised of Amboseli and Magadi census regions covering an approximate area of 14,143 km^2 (Figure 99)

Ecologically Amboseli-Magadi ecosystem is linked to a cross-border ecosystem in the Tanzania side as described in KWS & TAWIRI (2010). Wildlife population in the ecosystem has been well studied over the past 40 years (Western 1973; Western & Van Praet, 1973; Lindsay 1994; Kikoti, 2009). Most of these studies have, however, focused on smaller portions of the linked ecosystems, mainly confined within national administrative boundaries in Kenya and Tanzania. Consequently, the wider picture of the cross border ecosystem of Amboseli-West Kilimanjaro and Magadi – Natron in terms of wildlife population monitoring had not been adequately investigated until the year 2010. With increasing knowledge of animal movements within the ecosystem and observations of fluctuating animal numbers within the various constituent areas, it is necessary therefore to consistently carry out the broader census in both wet and dry seasons every

three years in order to study the changes within the whole area as a unit. Furthermore, adaptive management and conservation of natural ecosystems require effective monitoring of biodiversity, including regular censuss of wildlife abundance and distributions (Lindenmayer & Likens, 2009).

The overall goal for the census was to collect comprehensive wet season data on various wildlife species and human activities within the Amboseli- Magadi Ecosystem (AME). The specific objectives of the census were to:

a. Determine wildlife population's abundance and distribution in the Amboseli –Magadi ecosystem

b. Determine wildlife population trends in the ecosystem over time

c. Determine the extent and spread of human activities in the ecosystem

d. Identify threats to wildlife conservation in the ecosystem

e. Suggest strategies for effective wildlife management across the ecosystem

f. Provide baseline wildlife data for the National Wildlife census

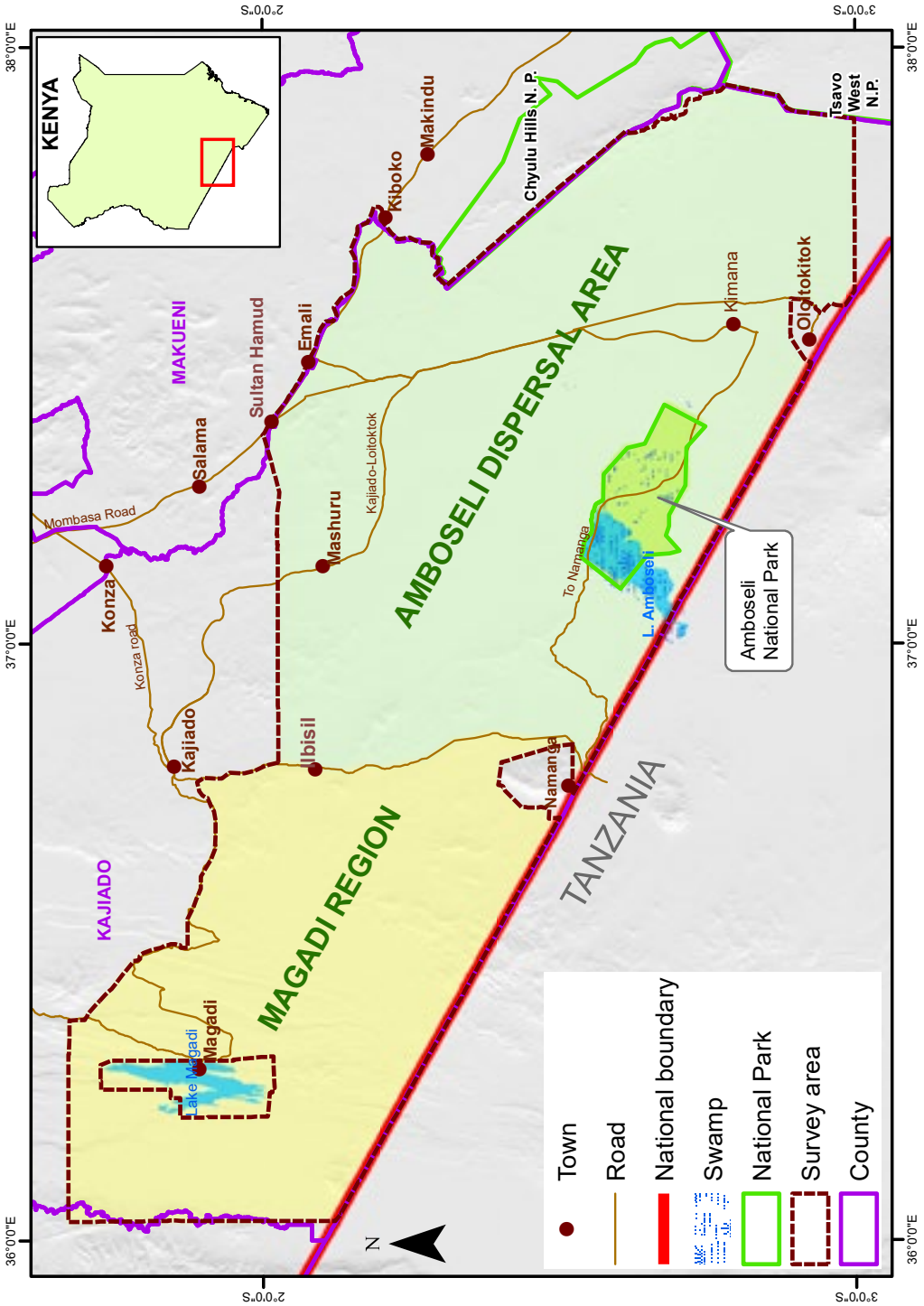


Figure 23: A map of the Amboseli-Magadi Ecosystem

3.2.5 Athi-Kapiti Ecosystem

11355 Zebra common
8415 Wildebeest
5440 Thomson gazelle
4700 Grants gazelle
2764 Hartebeest
1054 Eland
891 Impala
635 Ostrich
535 Giraffe
39 Lesser kudu
38 Grey-crowned Crane
30 Buffalo
13 Baboon
12 Gerenuk
10 Hippo
1 Klip springer

The Athi-Kapiti ecosystem (AKE) borders Nairobi National Park to the north and constitutes the larger Kitengela-Athi-Kaputiei ecosystem which is bound by Nairobi city in the north, the Kajiado ranches & farms to the west and the Machakos highlands in the north-east and east. It consists of large group ranches, wildlife conservancies, privately-owned ranches and GoK-owned ranches. The ecosystem covers a total of 6510km^2 and borders Amboseli-Magadi census blocks to the south and Mara census blocks to the northwest.

Even though ground censuses have been conducted in AKE in the past covering a small fraction of the ecosystem, the concept of aerial censuss only took traction as late as last year (2020) where likewise, a small fraction of the ecosystem was covered. By their very nature, aerial censuss are fast, consistent, cost-effective and accurate thereby being the most appropriate method for generating the much needed information including wildlife threats and challenges within the NNP dispersal area.

The aerial census is important to the extent that spatial distribution of threats affecting wildlife conservation in the region would be established. These threats including anthropogenic impacts like human settlements, crop farming, bomas, livestock and quarry/mining among others that substantively affect graze and browse resources base for wildlife species residing in the area. The distribution and abundance maps of various species in relation to the land use patterns will guide establishment of potential wildlife dispersal and migratory routes.

This census was aimed at mapping out wildlife populations in relation to developments and infrastructure as the city of Nairobi and its suburbs expand in Machakos and Kajiado counties. The specific objectives of the census were:

a. To determine the number and distribution of large animals

b. To map out various land use types and human activities to assess current pressures on wildlife conservation

c. To document the number and distribution of livestock in relation to large mammals in the ecosystem

d. To establish spatial distribution of threats to wildlife due to anthropogenic activities

e. To interpret the information obtained and deduce sound management decisions to guide management of wildlife in the ecosystem

f. To Provide baseline wildlife data for the National Wildlife Census

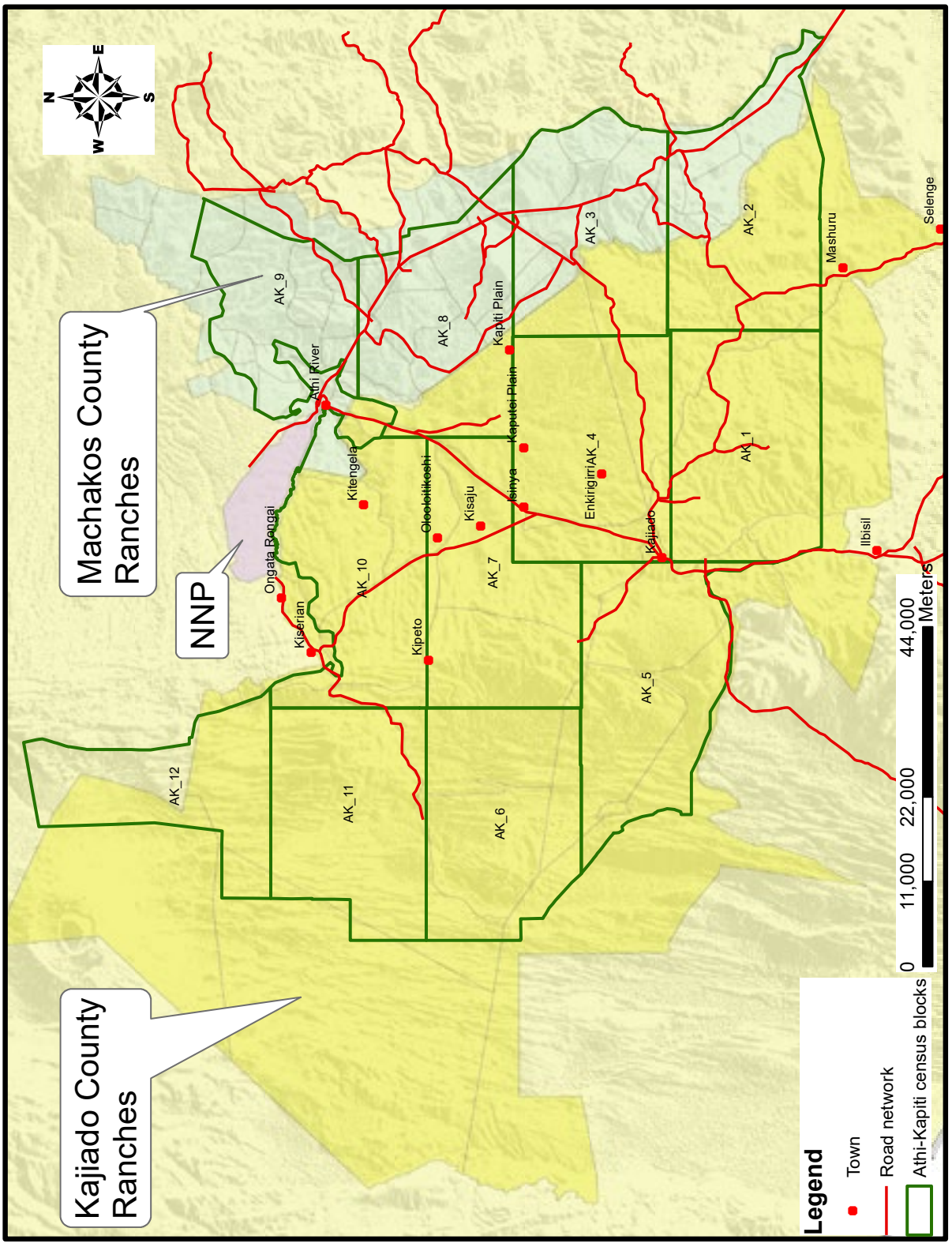
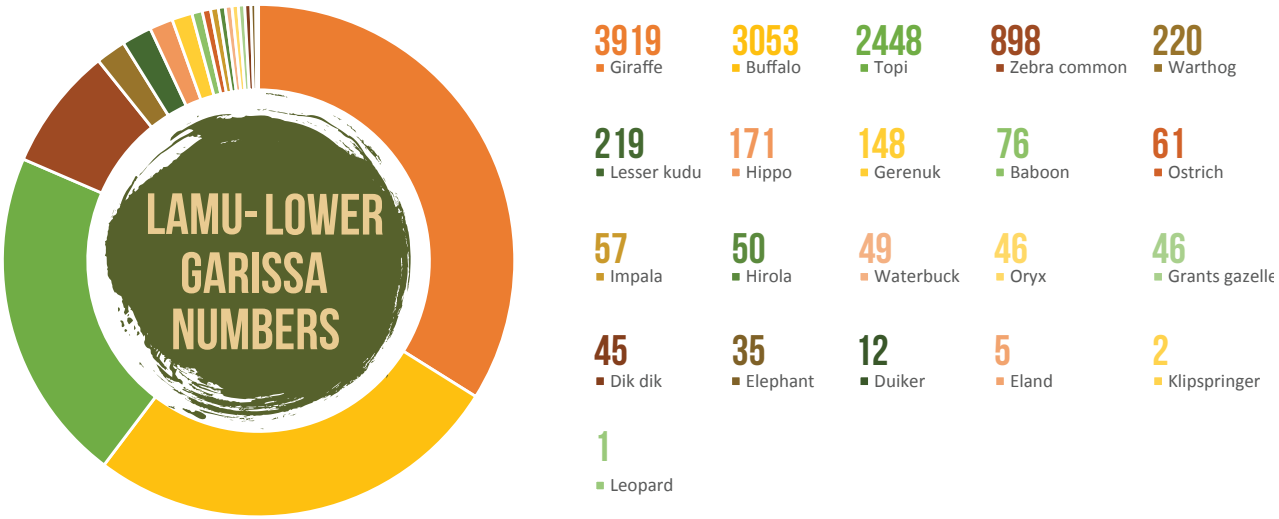


Figure 24: Athi-Kapiti Ecosystem covered during May, 2021 census

3.2.6 Lamu-Lower Garissa Ecosystem



Kenya is hosts a wide array biological resources, including wildlife inside of protected areas and outside living in private and community regions. Wildlife is an important revenue generator through tourism and employment for this country and therefore frequent monitoring to establish its status, population and trends provides important information for managers. Furthermore, wildlife resources are faced with many and mounting challenges including mushrooming human and livestock population, climate change that reduces rainfall and alters food resources available, infrastructural developments and human settlements all of which lead to increased fragmentation and habitat destruction. Therefore regulat monitoring of wildlife is important.

The most recent census was undertaken in the area in 2015 and 26 mammalian species were counted. The Cape buffalo (Syncerus caffer) was the most abundant at 13,754 individuals, followed by the topi (Damaliscus korrigum) at 9,686 and reticulated giraffes at 3,254 individuals. The common zebra, warthogs, and common waterbuck were amongst other species counted in this region. The persistence of wildlife in this region is primarily due to the pastoral nature of the communities that leaves wide swaths of land open for grazing. While such practices have proved to be pro conservation, changing lifestyles has led to sedentary settlements of once pastoral communities threatening wildlife conservation. This year's aerial total count was part of the National Wildlife Census (NWS) that sought to enumerate wildlife numbers in all key ecosystems in Kenya to ascertain their status and distribution against the changes in the ecosystems due to human factors.

This is the second aerial total count to be undertaken in the Lamu-Lower Garissa ecosystem after first aerial census in 2015. Like other ecosystems in Kenya, the ecosystem hosts a high diversity of wildlife including the buffaloes, topis, giraffes, the critically endangered hirola. Also, it is an important elephant range and past censuss have reported elephant sightings. Wildlife in this region is faced with multiple challenges including insecurity that predispose wildlife to poaching, bush meat, and human-wildlife conflicts. This year's census region included the almost the entire Lamu County and the lower regions of both Garissa and Tana River Counties totaling 23,377km^2. The team constituted of six aircrafts (2 - cessnas, 1-supercab, and 3-huskys) and lasted eight days. Due to strong winds prevailing in the region, 2km transects were only undertaken during the morning part of the days.

The objectives of the census was to:

- Document the abundance and distribution of all large mammals including elephants, buffaloes, giraffes, etc
- Understand the trend in wildlife numbers in the region,
- Map human activities including fences, logging, settlements, farming, and charcoal burning,
- Provide baseline wildlife data for the National Wildlife census
- Document the distribution and numbers of livestock (e.g. cattle, goats and sheep) and,
- Interpret the information obtained to guide management of elephants and other

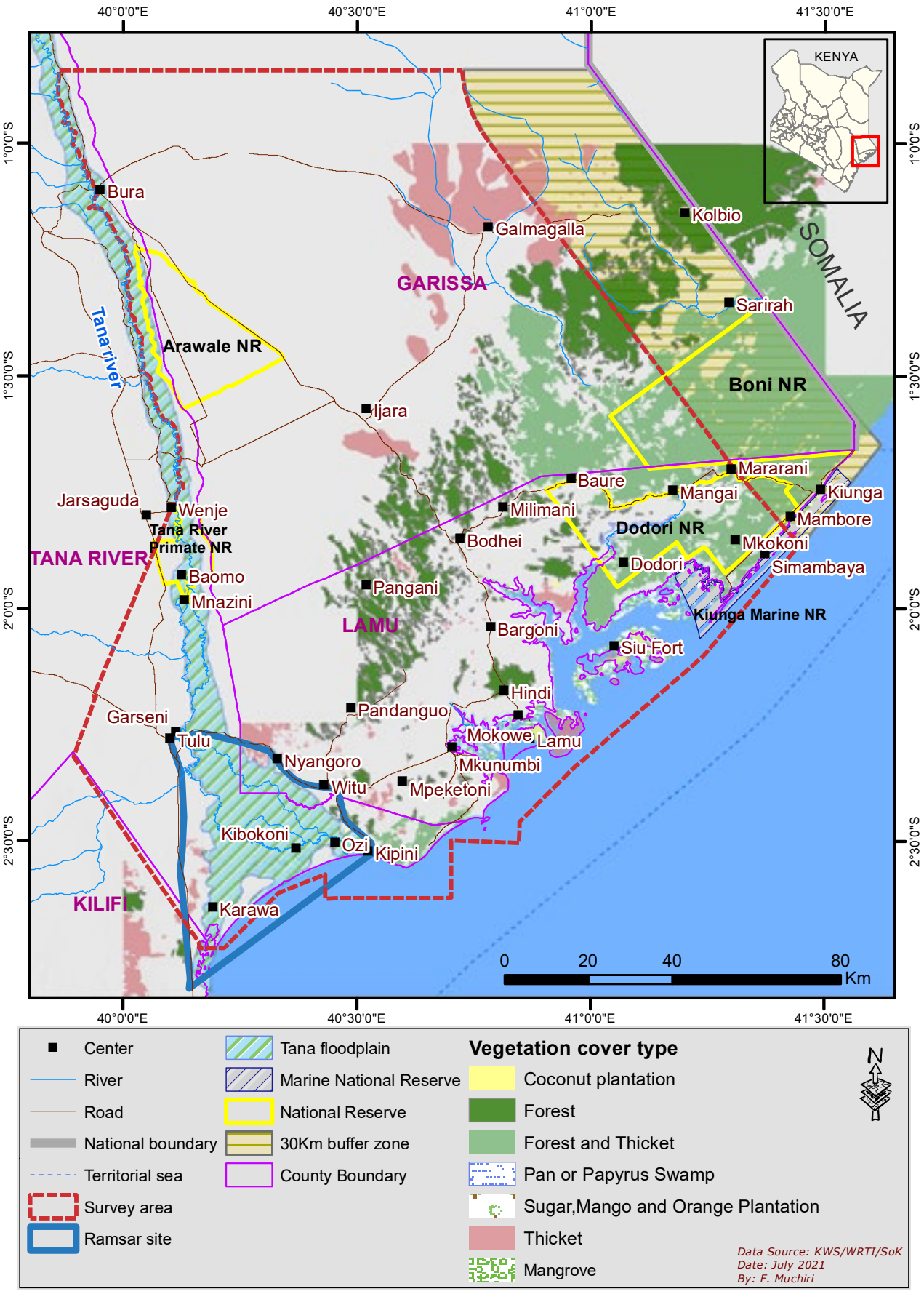
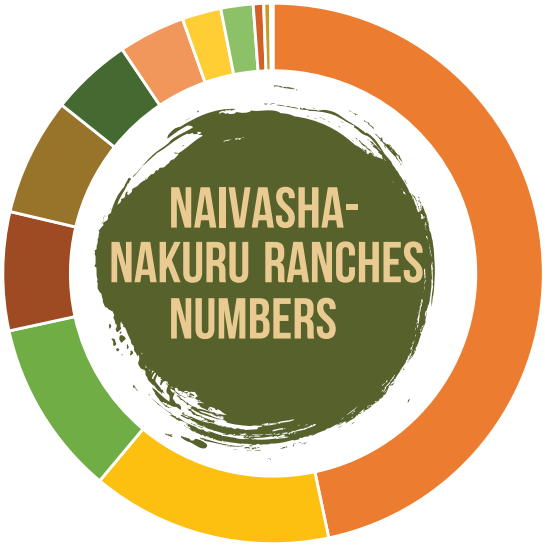


Figure 25: Map showing the Lamu-Lower Garissa ecosystem

3.2.7 Naivasha-Nakuru Ranches



4,886 Common Zebra	1,506 Buffalo	1,099 Impala
742 Wildebeest	736 Grants gazelle	508 Eland
418 Thomson gazelle	244 Hartebeest	202 Giraffe
65 Waterbuck	43 Warthog	10 Ostrich
5 Hippo	5 Grevy's Zebra	

The Nakuru-Naivasha Ranches is located in Central Rift valley region and falls within two counties: Nakuru and Kajiado. More than 90% of the conservancies/ ranches are found in Nakuru County. The census area is comprised of two Protected areas namely Hell's Gate and Mt. Longonot National Parks. The conservancies in Nakuru County included Eburu forest, Soysambu, Kigio, Malu, Marula Farm, Aberdare Golf Club, Morendat Farm, Karlo lower and upper farms, Kikopey area, Eburu forest, Green Park, Great Rift Vally lodge, Colour Crops, Loldia farm, Muhu Farm, Bilashaka Farm, Rocco farm, Ol-Suswa, Wileli, Korongo farm, Aquilla, Mundui Farm, Oserengoni Conservancy, Hippo point, Crater Lake, Kongoni Game Valley, Olerai, Kedong, Lendolia, Crescent Island, KWSTI, Annex, Game Farm, Sanctuary Farm, Karai area, Lakes Naivasha and Elementaita conservancies including their adjacent riparian areas and flower farms. Among the conservancies covered, only Mt. Suswa Conservancy falls in Kajiado County The study area lies between longitude 360 06' 32" E and 360 36'33" E and latitude 000 22' 47" S and 010 06' 26" S (Figure 138).

The Nakuru-Naivasha ecosystem is rich in wildlife resources. The ecosystem is a major tourism destination due to the diverse wildlife, geo-morphological features, floriculture, geology and other recreational activities. This calls for close and regular monitoring of the wildlife status and distsribution. Aerial censuses have not been very common in the area. Alternatively, the area has employed ground animal census since 1999 although hippo census using boats have also been carried out in the area. Most of these ground wildlife censuses have been carried out twice in a year taking into consideration the dry (August-October) and wet seasons (April-July). Bi-annual (January and July) waterfowl counts in the area have also been carried out in the area although these have been extended to cover all the Rift Valley Lakes.

Aerial census was undertaken within the Nakuru-Naivasha ranches in June 2021. The census involved total count for wildlife including the buffalo, giraffe within the Nakuru-Naivasha Ecosystem. We report on the status and distribution on the species of wildlife counted in the ecosystem. This is the first aerial census report since the area has employed ground mammal counts. The census further complements efforts by KWS and partners to attain a comprehensive status of large wildlife populations within the Nakuru-Naivasha area including the aquatic animals such as hippos and crocodiles found in the lakes and rivers. The census aimed to mapping out wildlife populations in relation to developments and infrastructure as the Nakuru-Naivasha Ranches. The specific objectives of the census were:

a. To determine the number and distribution of large animals

b. To map out various land use types and human activities to assess current pressures on wildlife conservation

c. To document the number and distribution of livestock in relation to large mammals in the ecosystem

d. To establish spatial distribution of threats to wildlife due to anthropogenic activities

e. To interpret the information obtained and deduce sound management decisions to guide management of wildlife in the ecosystem

f. Provide baseline wildlife data for the National Wildlife census

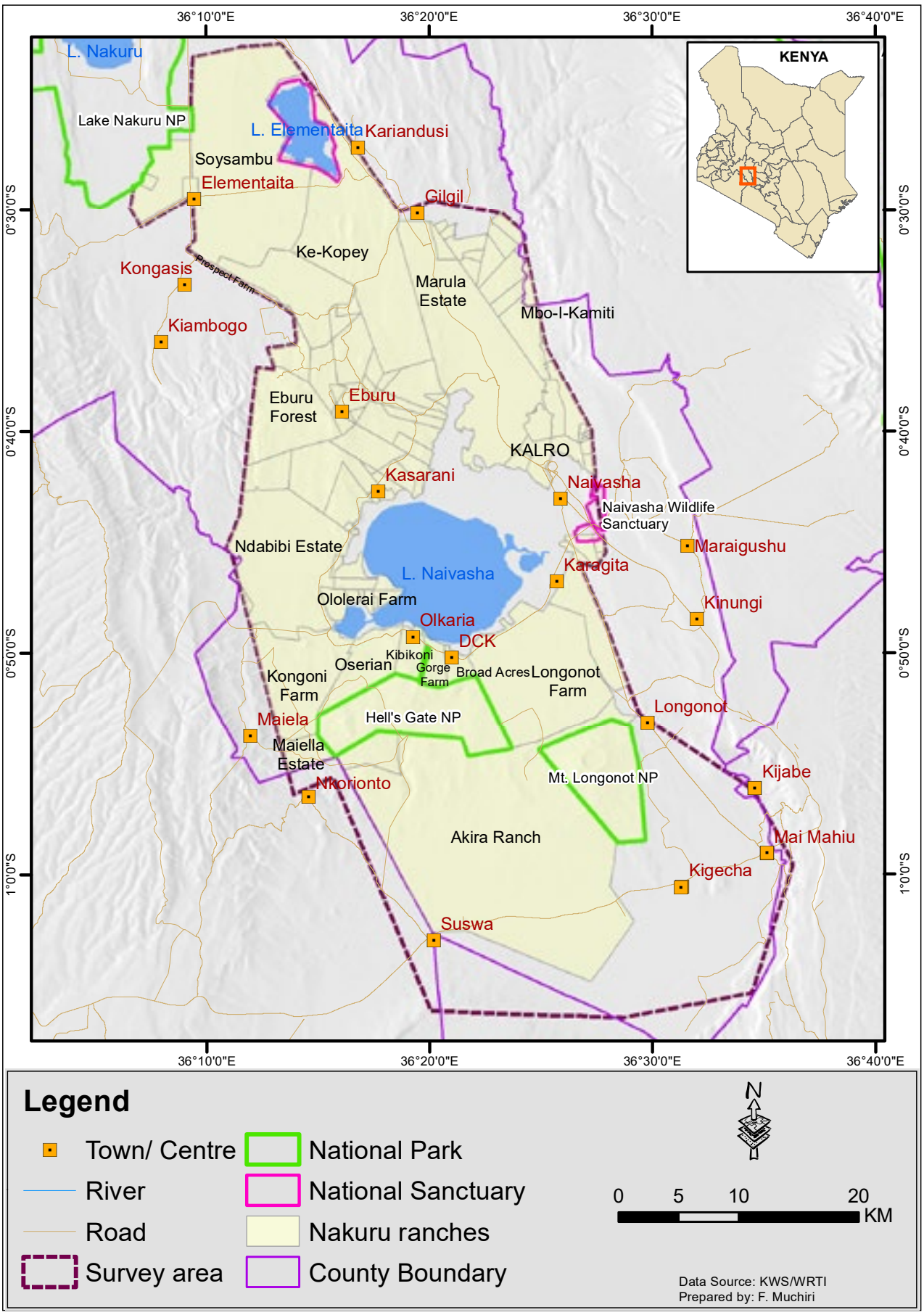
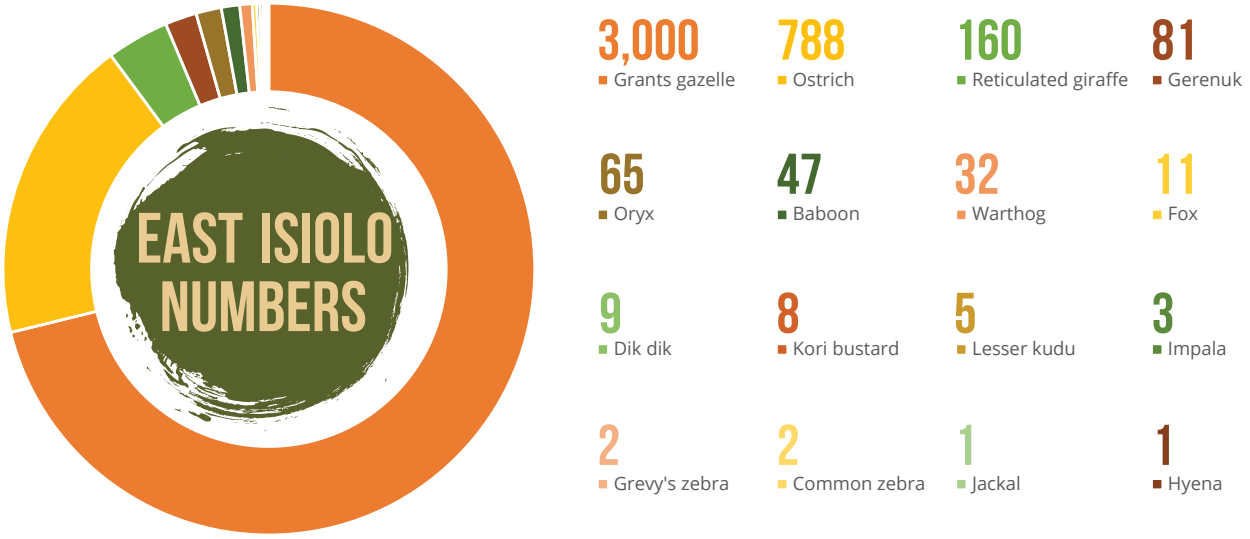


Figure 26: Map of the study area showing the protected areas and Conservancies

3.2.7 East Isiolo County



Isiolo County is one of the counties in the lower eastern region of Kenya. It borders Marsabit County to the North, Samburu and Laikipia Counties to the West, Garissa County to the South East, Wajir County to the North East, Tana River and Kitui Counties to the south and Meru and Tharaka Nithi Counties to the South West. Most of the land in the county is flat low lying plain resulting from weathering and sedimentation. The plains rise gradually from an altitude of about 200 m above sea level at Lorian swamp (Habaswein) in the northern part of the county to about 300 m above sea level at Merti Plateau. The main wildlife species found in the county includes: giraffe, African wild dog, elephant, ostrich, baboons, gerenuks, impala, grants gazelle, leopard, waterbuck, lesser kudu, greater kudu, Grevy zebra, lion just to mention a few. There are over 300 species of birds. The focus of this report is based on census blocks concentrated in Garbatula and Merti sub counties.

Kenya Wildlife Service has been undertaking wildlife census every 3 to 5 years. The focus for such routine census has been traditional wildlife hotspot areas with various methodologies being employed depending on the target taxa. In majority of these ecosystems, aerial census has focused on large mammals namely Elephants, Buffalo, Giraffe, plains and Grevy's Zebra, with different methodologies being employed for other species of conservation concern.

The 2021 National Wildlife Census largely ensured the conventional wildlife census areas are covered and it in addition expanded the scope to include more area and all the species that are observable from air. The census has also in addition included all the human activities within the landscape. This census is therefore considered the most comprehensive and is expected to guide in holistic understanding of the landscape and wildlife resources therein. Such data is expected to guide on management of wildlife, their habitat and advice on distribution of resources and management strategies. The census methodology followed standard methods described in details by Norton-Griffiths (1978) and Doughlas-Hamilton (1996).

The census was proceeded by training to ensure that all pilots and observers understand what is expected of them and that data generated is standardized. Procedures for data cleaning and analysis were followed as outlined in details by Doghlas-Hamilton (1996) and Norton-Griffiths (1978). The data was analysed and displayed in maps using ArcGis as outlined by ESRI (2010). Analysis and interpretation of the data was undertaken following procedures described by (1996). The census involved a total of 3 aircrafts. During this time, the landscape was generally dry in majority of the areas and isolated incidences of drought had been reported.

The overall goal for the census was to collect comprehensive data on various wildlife species and human activities within the larger Isiolo sub county. The specific objectives of the census were to: determine wildlife population's abundance and distribution in the census area; establish a baseline for wildlife and human activity dataset for the census area; determine the extent and spread of human activities in the census area; identify threats to wildlife conservation; and, generate data that can assist wildlife management across the landscape.

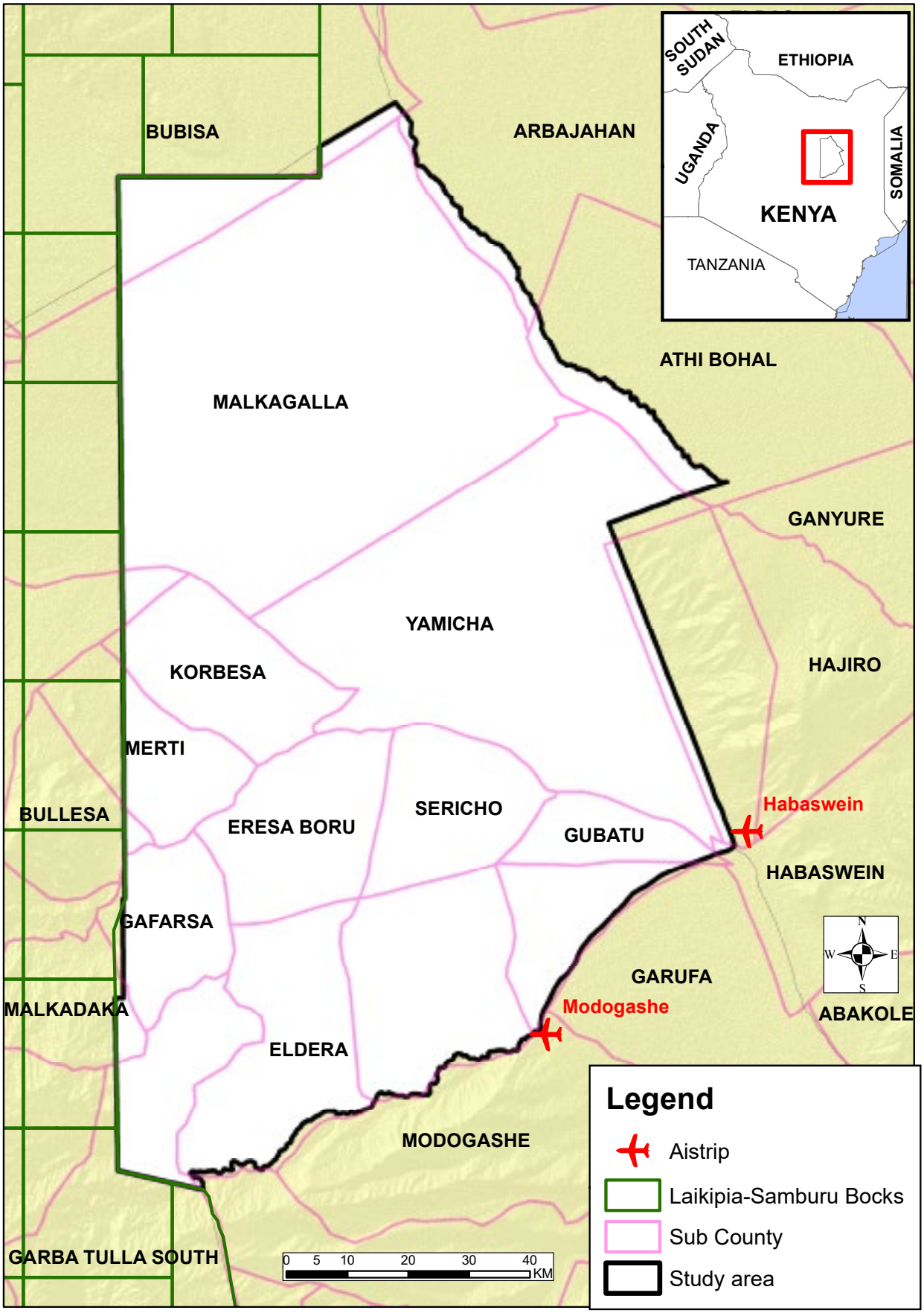


Figure 27: Location of the study area and Isiolo Census blocks

3.2.9 Lake Nakuru National Park

6412 Buffalo
1686 Zebra
1407 Impala
593 Warthog
263 Grant Gazelle
233 Baboon
116 Eland
109 Giraffe
98 Waterbuck
51 Rhino (Black and White)
41 Thomson Gazelle
2 Hyena
2 Reed Buck

Lake Nakuru National Park (LNNP) was established in 1961 and is world famous ornithological spectacle and conservation area. Initially, it only encompassed Lake Nakuru and the adjacent 5 km^2 riparian area adjacent to the lake, but was extended to include a large part of the surrounding savannahs to its current area of 188km^2. Lake Nakuru is one of the Rift Valley soda lakes at an elevation of 1,760 meters above sea level (m.a.s.l). It lies between Bahati Escarpment on the east and the Mau Escarpment on the west (Montcoudiol, et al., 2019). LNNP has a perimeter fence to contain wildlife as it is surrounded by town centers and communities all round. Fencing has made the park to be a closed island ecosystem (Shah, 2016).

Until recently, the lake had an abundance of algae which attracted a vast number of flamingos that famously lined the shore. It has a watershed spanning over 1800 km^2 which includes gazetted forests such as Mau, Eburru and Dundori. The Mau Forest consists of plantations and indigenous trees and is part of the Mau complex that covers an area of 650 km^2. Eburu Forest consists of indigenous tree species covering an area of 87.36 km^2 to the south of the lake while Dundori Forest in the eastern covers an area of 69.56 km (Shah, 2016).

The park supports a wide ecological diversity with flamingos and other water birds being the major attractions. The ecosystem supports over 300 plant species; 50 different species of mammals; and a variety of terrestrial birds numbering more than 450 species (Hongo, 2020). The park vegetation cover comprises areas of marshland and grasslands with bushy woodland in the rocky cliffs. The park has the euphorbia forest dominated by Euphorbia candelabrum on the eastern side and acacia woodland immediately around the lake shore which is dominated by Acacia xanthophlea.

The park is a closed ecosystem thus regular wildlife monitoring and counts are important to detect changes in populations and understand the drivers to inform management interventions. Among the challenges that the park faces include: 1) Loss of terrestrial habitat to rising water levels, 2) proliferation of invasive plant species;3) Overstocking of major herbivores: 4) Susceptibility to wildlife diseases and. 5) Seasonal variations in weather conditions.

For these reasons routine mammal census in the park has been conducted over the years. These censuses have been conducted through road count method which have a limitation in accessing certain parts of the park where the road network is very sparse or in vegetated areas. For the purpose of getting a more reliable estimate of parks buffalo population, a helicopter aerial census was conducted in January 2020 to guide the management in making decision on managing buffalo numbers in the park. Wildlife population assessments are important to enable the national government to understand population dynamics and to assess the success of conservation programs. Data and information generated during censuses assists in making informed decision and ensuring continued attention from the global conservation community. In an effort to understand the status of wildlife in the country, Kenya Wildlife Service with funding from the national government is undertaking a nationwide wildlife census from May –July 2021.

This report covers activities and findings of aerial helicopter census conducted in Lake Nakuru National Park on 4th June 2021. The activity aimed at finding out the density of wildlife population, population size , mapping of

wildlife distribution as well as factors that would affect the observed distribution as water sources, habitat conditions and effects of human activities e.g. fishing among other factors

The overall objective of this census was to gather comprehensive information on the current wet season data on the number and distribution of large wildlife species in Lake Nakuru National Park. The specific objectives were to:

1. Determine wildlife population abundance, species composition and distribution in the park
2. Determine wildlife population trends in the park
3. Identify threats to wildlife conservation in the park
4. Provide information for effective wildlife management in the park
5. Contribute data to the development of a national wildlife data portal

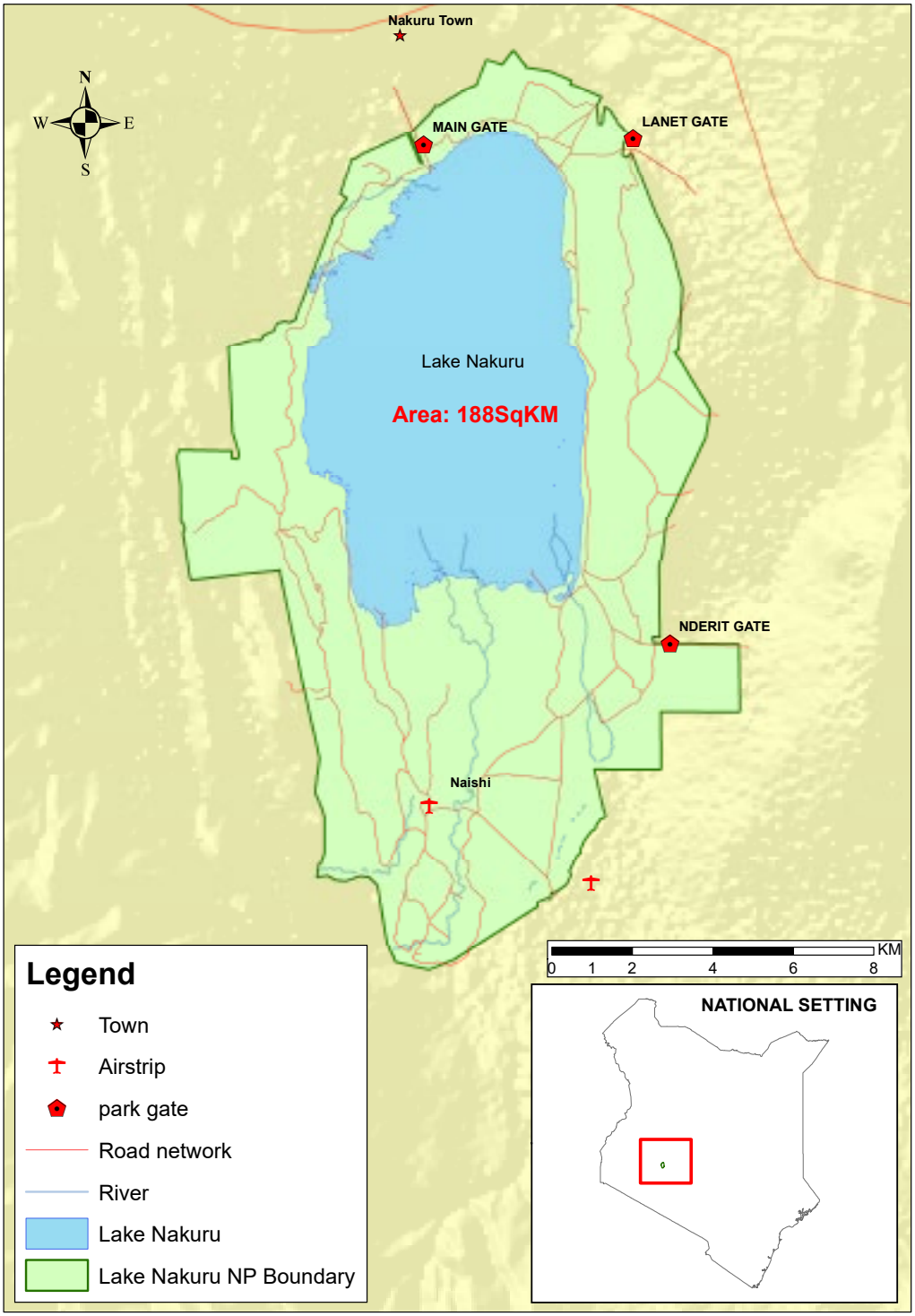
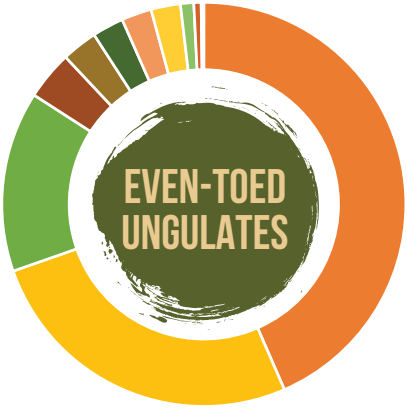
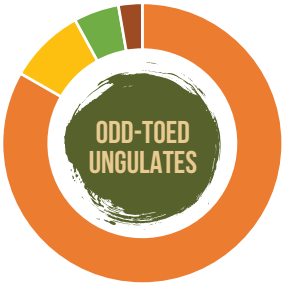


Figure 28: A map of LNNP used during the June 2021 wildlife census

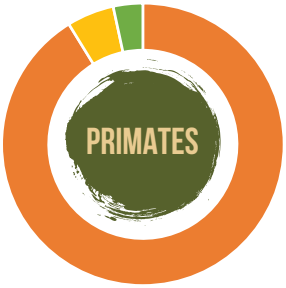
3.2.10 Nairobi National Park



- 1641 Impala
- 988 Buffalo
- 546 Coke's Hartebeest
- 147 Maasai Giraffe
- 108 Thomson Gazelle
- 95 Wildebeest
- 91 Grant Gazelle
- 89 Eland
- 40 Warthog
- 22 Waterbuck
- 3 Bohor Reedbuck
- 2 Suni
- 2 Duiker
- 1 Bushbuck

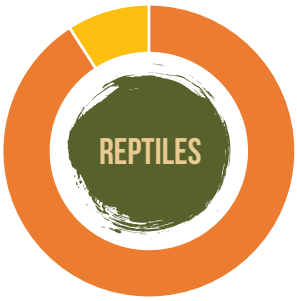


- 304 Common Zebra
- 32 Hippo
- 19 White Rhino
- 10 Black Rhino



- 135 Baboon
- 8 Sykes Monkey
- 5 Vervet Monkey

- 7 Black-backed Jackal
- 4 Cheetah
- 3 Leopard
- 3 Lion
- 3 Serval cat
- 2 White-tailed Mongoose



- 10 Crocodile
- 1 Leopard Tortoise

- 425 Helmeted G. fowl
- 161 Ostrich
- 29 Yellow N. Spurfowl
- 11 Grey crowned crane
- 7 Secretary Bird
- 1 Kori Bustard
- 1 Black B. Bustard

Nairobi National Park (NNP) was established in 1946 as the first National Park in the Country and East Africa. The park covers about 117Km^2. It is located about 10km from Nairobi City's central business district, the capital city of Kenya. The park is the protected core zone for the wider Athi-Kapiti ecosystem, which is approximately 2000km^2.

Regular monitoring of wildlife populations is an important activity in conservation of biodiversity. Adaptive management and conservation of landscapes require regular censuss of wildlife abundance, their distributions, and their relation to human activities (Lindenmayer & Likens, 2009). For all stakeholders to manage their wildlife populations effectively, they need to know how many animals they have (the wildlife population); where these animals are found and when (at what time of year) they are found (WWF, 2000). This information will improve problem-animal management activities, increase the productivity of wildlife based enterprises (e.g. tourism/ecotourism) and contribute to improved management of wildlife habitats. In Nairobi National Park (NNP), monitoring of wildlife of populations once every two months has been ongoing for the last three decades spearheaded by Friends of Nairobi National Park (FONNAP) and NNP management. This year the count coincided with, and became part of the National Wildlife Census.

Because of the park's proximity to Nairobi city, impacts of National infrastructural developments, expanding human populations and associated land sub-divisions into commercial and residential plots, have all diminished land wildlife. These changes have made the wildebeest migration that had over 30,000 animals in the 1960s to completely collapse due to blockage of their migratory routes. In addition, population of warthog (Phacochoerus africanus), waterbuck (Kobus ellipsiprymnus), hartebeest (Alcelaphus buselaphus cokii), and gazelle populations have declined by about 70%. From the bimonthly ground census, it is estimated that 70-80% of the park's animals roam outside of the protected area boundaries to the southern dispersal areas which are still crucial to most of the migratory animals. Unfortunately, those corridors linking the park to the greater Athi-Kapiti plains have been obstructed by development, urban sprawl and land subdivision and sale, or totally blocked by fences. The wildlife population monitoring is therefore important in understanding negative impacts of these developments.

This census aimed to establish the spatial distribution of various wildlife species in NNP and their population trends over the last decade to establish how the wildlife is faring in the face of expanding anthropogenic developments in Nairobi city and its metropolis. The specific objectives of the census were to determine the wildlife species numbers and distribution; determine key wildlife population trends over the last decade; and propose actions to address challenges facing the wildlife populations in the park. The Park has 15 traditional counting blocks based on the parks road circuits and main habitat types. As such, fifteen (15) census groups were constituted to carry out the wildlife census. Each group consisted of at least 4 persons; a team leader, a driver and 2 spotters and was assigned a single block.

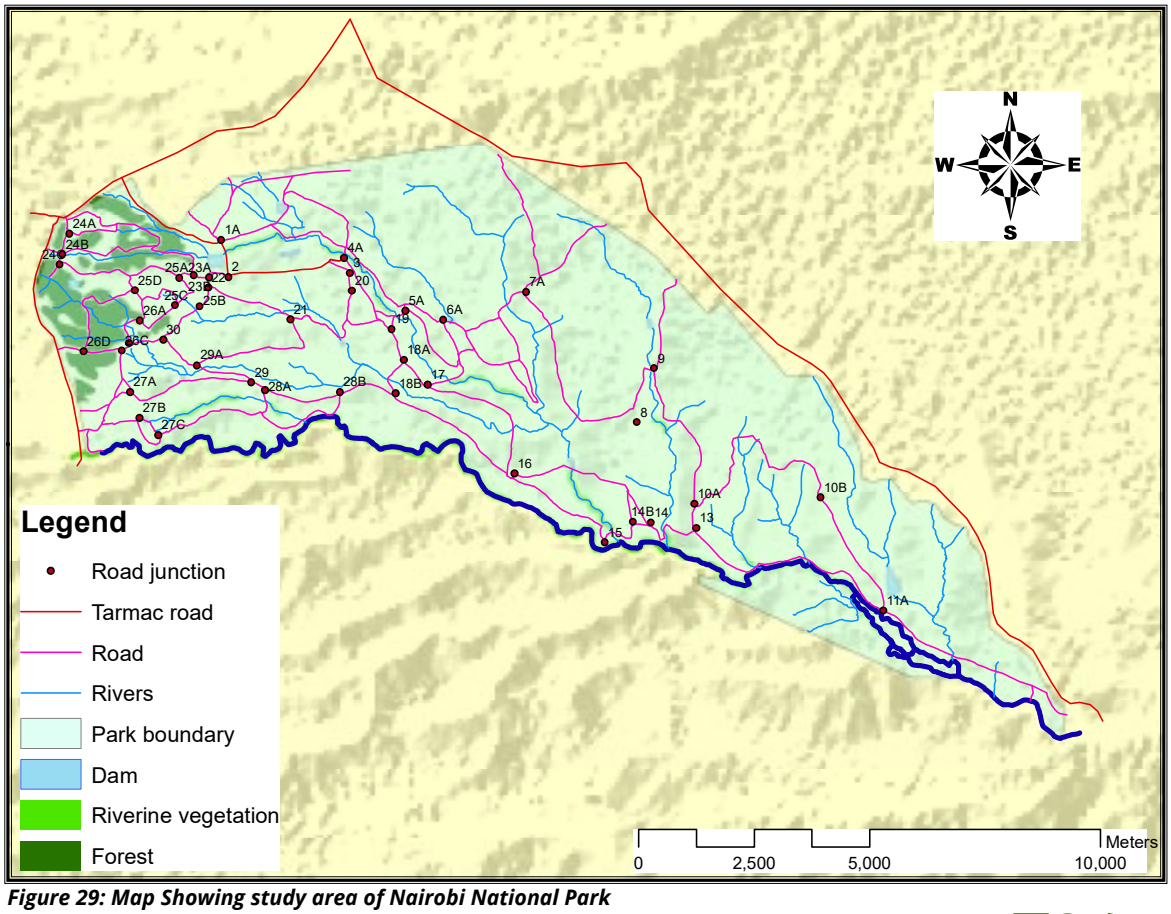


Figure 29: Map Showing study area of Nairobi National Park

3.2.11 Oldonyo Sabuk National Reserve Ecosystem

46 Vervet Monkey
30 Sykes monkey
25 Rock hyrax
23 Buffalo
19 Dik dik
18 Olive Baboon
12 Colobus monkey
7 Bushbuck
4 Common duiker
3 Tree Hyrax

Ol Donyo Sabuk National Park (OSNP) lies about 80 kilometers east of Nairobi city and 27 Kilometers from Thika Town off Thika-Garissa road. It is situated in Machakos County and lies between latitudes 1005' and 1010'S, longitudes 37010' and 37020'E at 2145M above sea level at the peak of the mountain (Figure 187). The park was gazetted in 1967, covers about 20.7 km^2 and is entirely a mountain. Four main vegetation types occur in the park with the most dominant being the closed bushland followed by closed trees and the open grassland/bushland in addition to the rain-fed herbaceous cover. The climatic conditions vary over time and space in the area. Other than the volcanic formations of granite rocks, the soils are deeply weathered, except where eroded on steep slopes or where un-weathered rock outcrops occur.

As in all other ecosystems with wildlife, the park is declining in ecological status at an alarming rate as a result of extensive agriculture, industrialization and other anthropogenic activities around it. These activities that influence the park negatively include charcoal burning, tree logging, poaching, quarrying, illegal grazing and frequent arson attacks. All these are adversely affecting wildlife in the park by threatening their survival. There is therefore need for accurate data on all wildlife species especially their population status and trends so as to make recommendations for management actions/decisions.

Regular monitoring of wildlife populations is an important activity in conservation of biodiversity. Adaptive management and conservation of landscapes require regular censuss of wildlife abundance, their distributions and status of their habitats in relation to human activities (Lindenmayer & Likens, 2009). For all stakeholders to manage their wildlife populations effectively, they need to know how many animals they have, where these animals are found and at what time of year they are found (WWF, 2000). This information will improve problem-animal management activities, increase the productivity of wildlife based enterprises (e.g. tourism/ecotourism) and contribute to improved management of wildlife habitats. In Oldonyo Sabuk National Park (OSNP), these regular censuss have largely been lacking owing to constrained resources and difficult terrain. Indeed, the current wildlife census in OSNP serves as the only record about the status of wildlife in the park. The only other record was a Biological Resource Inventory done in November, 2007.

The goal of the census was to establish a baseline of the population status and distribution of various wildlife species in OSNP. This goal was achieved by the following specific objectives: to determine the number and distribution of different wildlife species in the park and identify the status and impact of illegal activities on park's wildlife and habitat.

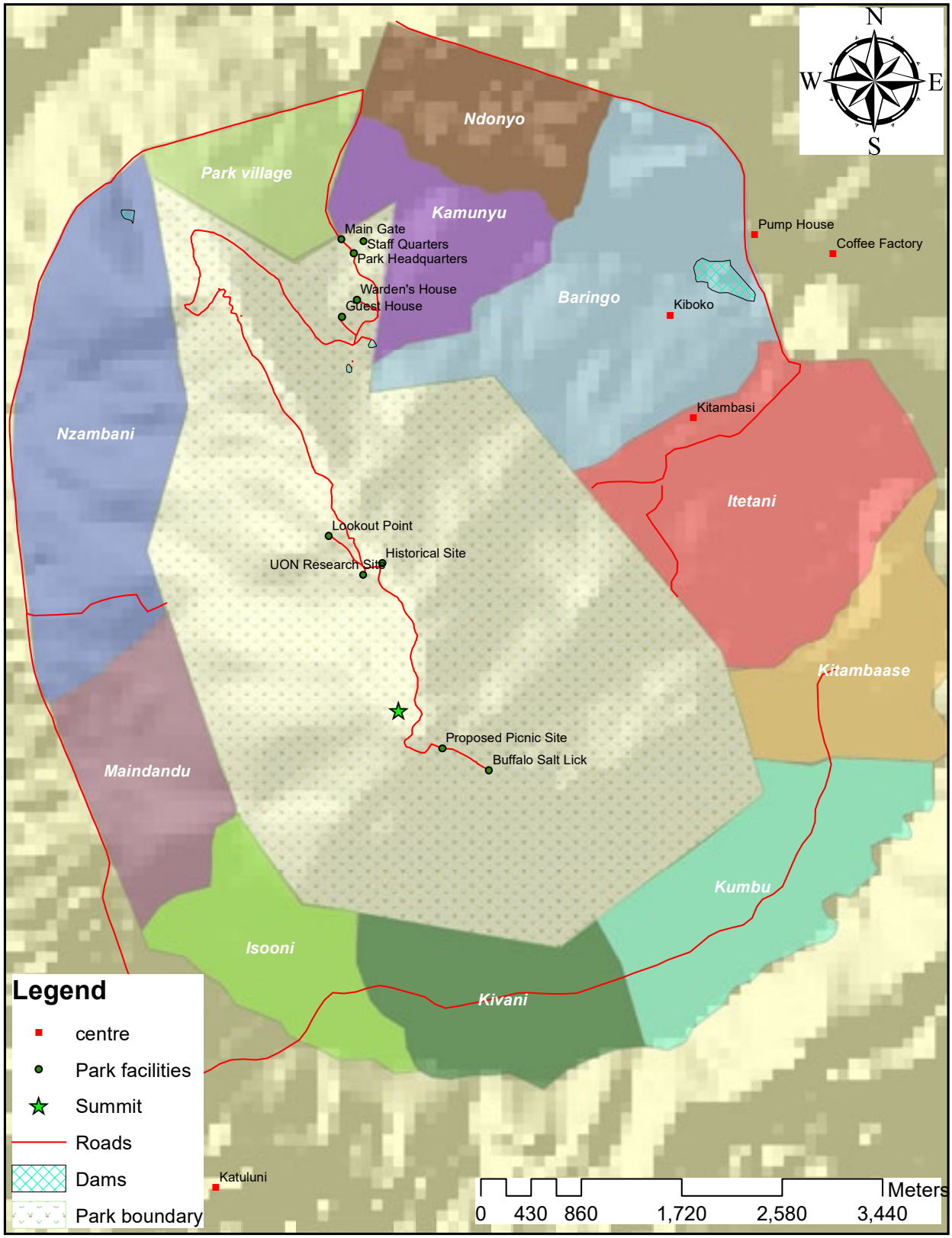
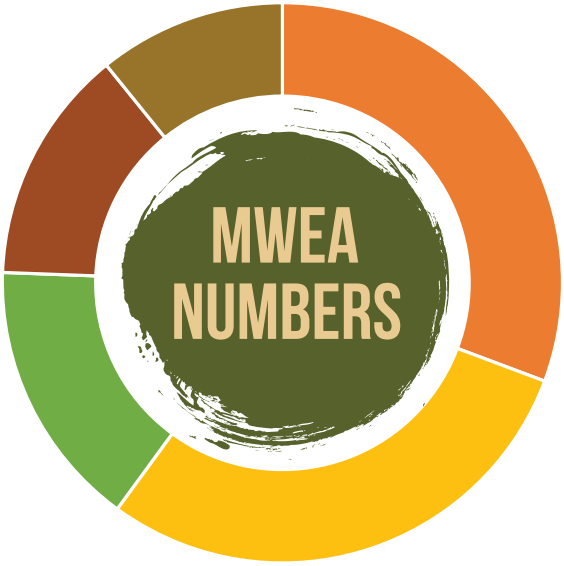


Figure 30: Map showing the locatipon of Oldonyo Sabuk National Park, Machakos County, Kenya

3.2.12 Mwea National Reserve Ecosystem



156
Elephant

149
zebras

79
giraffe

69
buffalos

55
hippopotamus

Mwea National Reserve (MNR) was gazetted as a National Reserve (NR) by legal notice No. 2 of 29th January 1976. The gazetted area was initially 68km², but later in year1978 excisions for settlements were done and only 42km² remained as a National Reserve (Figure 191). The reserve is managed and protected by Kenya Wildlife Service (KWS) on behalf of the County Government of Embu (CGE). In 1998, a perimeter electric fence was erected enclosing the reserve areas where it borders the local communities' land. The fence serves a dual purpose of mitigating wildlife conflict by preventing crop damage by animals as well as limiting unauthorized access into the reserve which may lead to destruction of habitat and poaching. MNR is actively managed to achieve desired conservation goals and safeguard the welfare of the neighboring community. To meet the conservation goal, other management practices have been implemented that include managing animal population through re-introductions and translocation.

MNR has been home to elephants and other herbivores for a long time. In the year 1979 it was estimated that there were 49 elephants in the reserve. These elephants were believed to move freely within the reserve, Tana River, Kiambere forest and North Kitui National Reserve (Ngene et al., 2012) (Njumbi, 1995) (Litoroh, Nicholas, & Masinde, 1994). Increased human settlements and agricultural activity around the reserve, and the subsequent construction of an electric fence, led to isolation and confinement of majority of wildlife. The enclosure also led to various challenges. For example, the occurrence of anthrax outbreak in 2011 that resulted in the death of 11 Nubian giraffes (Giraffa camelopadalis Nubiani) and one lesser Kudu (Ammela phusim berbis; Kaitho et al, 2013). Local extinction of some wildlife species like Kongoni, common zebra, giraffe and ostrich have been reported which hitherto used to be abundant. These challenges have prompted the re-introduction of certain animals, for example the Nubian giraffe in 2009 (Njumbi et al., 1996) and various zebra introductions. However, despite the numerous challenges, some wildlife species have been thriving. The elephant population for example has continued to grow over the years leading to 23 individuals had to be trans-located to Tsavo East National Park in 2007.

Several aerial and ground wildlife censuses have been undertaken to establish population status of wildlife in MNR. These however have focused mainly on the large mammals (e.g., the recent census of year 2012 and year 2017). The year 2021 aerial census attempted to establish the population status of a broader number of species that were observable from air.

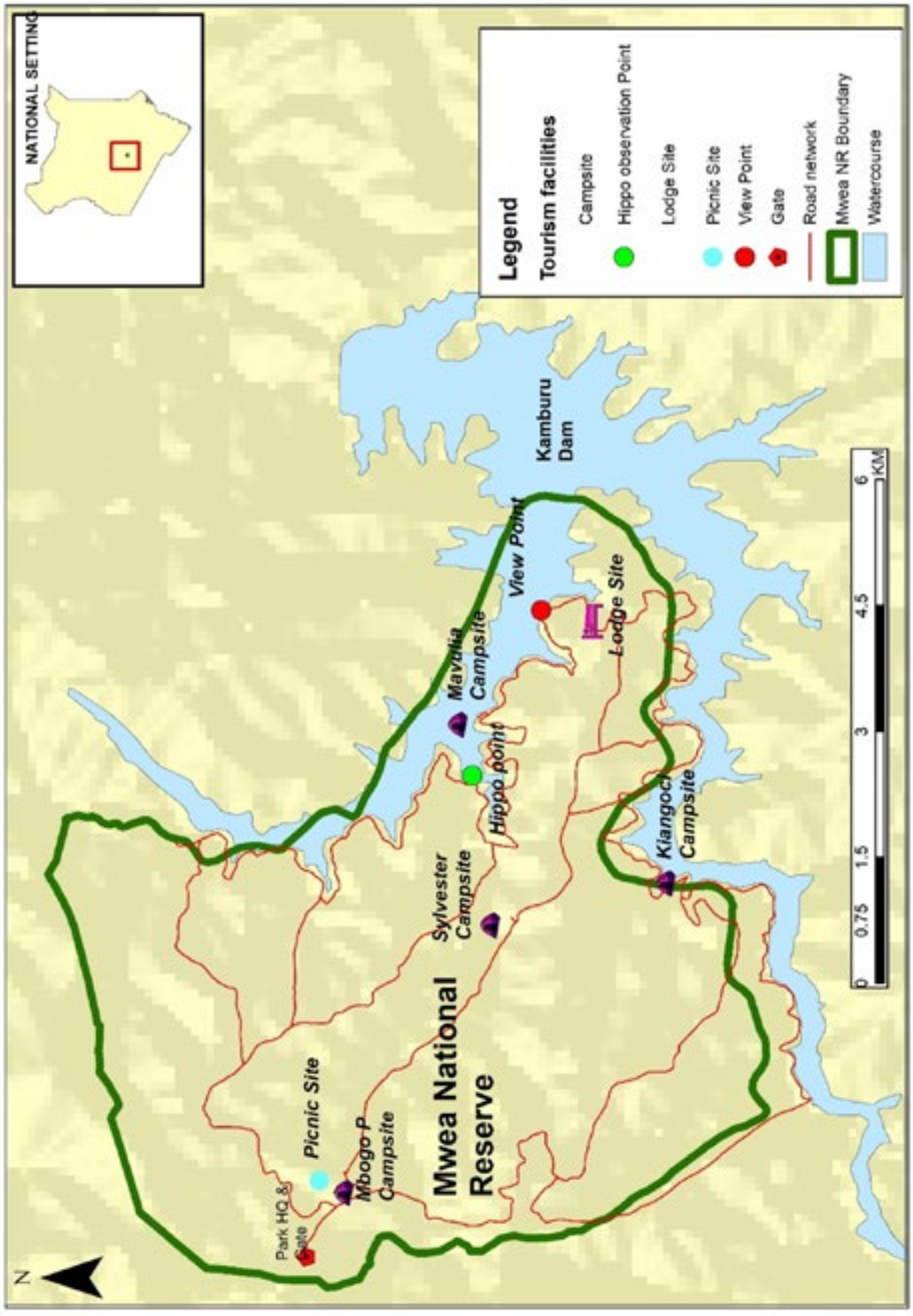


Figure 31: Location of Mwea National Reserve and basic infrastructure within the reserve

3.2.13 Ruma National Park

550 Giraffe	365 Buffalo	244 Zebra
56 Defassa Waterbuck	38 Impala	33 Baboon
28 Topi	21 White Rhino	14 Black Rhino
12 Lelwel's Harte Beast	8 Roan Antelope	5 Oribi
3 Bush Buck	3 Bohor Reedbuck	1 Crown Cranes
1 Grey Bush Duiker	1 African Fish Eagle	1 Black Bellied Bustard

Ruma National Park is located in Lambwe Valley between Ndhiwa, Suba North and Suba South Sub-Counties in Homa Bay County, Western Kenya. As at 1966 the gazetted Lambwe Valley Game Reserve had an area of approximately 308 km^2. The park was gazetted under Legal notice no 100 of 14th June 1983 as a National Park from its previous protected area category as Lambwe Game Reserve, with the rea coverage being 120km^2.

The Lambwe valley floor which forms Ruma National Park is sandwiched by Gwasi Hills to the west and Kanyamwa Escarpment to the east and other satellite geological features such as Gembe Hills and Ruri Hills to North West and North of the Park respectively. Adjacent lands provide rich culture and history of the neighboring Luo and Abasuba communities with land use mainly being subsistence and commercial crop cultivation and livestock keeping.

Wildlife population censuses and assessments are important management tools enabling national governments to understand population dynamics and evaluate success and failure of conservation programs. Data and information generated from these censuss assists in making informed decision and ensuring continued attention from the global conservation community. It is because of this that Wildlife Research and Training Institute (WRTI) in collaboration with Kenya Wildlife Service endeavors to understand the status of her wildlife by carrying out nationwide wildlife census.

This report covers activities and findings aerial census conducted in Ruma National Park on 31st May 2021. The overall objective of this census was to gather comprehensive wet season data on the number and distribution of large wildlife species in Ruma National Park. The specific objectives were to:

1. Determine wildlife population abundance, species composition and distribution in the park
2. Determine wildlife population trends in the park
3. Identify threats to wildlife conservation in the park
4. Provide information for effective wildlife management in the park
5. Contribute data to the development of a national wildlife data portal

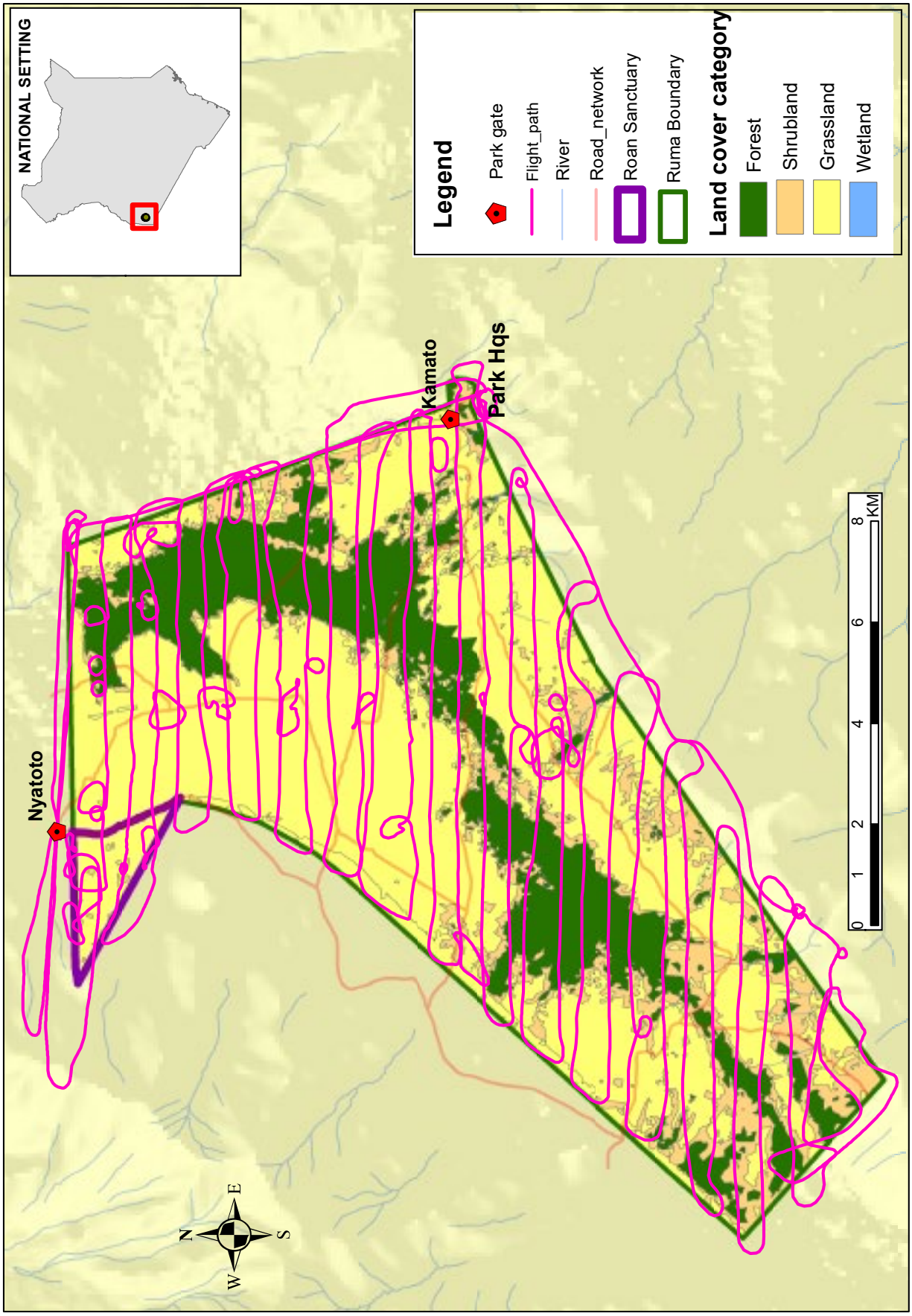
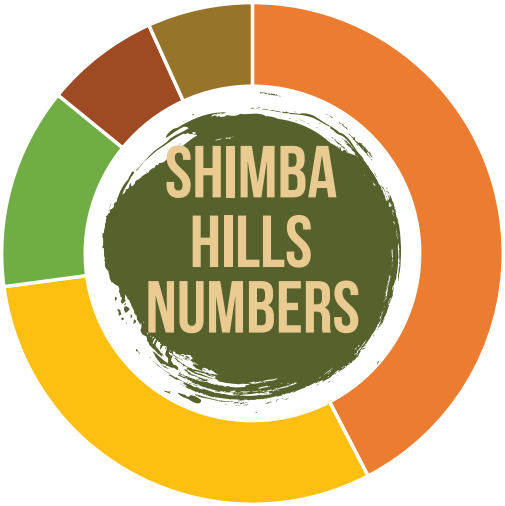


Figure 32: Map of Ruma National Park showing flight path

3.2.14 Shimba Hills Conservation Areas



75 Elephant

54 Warthog

23 Buffalo

13 Baboon

12 Waterbuck

The Shimba Hills Conservation Area consists of the Shimba Hills National Reserve, Mkongani (west and north) Forest Reserves, and Mwalunganje (Elephant Sanctuary and Forest Reserve; Figure 201). These conservation areas are home to the remaining population of elephants in Kwale County. Before the elephants were confined to the conservation area, they used to roam freely within the Kwale County (Estes 1974). Prior to 1960s, the elephants were part of a larger population that ranged across the entire Kwale County and as far as Tsavo and Mkomazi, which are about 60km north and 40km south respectively (Estes 1974). Huge herds of the elephants annually migrated every October and November from the south to the east of the conservation areas in search of palm seeds. However, controlled shooting, human settlements and poaching gradually eliminated the elephants from the rest of the county (Thouless et al. 2008). For instance, between 1961 and 1962, about 250 elephants were shot in the area to create the Shimba Settlement Scheme (Estes 1974).

Human population has continued to increase in the area after the establishment of the settlement scheme. This was followed by a wave of poaching in 1970s and 1980s, which forced the remaining elephants to be confined in the conservation areas for protection (Thouless et al. 2008). At the same time, human-elephant conflicts started to be experienced in the area as human population and area under farms increased. In order to mitigate human-elephant conflicts, the conservation areas within the Shimba Hills were fenced with electric fence between 1991 and 1995) (Thouless et al. 2008). Fencing resulted to confinement of elephants within the conservation area. The confinement was a threat to the woody vegetation as elephants at higher densities started to destroy them (Ross 1984). As a result, it became necessary to constantly monitor the elephant population within the Shimba hills conservation areas.

Elephant population monitoring in Shimba hills has followed three main methods, which include aerial count (Ngene et al., 2013; Tamooh, 2009; Kimtai, 2007; Kahumbu, 1997; Litoroh, 1997; Kiiru, 1995), dung count (Omondi, et al., 1998;; Mwathe, 1995; Reuling et al., 1992) and individual recognition (Kahumbu, 2002). Ngene et al. (2013) estimated the elephant population in the Shimba hills conservation areas at about 274 animals, and provides a summary of past elephant population estimates in the area. Using the dung count method, Reuling et al. (1992), Mwathe (1995), Omondi et al. (1998) and Litoroh (2002) estimated about 429±128 animals, 453±181 animals, 598 animals, and 649±151 animals respectively in the conservation areas. Kahumbu (1995), Litoroh (1995), and Kimutai (2007) using a helicopter sighted a minimum of about 467 and 305 elephants in the conservation areas. However, Kahumbu (2002) estimated 658 animals using the individual recognition method after removal of 30 bulls from the conservation areas (Muir, 2000). In 1995 and 2009, about 232 and 144 elephants were sighted in the conservation areas using a fixed wing (Kiiru, 1995; Tamooh, 2009).

The aerial census aimed at updating the population status of elephants and other mammals in the Shimba Hills Conservation Areas. The specific objectives of the aerial census were to: establish the number and distribution of elephant and other mammals in the Shimba Hills conservation areas; establish the number and distribution of elephant carcasses; and, establish the human influence specifically distribution of logging activities in the conservation areas. It is important to continue monitoring elephants and other large mammals' population in the Shimba Hills Conservation Areas. The data and information obtained will illustrate the number and distribution of elephants and other large mammals in the conservation areas. This information is important to conservation area managers and policy makers as it will guide them in making decisions regarding future management of elephants and other large mammals in the conservation areas in Shimba Hills.

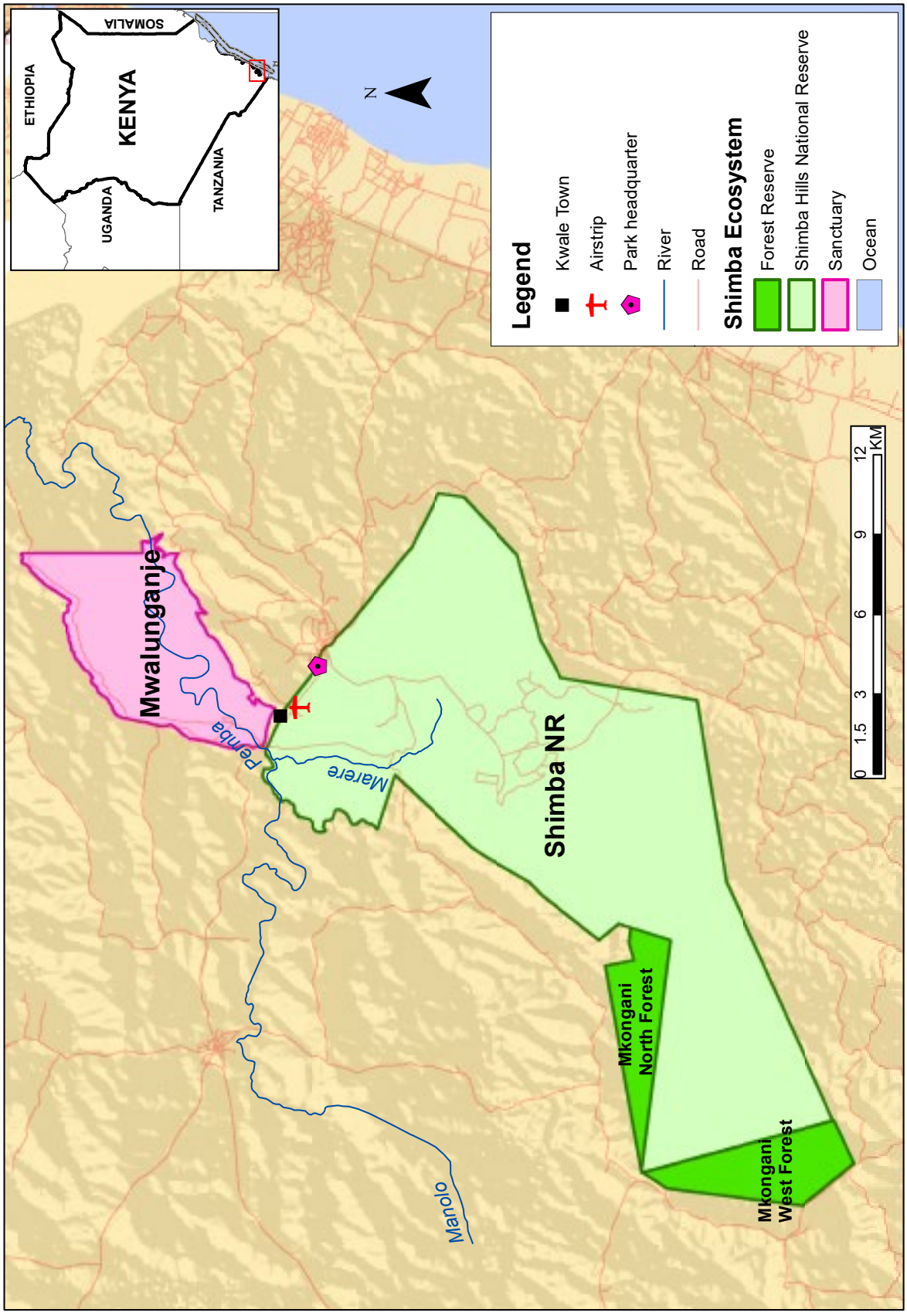
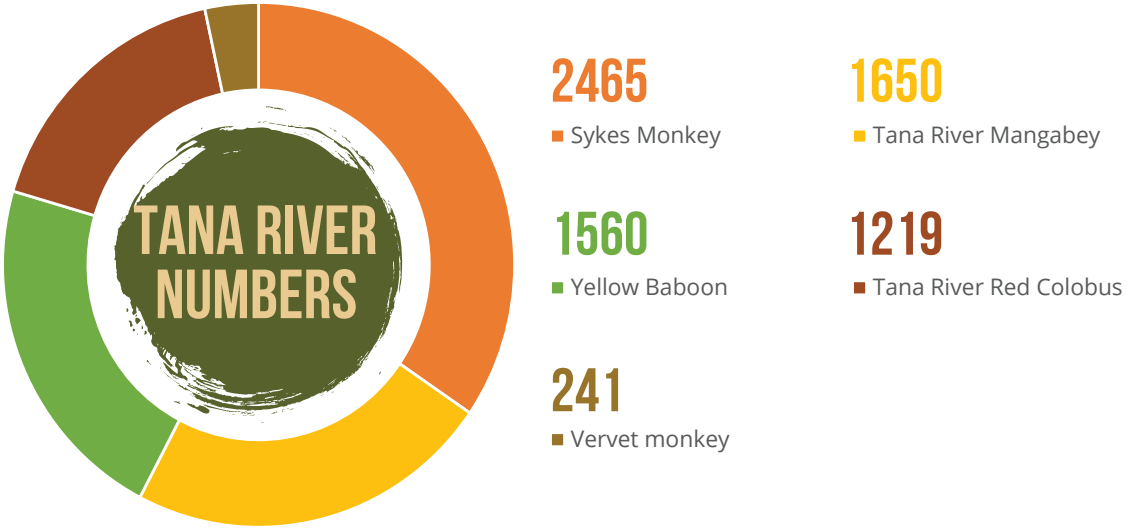


Figure 33: Shimba Hills Study Area

3.2.15 Tana River Remnant Forests



The Tana River, which is the longest river in Kenya has its source from Mt. Kenya and the Aberdares draining to the Indian Ocean at Kipini (Figure 203). The river flows through a broad flood plain of alluvial sediments in its lower reaches primarily covered by grass and numerous patches of forests and woodlands. The flood plain forest can be divided into two; the extensive forests north of Garsen and the small fragments occurring along the river courses south of Garsen. The river mouth at Kipini is dominated by the tall mangrove forests represented by the eight mangrove species found in Kenya. The middle and lower sections of the river is dominated by three communities including the Pokomo who are agriculturalists, Orma and Somali who are pastoralists.

The lower Tana River forests are home to several primate species including the endangered Tana River Red colobus (Piliocolobus rufomitratus) and the Tana River Mangabey (Cercocebus galeritus) (Wahungu et al., 2005). The two species have lost more than 70% of their primary riverine forest habitat because of the anthropogenic activities mainly forest clearing for Agriculture (Moinde-Fockler et al., 2007; Kivai, 2018). According to Moinde-Fockler et al. (2007), over a period of 21 years (1979-2000), forest cover amounting to 29% inside, and 38% outside of the TRPNR has been lost. This loss of habitat has been associated with the sharp decline in numbers and the last detailed census put the average global population of Tana River red colobus at 788 individuals and Tana River mangabeys at 2069 individuals (Karere et al., 2004). Six other nonhuman primates inhabiting the region include the yellow baboon (Papio cynocephalus ibeanus), lowland sykes monkeys (Cercopithecus mitis albotorquatus), vervet monkeys (Chlorocebus pygerythrus hilgerti), garnett's galago (Otolemur garnetti lasiotis), Senegal galago (Galago senegalensis braccatus) and Kenya coast galago (Paragalago cocos) (Suleman, et al., 2001).

The Tana River red colobus and Tana River mangabey are endemic to Kenya, occurring in isolated populations in 27 and 30 patchy and highly fragmented gallery forests respectively. They occur within a geographical short range of about 60 km that supports approximately 80 forest patches along the lower Tana River (Butynski and Mwangi, 1994; Karere et al. 2004). Most of these forest patches however occur north of Garsen-Witu road to TRNPR with a few records 5-15Km south of this road at Onkolde and Masewe forest patches (Hamerlynck et al., 2012; Karere et al., 2004). Increase in community needs for the forest resources within these forest patches has raised the concern of understanding the conservation status of the diverse fauna. Several primate censuses have therefore been undertaken over the last few decades to determine the Tana River mangabey and Tana River colobus distribution and demography (Groves et al., 1974; Andrews et al., 1975; Marsh, 1978; Kinnaird and O'Brien, 1991; Decker and Kinnaird, 1992; Kahumbu and Davies, 1993; Butynski and Mwangi, 1995; Muoria et al., 2003). All these census targeted different forest patches with Marsh 1975 census being the first detailed census where 59 of the known 77 forest fragments was covered (Marsh, 1978). Using similar methods, Butynski & Mwangi (1994) covered 60 of the forest fragments while Karere et al., (2004) covered 73 forest patches in 2001. The 2001 census forms the basis around which the current population trends for the two endangered primates will be assessed.

Despite, the negative impacts on the lower Tana ecosystem, information is lacking on the current population dynamics of the Tana River mangabey, the Tana red colobus and changes on their habitat status. The last meaningful habitat and population assessment of the two primates was conducted in 2001, and unfortunately, due to community resistance and protest against the GEF project, mass destruction of the habitat ensued. Nonetheless, the

impact of such forest changes on the endangered Tana primates and their habitat is yet to be established. Thus, lack of continuous monitoring and documentation of the effects of forest cover change on Tana primates has contributed to the conservation challenges facing the two species. This census was therefore undertaken to better understand the current population status and distribution of the critically endangered Tana River mangabey and the Tana River Red colobus and strengthen the long-term conservation of the two species and their habitat.

The main purpose of undertaking this census was to understand the current population status of the critically endangered Tana River red colobus and Tana River mangabey and other wildlife species inhabiting the Tana River flood plains by evaluating the effects of habitat changes on population numbers and distribution

i. To determine the current population size, distribution and density of the Tana River red colobus and Tana River mangabey, which are sympatric in the lower Tana River forest patches

ii. To establish the forest habitat changes for the two species over the last 20 years and map out the current habitat suitability for the two species.

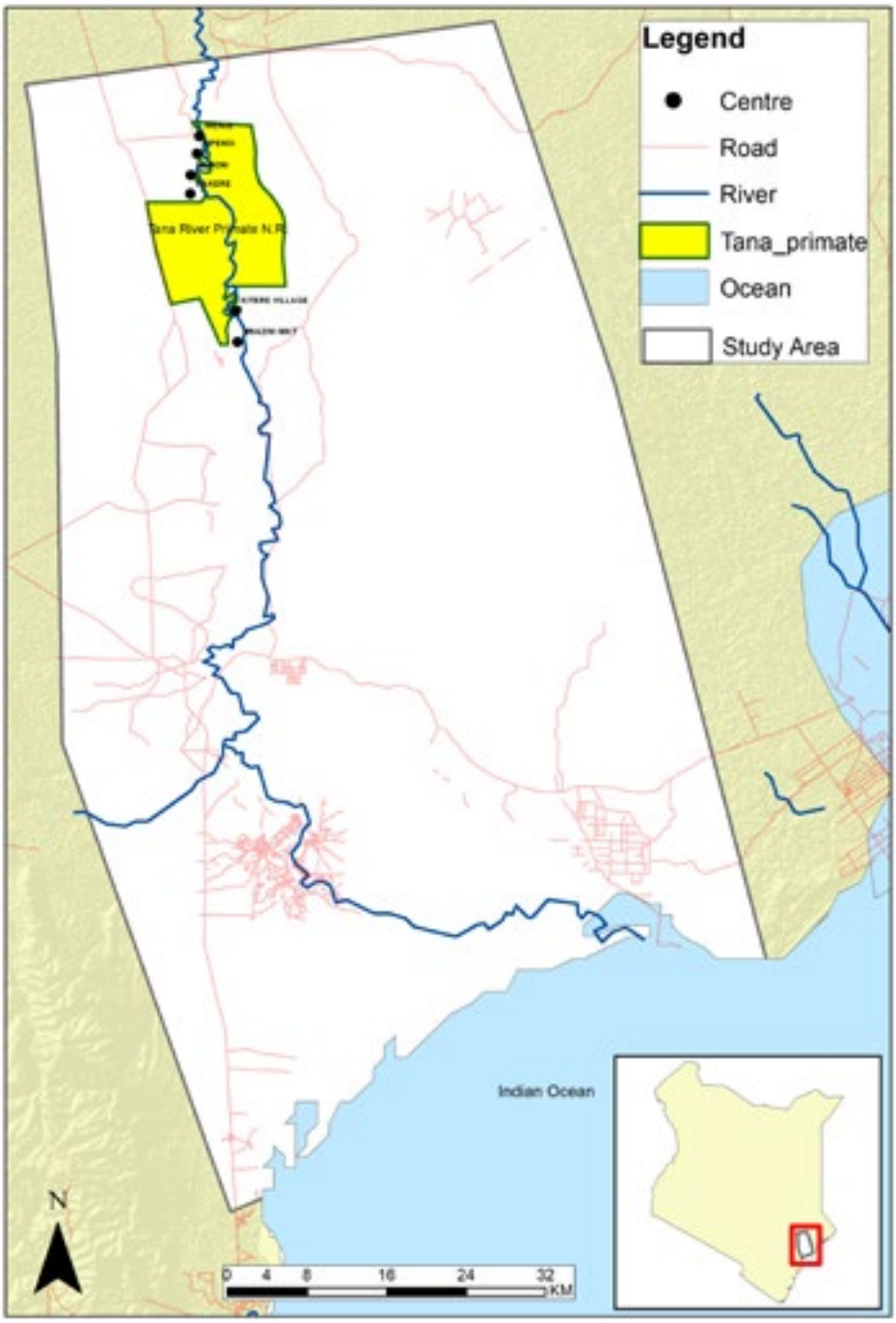
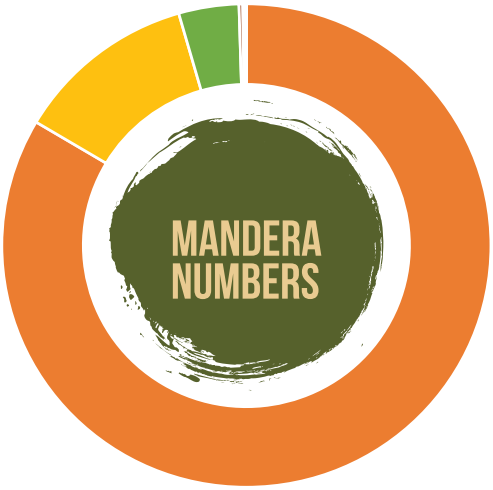


Figure 34: Map of the forest patches along the Lower Tana River extending from Nkanjoja to Onkolde indicating the location of TRNPR and including the un-censused section of the middle sector. Adopted from Butynski & Mwangi (1994)

3.2.16 Mandera County



736,416 Shoat
105,845 Camel
35,098 Cattle free ranging
2,168 Donkey
716 Gerenuk
385 Dik dik
257 Lesser Kudu
257 Warthog
220 Oryx
165 Grant Gazelle
91 Reticulated giraffe

Kenya's rich wildlife resource is one of the key economic pillars of the country. However, the country is not receiving optimized benefits as anticipated due to inadequate knowledge on the status of the country's Wildlife populations as there is no comprehensive scientific data for informed policy direction. To achieve this, there is need for a coordinated National wildlife census in all conservation areas to support implementation of GOK conservation policies and development of evidence-based decision support tools for adaptive management, integrated cross sectoral and multi-scale planning for conservation and sustainable development to optimize wildlife benefits to the country.

The number and distribution of species listed in schedule six (6) of the Wildlife Conservation and Management Act, 2013 (WCMA, 2013) whose numbers and range have significantly declined in the past three decades require regular monitoring. Such wildlife Censuses have become a legal requirement. Every three to five years the Ministry in-charge of wildlife is required to provide species data and information as outlined in the WCMA, 2013 to develop the status of wildlife conservation report as well as the status of wildlife resources monitoring report after every five years. These reports are then presented to parliament by the Cabinet Secretary Responsible as stipulated in sections 49(4) and 64(3) of the WCMA, 2013.

Mandera County wildlife sample count was last done in 2011 by department of resource census and remote sensing(DRSRS)and since then policy decisions on wildlife conservation in the County has relied on the data. The data obtained from Mandera census is therefore aimed to be manager's tool to manage wildlife resources in the County and manipulate the range condition and productivity of the various wildlife species, including distribution and provision of space and grazing. It will also be useful in provision of security towards wildlife while at the same time guide tourism activities in the conservation areas. Issues of human-wildlife conflicts will also be adequately addressed as well as resource allocation towards conservation and monitoring of the same.

The goal of the sample aerial census was to establish a wildlife population status in Mandera County. The specific objectives of the census were to: determine wildlife population abundance and distribution; assess the wildlife population trends over time; and, identify threats and recommend appropriate strategies to wildlife conservation and management in the County.

The county is located at the extreme end of North-Eastern Kenya, bordering Somalia and Ethiopia and is about 25,991km2. It lies between latitude 20 11' North and 40 17' North and longitudes 390 47' East and 410 4.8' East. Administratively, the county is divided into seven (7) sub-counties namely: Mandera East, Mandera North, Mandera west, Lafey, Banisa and Kutulo (Figure 204).

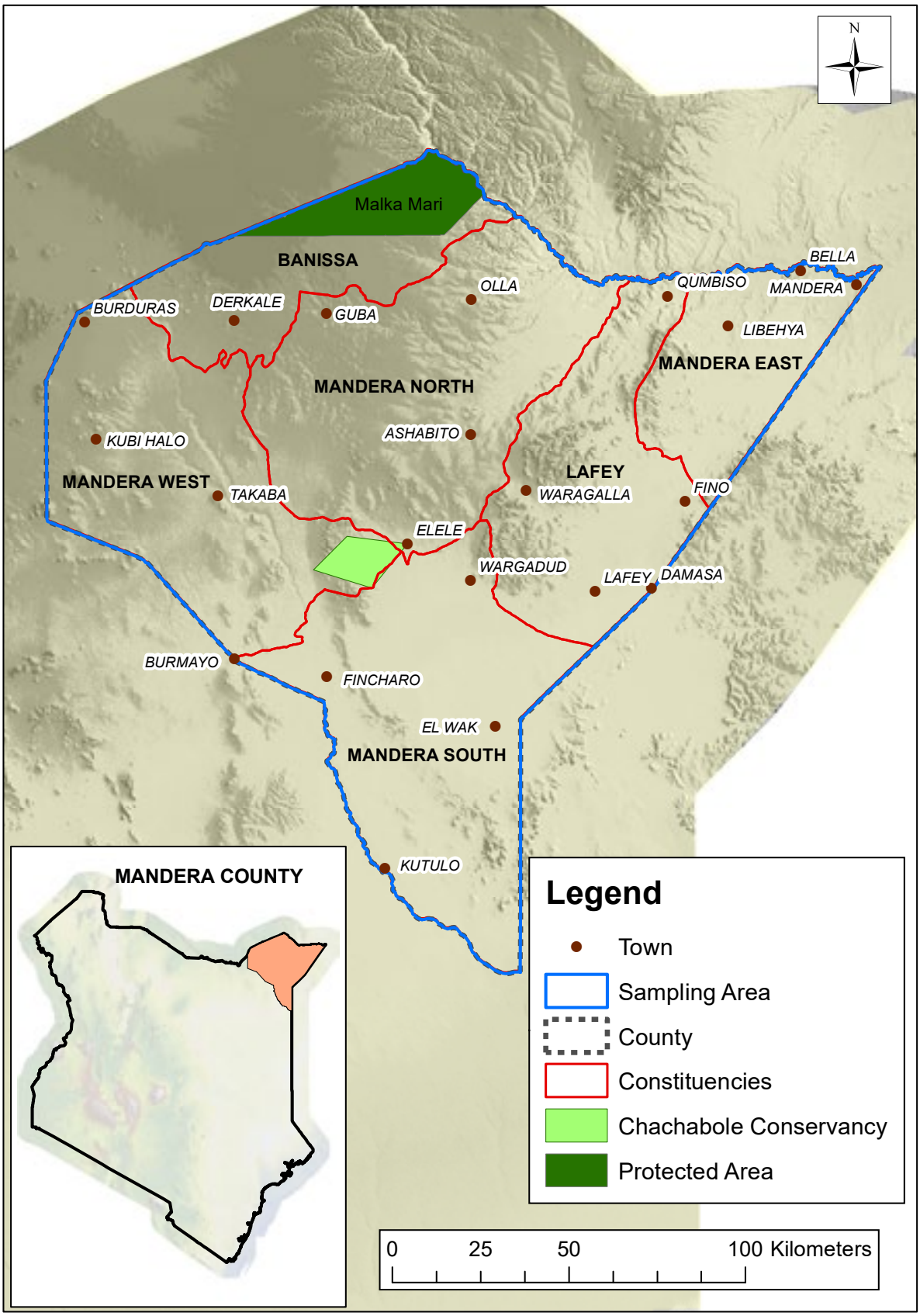


Figure 35: A map of Mandera County showing the constituencies

3.2.17 Garissa County

761,209 Shoat	77,494 Camel	47,270 Cattle free ranging
4,830 Reticulated giraffe	4,367 Donkey	3,442 Gerenuk
2,757 Grant Gazelle	1,795 Warthog	1,054 Oryx
943 Ostrich	333 Lesser Kudu	240 Dik dik
74 Grevy's zebra	55 Common zebra	37 Eland

The census was carried in Garissa county, which lies between latitude 10 58'N and 201'S and longitude 380 34'E and 410 32'E and covers 44,174.1km^2. It borders the republic of Somalia to the East, Lamu County to the South, Tana River County to the West, Isiolo County to the North West and Wajir to the North (Figure 211).

Garissa County, in the former North Eastern, is one of the rangeland counties found in Kenya. Kenya's rangelands constitute the arid and semi-arid lands (ASALs). The rangelands are dry, hot and have erratic rainfall often below 600mm annually and the home to almost 20% of the country's population mainly the pastoral communities with their large livestock populations. The rangelands are therefore very important in the Kenyan economy in terms of livestock production, as well as the conservation and management of wildlife that occurs in abundance and diversity. It is estimated the ASALs support almost over 50% of the nation's livestock population and over 70% of the country's wildlife population. In most of the year, over 70% of Kenya's terrestrial wildlife reside outside the protected areas and compete with livestock for resources such as water and forage. But in other cases, wildlife is restricted in the parks/reserves thereby degrading their habitats, particularly the vegetation.

Wildlife and livestock in the county is continuously facing increasing risks such as drought, insecurity, animal diseases, increasing human populations and land fragmentation. However, wildlife species co-exist and compete with livestock for survival. To address these challenges, there is need to generate adequate knowledge on the status of the wildlife and livestock populations for informed decision making.

The aerial sample count for Garissa County was part of the National wildlife census in all conservation areas to support implementation of GOK conservation policies and development of evidence-based decision support tools for adaptive management, integrated cross sectoral and multi-scale planning for conservation and sustainable development to optimize wildlife benefits to the country.

The wildlife Act 2013, schedule six (6) requires production of regular reports on the status of wildlife species whose numbers and range have significantly declined in the past three decades. These reports are presented to parliament by the Cabinet Secretary Responsible as stipulated in sections 49(4) and 64(3) of the WCMA, 2013.

Garissa County wildlife sample count was last done in 2011 by department of resource census and remote sensing(DRSRS) and since then policy decisions on wildlife conservation in the County has relied on the data.

This census is therefore targeted to be a manager's tool to manage wildlife resources in the County and manipulate the range condition and productivity of the various wildlife species, including distribution and provision of space and grazing. It will also be useful in provision of security towards wildlife while at the same time guide tourism activities in the conservation areas. Issues of human-wildlife conflicts will also be adequately addressed as well as resource allocation towards conservation and monitoring of the same.

The goal of this Census is to establish a wildlife population status in Mandera County. The specific objectives that aims to achieve this goa are to:

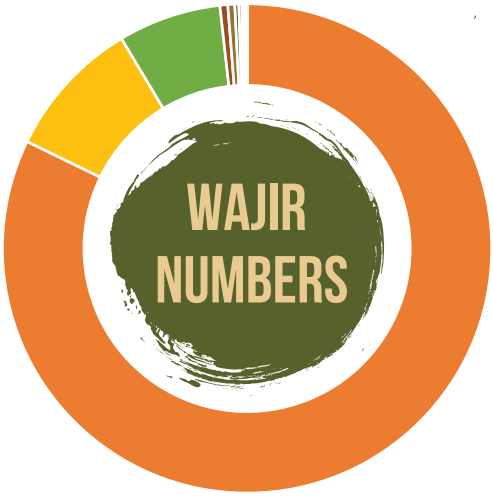
i. Determine wildlife population abundance and distribution

ii. Assess the wildlife population trends over time

iii. Identify threats to recommend appropriate strategies to wildlife conservation and management in the County

Figure 36: A map of Garissa County showing the constituencies

3.2.18 Wajir County



2,329,507 Shoat	261,327 Camel	192,854 Cattle free ranging
14,684 Grant Gazelle	12,967 Donkey	7,473 Gerenuk
6,120 Reticulated giraffe	3,090 Oryx	3,009 Ostrich
2,322 Warthog	302 Grevy zebra	201 Lesser Kudu
141 Lion	40 Dik dik	

Wajir county is located in the North-Eastern region of Kenya between latitudes 10N60'N and 0020'N and latitudes 390E and 410E. The County is a cross border county located in the north eastern region of Kenya. It borders Republic of Ethiopia to the North and Somalia to the East, Mandera County to the North East, Marsabit to the West, Isiolo to the South West and Garrisa to the South. The census focused on the entire county which is 55,840km^2. The County is divided into 6 constituencies as shown below. Wildlife is an important natural resource in arid and semi-arid zones of Kenya and its management requires regular species counts to provide a basis for measuring population changes over time and space.

Wajir County falls within the semi-arid pastoral rangeland of Northern Kenya, where wildlife and livestock abundance are inversely correlated with livestock concentrated around permanent water sources and wildlife density and diversity increasing much further from water points. This inverse correlation between livestock and wildlife abundance has been attributed to indirect interference from associated with livestock most likely because of poaching and harassment, rather than direct competition for forage (Augustine; 2010).

The court of arms for the county is a reticulated giraffe and a camel and the county is considered as the home and a stronghold of the two species. From 1977 to 2017, the Department of Resource Censuss and Remote Sensing (DRSRS) has consistently conducted aerial sample counts of livestock and wildlife in the North-Eastern region of Kenya aimed at assessing the status of the resources to inform decision making. According to the National Recovery and Action Plan for giraffes in Kenya (2018-2022), records indicate that, there is a 67% population decrease of giraffe since 1970s. This decline has affected all the three recognized subspecies and addressing this decline is of high priority. From 13th to 23rd June 2021, Kenya Wildlife Service (KWS), Wildlife Research and Training Institute (WRTI), DRSRS and National Air Support Department (NASD) jointly carried out a wildlife sample Count in Wajir County as part of the National Wildlife Census with the aim at updating the status of wildlife species in the region

Records of reticulated giraffe species indicate that the species has recently suffered a major and rapid decline giving rise to concern about its long term survival. According to the National recovery and action plan for giraffe in Kenya (2018-2022), Wajir County had an estimated population of 3,797 reticulated giraffes in 2016. All the three giraffe species in Kenya are protected under the Wildlife Conservation and Management (WCMA) Act 2013. Schedule 6 of the Act lists Nubian's giraffe as endangered while the other two species (Maasai and Reticulated) are listed as vulnerable and hence the need for action towards conservation of the three species.

Threats facing this species are both intrinsic and extrinsic in nature. The extrinsic threats include: poaching/illegal hunting, habitat loss, climate change, infrastructural developments and inter-specific competitions while intrinsic threats include; inbreeding, dietary complications (e.g., toxins) and diseases.

The giraffe recovery and action plan calls for species censuses in areas where information is lacking or gaps exist to assist in mapping range boundaries and distribution of giraffe subspecies in the country. This census was therefore aimed towards provision of information to guide decision making and consequently safe the giraffe population by addressing the threats faced by the species. Increased data collection is also expected to raise awareness on the plight of the species in this region.

The goal of the census was to determine the abundance and distribution of large and medium mammals in Wajir County. The specific objectives were to:

i. Determine the number and distribution (range) of wildlife species in Wajir County.

ii. Assess the distribution of available natural resources in relation to wildlife including water and forage.

iii. Map habitat destructive (logging, charcoal burning) and human activities (farming, settlements) in relation to wildlife distribution and abundance

iv. Map the distribution and abundance of livestock in relation to large mammals in the ecosystem

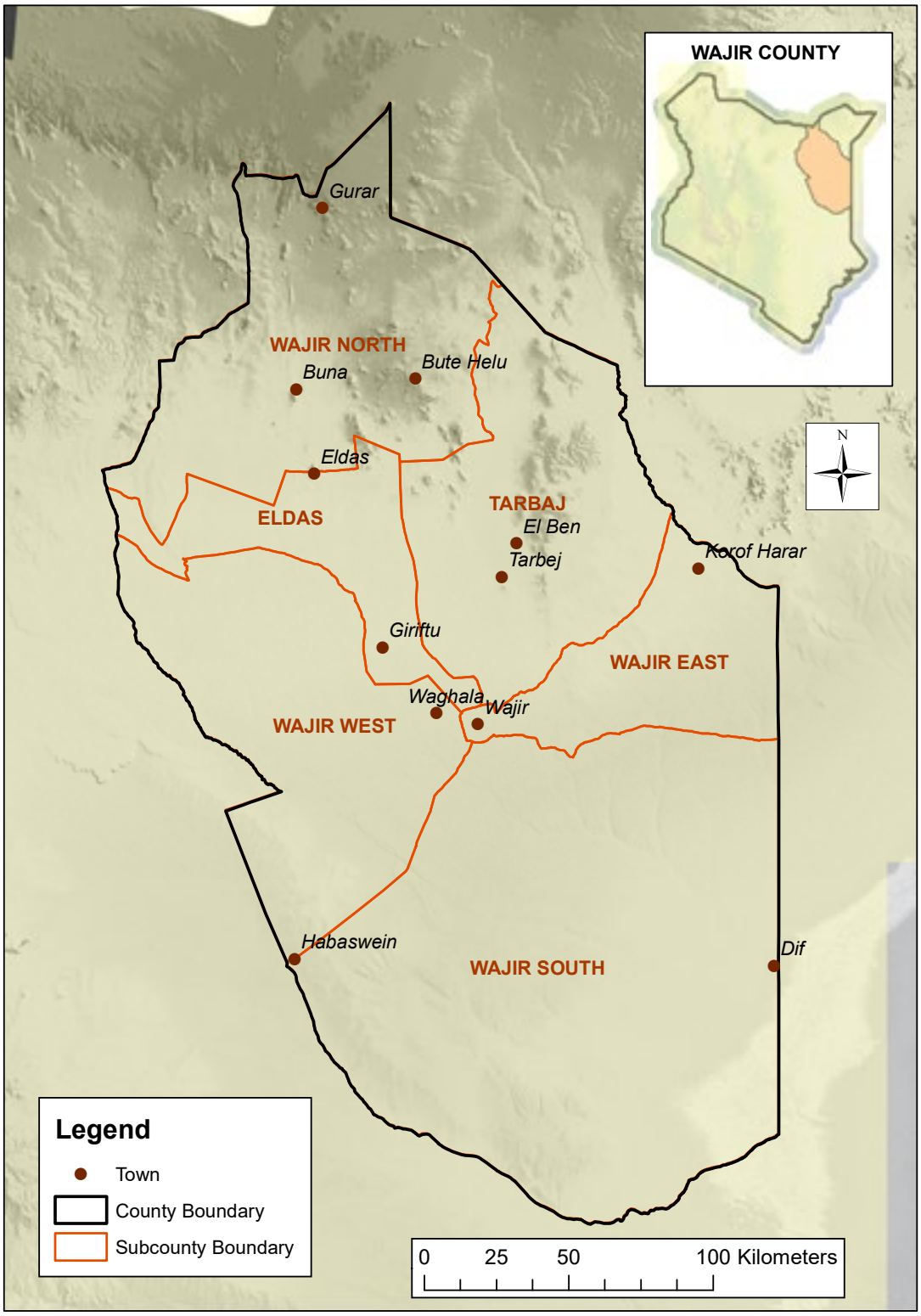
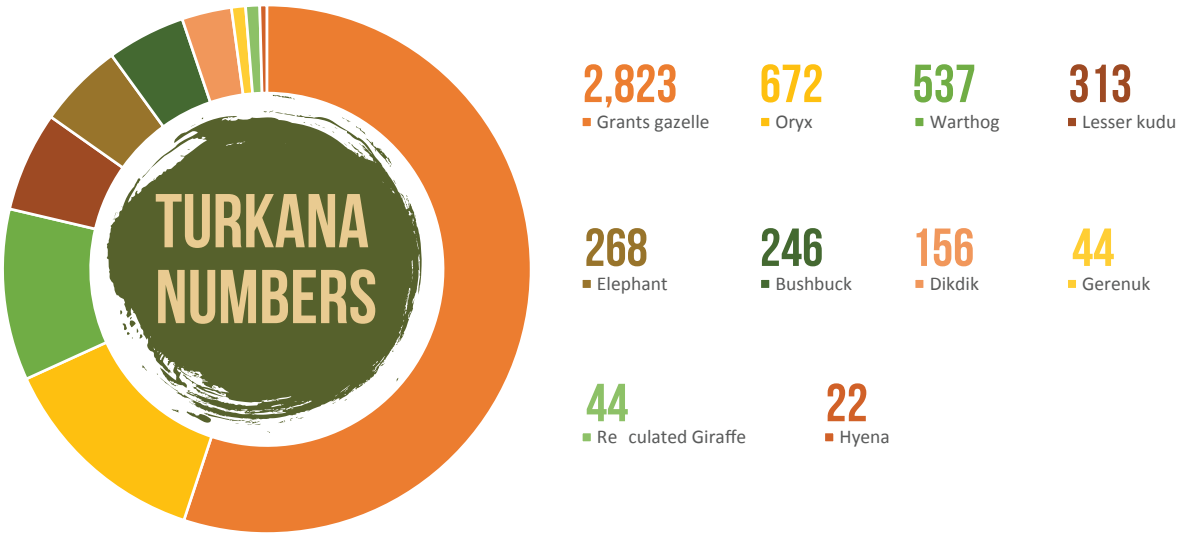


Figure 37: A map of Wajir County showing the location of the constituencies

3.2.19 Turkana County



The Kenya rangelands contain substantial numbers of wildlife. Wildlife contributes substantially to the national economy through tourism as the prime tourist attraction. Wildlife based activities contribute approximately 70% of gross tourism earnings. Generally, populations of many wildlife species in the country have declined over the years owing to factors such as habitat loss, changing land use patterns, poaching and drought, including other climate change related factors.

The County shares Lake Turkana with Marsabit County. The total area of the county is 77,000 Km² and lies between Longitudes 340 30'and 360 40'East and between Latitudes 10 30'and 50 30'North (Figure 229). Turkana County is home to several wildlife species. Some of the species that were observed during the count include: the elephants, gerenuk, lesser kudu, giraffe, Oryx, Grant's gazelle, Duiker, and Bushbuck, among other mammals.

The decrease in numbers for some wildlife species over the years as shown in trend analysis could be attributed to negative impact resulting from climate change, poaching and competition for resources (forage and water) with both livestock and humans, and disruption by increased human activities. Conservation of wildlife in protected areas such as South Turkana National Reserve should continue. Kenya Wildlife Service (KWS) may enhance anti-poaching measures to stem poaching of some species. Also, involvement of local communities in wildlife management can be incorporated in the wildlife conservation strategy of the county.

Livestock grazing is the main land use and economic backbone of Turkana County. Therefore, there is need to support the pastoralists so as to promote their economic base and enhance their livelihoods. This could be achieved through increased infrastructure development; provision of marketing facilities and construction of abattoirs for livestock off-take during drought to prevent losses; improved livestock breeds; sustainable range utilization during the wet seasons, and provision of insurance for the risks of livestock deaths during adverse weather conditions, among other interventions.

The key threat to wildlife conservation and management in the county is land use / land cover changes. This is especially more so due to increased human related infrastructure development. In recent years, there has been enhanced mining and exploration of oil and other minerals in the county. This has led to increased human population from prospectors and visitors, and also interference with wildlife habitats.

Although the county has two National Reserves in existence, publicity and public awareness about Nasolot and South Turkana National Reserves is minimal and they rarely attract visitors. There is need for integrated management of these two reserves between KWS and the County Government of Turkana.

The goal of this census was to determine population size and distribution of large to medium sized mammals. The specific objectives were to:

1. Determine wildlife population abundance, species composition and distribution in the County
2. Assess the wildlife population trends in the County
3. Identify and map threats to wildlife conservation in the County
4. Map the distribution and abundance of livestock in relation to large mammals in the County

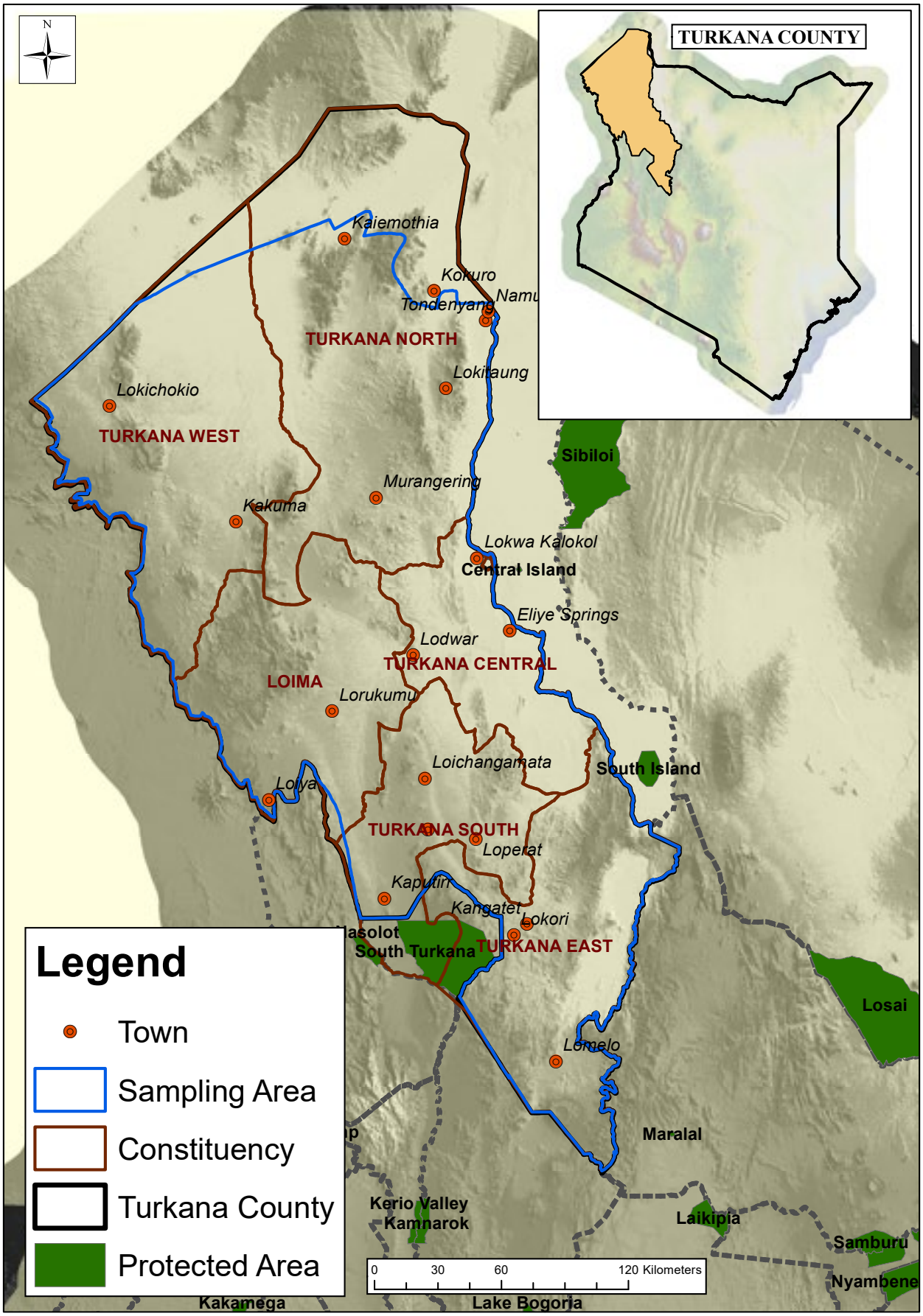


Figure 38: Map showing the location of Turkana

3.2.20 Marine ecosystem

495 Silky Shark
358 Oceanic whitetip shark
354 Indo- Pacific bottlenose dolphin
222 Scalloped Hammerhead
89 Giant Guitarfish
63 Humpback whales
60 Sawfish
29 Great white shark
23 Bowmouth guitarfish
17 Tiger shark
11 Mobula rays
9 Whale shark
3 Halavi guitarfish
3 Lesser guitarfish
3 Dugong
2 Blue whale
2 Basking shark

Kenya is endowed with biologically rich marine ecosystems ranging from, mangrove forests, coral reefs, seagrass beds, estuaries, sandy shores, sand dunes and rocky shores. These ecosystems provide important goods and services such as; habitats for fish and other aquatic and terrestrial organisms, erosion control, provision of wood and non-wood forest resources, provision of food, water and industrial resources to millions of people along the coast. This chapter highlights the status of these ecosystems and their associated biodiversity; pressures that threaten their long-term integrity; as well as management interventions.

The information provided covers approximately 600 km long coastline extending from the Kenya-Somalia border at Ishakani in the north (1.7°S;41.5°E) to Kenya-Tanzanian border at Vanga in the south (4.7°S; 39.2°E; Figure 1). The Kenyan territorial waters extend from the shoreline up to 12 nautical miles covering approximately 9500km^2. The Exclusive Economic Zone (EEZ) which extends to the 200 nautical miles offshore covers an approximate area of 142,000 km^2. The coastal counties include: Lamu, Tana River, Kilifi, Kwale and Taita- Taveta.

The Kenyan inshore waters experiences semi-diurnal tides with a spring tidal range of not exceeding 4 m. The coastal offshore waters experiences swell whose magnitude varies in different periods of the year. The waves are usually very large with a maximum significant height of 8m during the southeast monsoon (May-October) approaching the coast predominantly from south-east and southwest direction.

Kenya hoists a number of marine species of conservation concern due to their rarity, endemism and have evidence of declining population. They include marine mammal species (Cetaceans and Sirenians), sea turtles and bony fishes and elasmobranchs (sharks and rays). A total of 24 marine species have been reported in inshore and off shore waters of Kenya. The most frequently reported species are humpback whale during their peak migration period, July to September and the Indo-Pacific bottlenose dolphin from November-April. Humpback whale sightings are higher because of increased observer effort during the migration period.

The objective of this section is to provide the current information and status of marine biodiversity focusing on marine habitats and species of conservation concern which include Marine mammals, Sharks and Ray, Sea turtles, Coastal birds, Exploited fishery resources, Corals reef ecosystem, Seagrass ecosystem and Mangrove ecosystem.

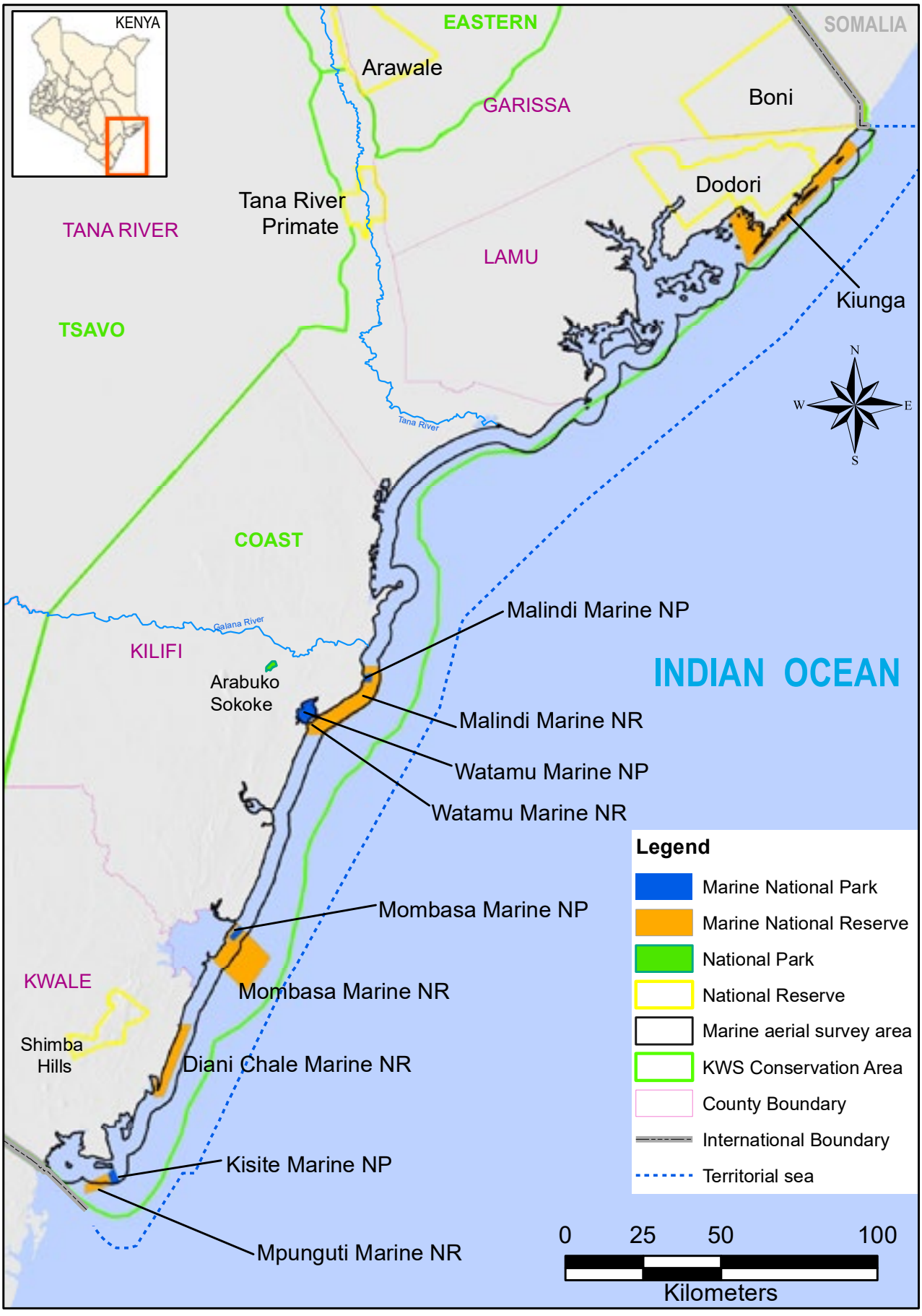
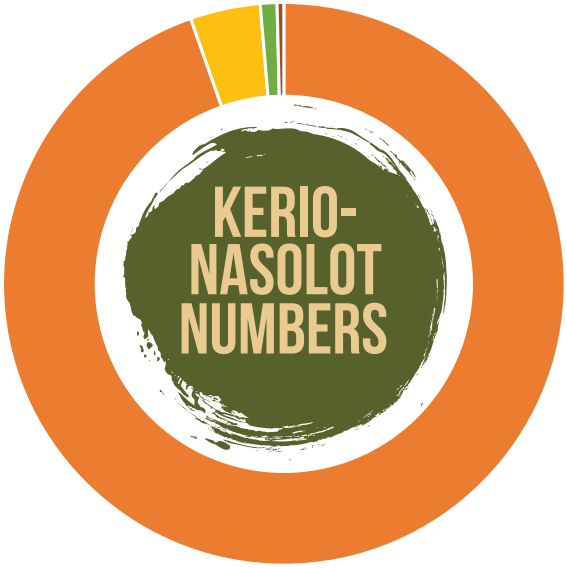


Figure 39: Map showing the location of Marine

3.2.21 Nasalot-South Turkana-Kerio Valley ecosystem



493
African Elephant

21
Warthog

5
Lesser Kudu

2
Grant's Gazelle

The Nasalot-South Turkana-Kerio Valley ecosystem covers Nasolot, South Turkana, Rimoi and Kamnarok National Reserves and the surrounding areas with an estimated area of 4571km^2. It encompasses elephant ranges of West Pokot, Elgeyo Marakwet, Turkana and Baringo Counties. This dispersal area covers a part of the Kenyan North Rift between 204' N and 0046' North and 3503'E and 3602' East. The ecosystem comprises the Kerio valley which is lined by the Turkwel gorge to the North. The gorge branches into escarpments flowing southwards to Keiyo and Baringo which host Rimoi and Kamnarok National Reserves respectively. Nasolot and South Turkana National Reserves covering 92 km^2 and 1019 km^2 respectively form the Northern part of the study area while Rimoi and Kamnarok National Reserves in the south cover 66km^2 and 87.7km^2 respectively. The Kerio valley is situated at 1,000m and is formed by a narrow and long strip of approximately 80 km and by maximum 10 km wide (OP/MPND, 1991 & 2000; Chebet and Dietz, 2000; Jeatzold and Schmdt, 1983). The total aerial census took placein this area as part of the National Wildlife Census.

Kenya through the Wildlife Research Training Institute (WRTI) and the Kenya Wildlife Service (KWS) is for the first time undertaking a one-off national wildlife census to establish the status of her wildlife resources. Kenya's rich wildlife resource is one of the key economic pillars of the country. However, the country is not receiving optimized benefits as anticipated due to inadequate knowledge on the status of the country's wildlife populations as there is no comprehensive population data for many species of wildlife to inform management.

In every three to five years the Ministry of Tourism and Wildlife is required to provide information as outlined in the Wildlife Conservation and Management Act (WCMA), 2013 as well as the status of wildlife resources monitoring report respectively.These reports are supposed to be presented to Parliament by the Cabinet Secretary responsible for Wildlife Conservation and Management as stipulated in sections 49(4) and 64(3) of the WCMA, 2013. This report focuses on a two day aerial census which was conducted in Nasolot/South Turkana/Rimoi/Kamnarok areas on 4th and 5th June 2021. South Turkana and Nasolot reserves probably hold the largest elephant population in western Kenya.

This census will enhance conservation efforts by determining the exact numbers of all wildlife including the endangered species and their exact location. It will also establish an updated data base which will form a basis for establishing real economic value of wildlife capital for reflections in the national budgeting process and enhance conservation efforts.

The last comprehensive total aerial count was carried out in 2015 (Chase et al., 2015). In 1973 it was estimated that there were 1,500 elephants in Turkana District, but figures were unavailable for West Pokot, Elgeyo Marakwet and Baringo districts (Jarman, 1973). Censuss undertaken by Department of Remote Sensing and Resource Censuss (DRSRS) in 1970's and 1980's generally yielded low estimates apart from one count in 1981 that recorded more than 800 elephants outside the reserves. Kenya Wildlife Service estimated in 1990 that 400 elephants utilized Nasalot and south Turkana with another 100 in Rimoi and Kamnarok. DRSRS sample counts in the same year gave estimates of 535 for West Pokot (including Nasolot), zero for Turkana and 596 for Baringo. In a sample count that was undertaken by Mbugua (1992) in Elgeyo Marakwet, a small number of elephants was sighted inside the sample strips, and thus the count was treated as a

low-intensity total count. The count further presented a similar figure of 580 elephants, of which 525 were in Nasolot and South Turkana. Since this was carried out at a low intensity, it was estimated that the total population could have consisted over 900 elephants. Total aerial counts of the Nasolot/South Turkana elephants were carried out in June 1997 (Muriuki et al.1997) and July 1999 (Omondi et al.1999) that employed methods by Douglas-Hamilton et al.1994 and Douglas-Hamilton, 1997. A total of 852 and 792 elephants were counted in 1997 and 1999 respectively. In both counts the majority of elephants were found in the northern block of Nasolot/South Turkana, with smaller numbers observed in the southern Kerio block in the environs of the Rimoi and Kamnarok National Reserves. In 2002 (Omondi et al, 2002), a total aerial count was conducted and a total of 490 elephants were recorded. Most of them were found further south east towards South Turkana National Reserve and the rest in the furthest south of the Kerio valley in Rimoi National Reserve. The most recent total aerial count was undertaken in 2010 (Edebe et al, 2010) and a total of 362 Elephants were recorded. Other wildlife species counted included grant gazelle, lesser kudu, dik dik, and domestic livestock mainly cattle, camel, sheep and goats (Shoats). Cultivation and new human settlements were observed while pastoralism was noted as the main economic activity.

The objective of the exercise was to ascertain Nasolot-South Turkana-Kerio valley wildlife population and distribution, determine the exact locations of wildlife in those areas to minimize human wildlife conflict and identify threats to wildlife conservation and management.

The specific objectives of the census were:

a. To determine the number and distribution of large animals

b. To map out various human activities to assess current pressures on wildlife conservation

c. To document the number and distribution of livestock in relation to large mammals in the ecosystem

d. To establish spatial distribution of threats to wildlife due to anthropogenic activities

e. To interpret the information obtained and deduce sound management decisions to guide management of wildlife in the ecosystem

f. Provide baseline wildlife data for the National Wildlife census

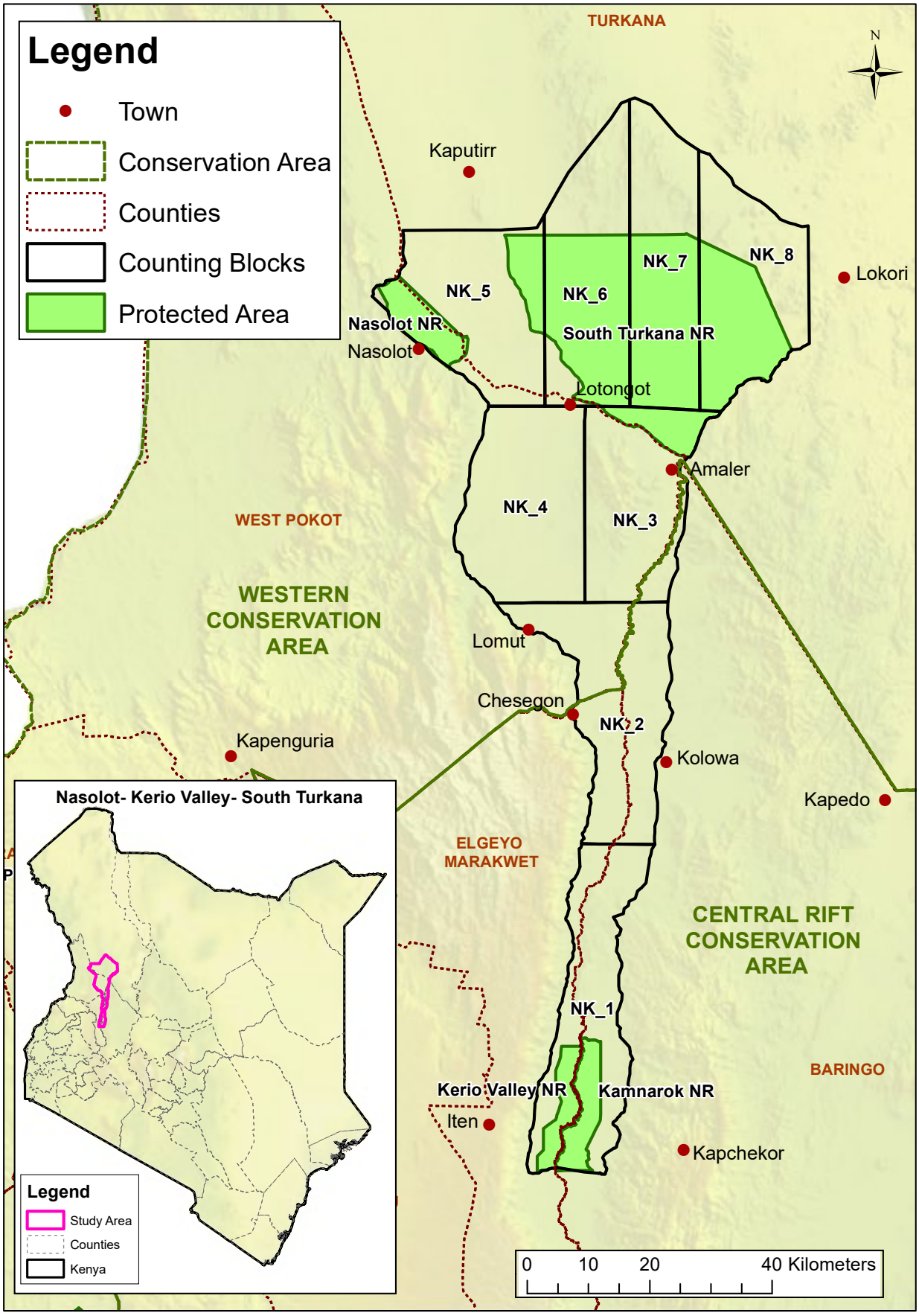
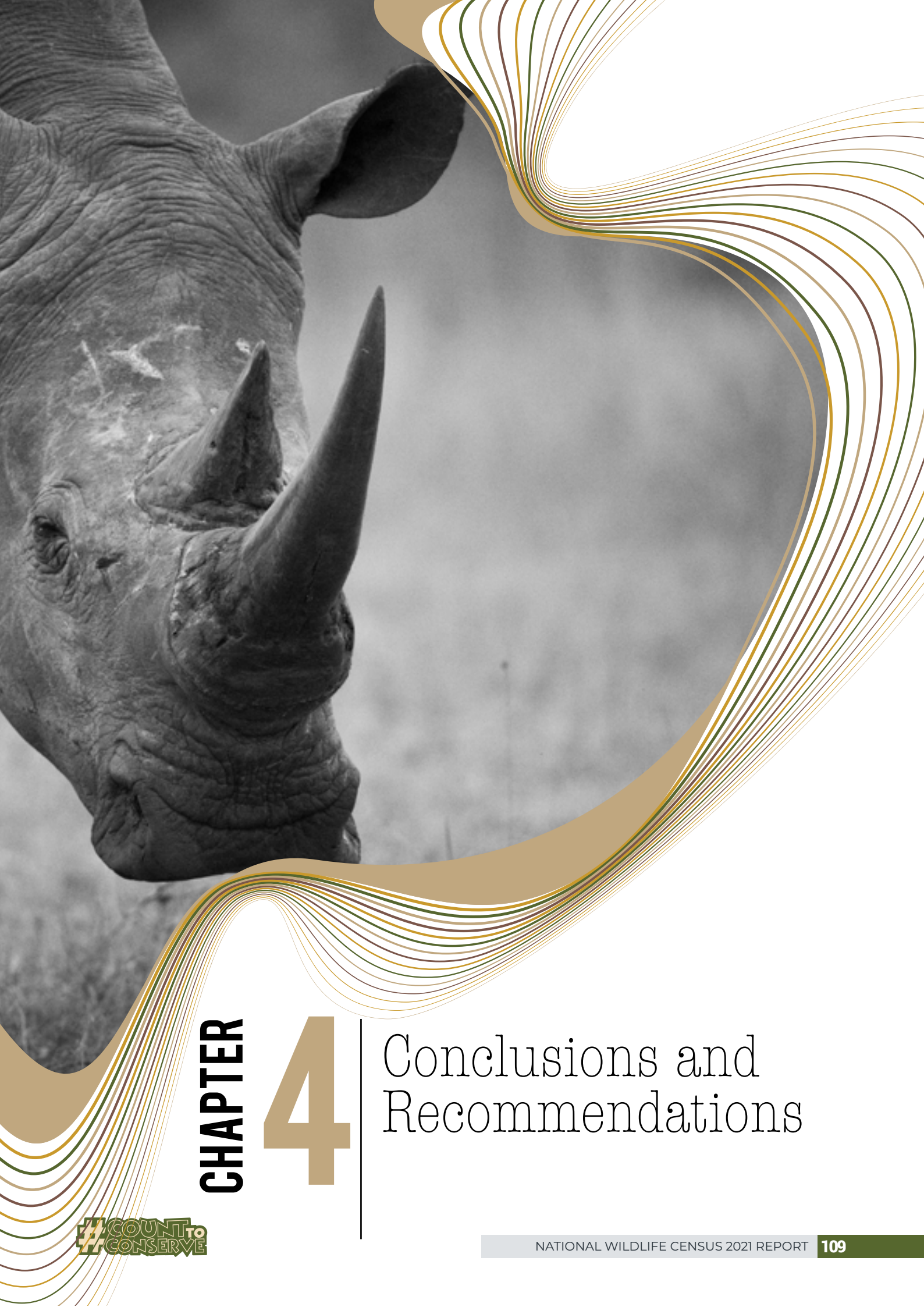


Figure 40: Map of the study area showing the extent, county boundaries, and the KWS conservations regions.



CHAPTER 4

Conclusions and Recommendations

#COUNT TO CONSERVE

4.1 | CONCLUSIONS

The national elephant population has increased from 32,214 animals in 2014 to the current population of 36,169 animals in 2021. This represents a 12% population increase in 7 years or 1.75% annual increase over the period. The 2014 period marked the peak of poaching in Kenya. During the period, elephant population was adversely affected by the poaching. The population reduced from 35,588 elephants in 2012 to 32,214 elephants in 2014. Since then (2014), the elephant population has increased. Therefore, efforts put in place by the Government to curb elephant poaching in different ecosystems continue to be productive. These efforts should be continued to further sustain future elephant population growth and range expansion.

The national giraffe population also recorded growth from about 23,000 animals in 2019 to about 34,240 animals in 2021, which represents about 49% increase in three years. However, this increase is attributed to inclusion of more updated data of reticulated giraffe in northern Kenya (Wajir, Mandera, Garissa and Turkana Counties) in 2021 as the data used in 2019 for these counties was for 2011. However, it is important to note that there has been a notable increase of all the three species of giraffe found in Kenya. Efforts to increase penalties on crimes related to threatened species appear to be bearing fruits. Such efforts should be sustained for long term conservation and management of this species.

The three key ecosystems for buffalo include Maasai Mara ecosystem, Tsavo ecosystem, Lake Nakuru National Park and Laikipia-Samburu-Marsabit ecosystem. The Maasai Mara ecosystem recorded the highest population of buffalo in the country (n=11, 604 buffaloes), which represents about 28% of the total buffalo population in Kenya. This is followed by Tsavo ecosystem (19%), Lake Nakuru National Park (15%) and then Laikipia-Samburu-Marsabit ecosystem (15%). These four ecosystems account for about 78% of the total Kenya's buffalo population. Efforts to sustain these populations through veterinary interventions to prevent disease outbreaks, climate mitigation measures to evade drought impacts on their population, enhance security surveillance to prevent poaching for bush meat and use of conservancy concept outside protected areas are necessary.

Our results reveled that Kenya has a population of 473 sitatunga out of which 424 and 49 individuals were recorded in Western and Central Rift Conservation Areas respectively. It is important to note that these populations occur in unprotected wetlands across their range. It is only in Saiwa Swamp National Park and Kitale Nature Conservancy where this species occur in a protected areas. It is therefore important to engage with communities and County Governments where these species occur to explore options of making them acquire some conservation status. Community conservancies and County Reserves can be established in such range sites by communities and County Governments.

Special attention should also be given to species with less than 100 individuals (e.g., roan and sable antelope and mountain bongo) so that their conservation status is enhanced. Interventions like developing of predator free sanctuaries and intensive management need to be explored to save these species from local extinction. A special example that has proved that such species populations can grow is the hirola in Ishaqbin Sanctuary whose hirola population has continued to grow since its establishment. This has improved the National Hirola population which stands at 497 animals in 2021. In addition, options to enhance the population is to import individuals from other wild and captive source sites outside Kenya. This will promote revival of the species and genetic mixing to improve survival of new progeny.

There has been an influx of livestock into the key wildlife ecosystem like Laikipia-Samburu-Meru-Marsabit, Tsavo, Maasai Mara and Lamu-Lower Garissa. This scenario will possibly affect the wildlife species negatively as their habitats become encroached and competition for resources (water, space and forage) increase. As such, displaced of wildlife is likely to occur as they avoid competition with the livestock. This was observed in Laikipia-Samburu-Marsabit-Meru Ecosystem, where it is believed elephants relocated to the hilly areas in the ecosystem, which made it difficult for the census team to sight and count them leading to an overall recording of less population than was recorded in 2017. Such incursions also fuel poaching as most herdsmen are armed with automatic weapons.

Also, there is continued pressure of human activities on wildlife and its habitats within most of the ecosystems. It is unlikely that majority of the wildlife species would co-exist with livestock or in areas with high density of human settlements. Conflicts like crop raids, human-deaths and injury, property destruction and disruption of community social and economic life are destined to ensue in new crop farming and settlement areas. Efforts to develop spatial plans by county governments will help separate humans and wildlife or promote human-wildlife co-existence programs thereof.

Lastly, aerial and ground census methodologies are expensive and labour intensive to implement at national scale. Alternative new technologies that utilize artificial intelligence, operating in a more intensely targeted way over a much smaller landscapes, have recently been tried to count wildlife. For example application of remote sensing combined with artificial intelligence software is promising as the future of wildlife censuses. It is likely, given their agreement with historic estimates that these will be more suited to the long term monitoring of wildlife in future. However, until newer methods can deliver a calibrated trend for population status monitoring and management uses, the current aerial and ground census methodologies are still satisfactory for these purposes.

4.1 | RECOMMENDATIONS

From our findings we recommend the following:

1. The National Wildlife Census to be conducted after every three years in line with wildlife ecological cycles. In this regard, a budgetary allocation by the National Treasury during the budget cycle every three years is critical.
2. An annual budget is required to support annual and active monitoring of rare and endemic species such as roan antelope, sable antelope, mountain bongo, rhino, Grevy's zebra, hirola and sitatunga
3. An immediate budget support is required to establish status of species currently threatened by illegal trade and bush meat such as pangolins, dik diks and gazelles and those species that were not covered during this census such as leopard, small carnivores and non-human primates
4. There is need for review of legislation to recognize community conservancies as protected areas as they constitute important wildlife range
5. To improve the ecological integrity of dormant parks and reserves, there is need to enhance public-private partnerships
6. A budgetary support is required to establish a data portal and access mechanism at the Wildlife Research and Training Institute to inform wildlife management as part of its mandate
7. For the endangered, rare and endemic species such the black rhino, mountain bongo, roan antelope, sable antelope among others, there is need for budgetary allocation to support development and implementation of their recovery plans.
8. Deliberate efforts to secure existing rhino population and additional space for rhinos due to the huge investment costs, security and management requirements
9. Invest in new innovations, modern census equipment and software to improve efficiency in undertaking wildlife censuses.
10. The County Governments to incorporate the census findings in the development of the County Integrated Development Plans (CIDP) and spatial plans.
11. The WRTI to pilot models of wildlife utilization programme as part of management of common species to enhance benefits to land owners who live with wildlife.
12. Fast track the full operationalisation of the WRTI which is the corporate body mandated to undertake and coordinate wildlife research.
13. Undertake a national classification of species with low populations in consultation with IUCN.

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