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# Species Composition and Relative Abundance of Medium and Large Sized Mammals in Woyde Woshe Community Reserve Forest Areas, Kucha Alpha Woreda, South Gamo Zone, Southern Ethiopia

Tamirat Haile Chankallo
Ethiopian Wildlife Conservation Authority, Nech Sar National Park, Ecologist, Arba Minch, Ethiopia

**Abstract**
The overall objective of this study was to understand the Species composition & relative abundance of medium and large sized mammals in Woyde Woshe Community Reserve forest areas. Systematic Random sampling design frame were employed to ensure the representativeness of the study population by sampling the total area of the forest. Transect line varies from 1-2.1km long were sampled. Besides direct methods, indirect methods such as faecal droppings, fresh tracks, carcass or shell count, den (burrow), hair, and digging were used. An ecological study on medium and large mammal's species has been carried out from January-March for dry season, & June–August for wet season. Data were analyzed using descriptive statistics. 17 mammalian species belonging to six orders & eleven families of medium and large sized mammals were identified in WWCRF. The species recorded were The majority of the mammalian species in the area were *Papio anubis* was the most abundant followed by, *Cercopithecus pygerythrus, Colobus guereza, Cercopitheus neglectus, Sylvicapra grimma, Crocuta crocuta, Potamochoerus larvatus, Hystrix Cristata,Traglaphus Scriptus, Orycteropus afer, Oreotragus oreotragus, Genetta feline, Lepus habessinicus, Felis Caracal, Panthera paradus, Felis Serval , & Canis adustus*. Seasonal variation in the number of species of medium & large sized was significantly different ($p<0.05$). A total of 532±10 & 362±7 medium & large sized mammals were counted during wet & dry seasons, respectively. Therefore, i suggest that to protect both nature & wildlife protection the important steps is studying on mammals and sustainable income generating strategy for local community to solve management problems of anthropogenic.
**Keywords:** Alpha Woreda , Bala Barsa Woyde, Community Reserve forest, Gamo Zone, Kucha Woreda, Relative Abundance, Mammals, Woyde Woshe
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## Introduction

Mammals are any member of the group of vertebrate animals in which the young are nourished with milk from the special mammary glands of the mother [1]. Mammals are a highly evolved group of the Animal [2] and their taxonomic diversity of 5487 species and 29 orders of living mammals [3]. Mammals are among the most studied vertebrate taxa and yet new species are still being discovered and described [1].

Ethiopia is one of the countries found in the eastern horn of Africa, which is endowed with spectacular landscape and topography from which diverse habitats and associated flora and fauna are found [4]. Ecosystem is stratified into several ecological units, the associated diversity in climate and the varieties of ecosystems have rendered the country has a diverse, rare, unique and endemic species [5] .Wild animals (mammals, birds, amphibians, reptiles and fish) were abundant in a bewildering variety, but currently in a declining state due to anthropogenic pressures [4,6]

The country is also rich in its faunal diversity [7].The Ethiopian mammal fauna consists of 326 species, under 144 genera, 43 families and 14 orders [8, 9]. The number of mammals in Ethiopia is much higher than in other African countries [10]. More than 60% of the mammal species in the country are medium & large-sized [10]. Ethiopia contains over 57 endemic small and large mammals [9]. Among mammalian species are endemic (36 rodents, 10 shrews, 3 bats, 2 primates, 5 artiodactyls, and 1 carnivore) [10,5]. However, studies on the population ecology of mammals are still poorly known in many parts of Ethiopia. The present study area, Woyde Woshe community Reserve forest areas, is one of the natural forests located in the Alpha Woreda, South Gamo Zone, which is managed by the local communities. It is an area that is endowed with biodiversity, albeit there are no ecological studies on mammals carried. Thus, the present study was aimed to investigate species composition & relative abundance of medium & large-sized wild mammals in the study area.

## Description of the Study Area

**Location of the study area:** The study was conducted in Alpha Woreda which is one of the 11 woredas of Gamo Zone in the Southern Nations Nationalities and Peoples' Regional State (SNNPRS). Alpha Woreda is geographically located between $6^0$ 26'0"E - $6^0$ 42'30"N longitudes and $37^0$6'0" E-$37^0$26'0"E Latitude. Elevation

ranges Alpha woreda from 800m to 2,250m. Woyde Woshe (Bala Barsa Woyde) Community Reserve forest areas is found in Alpha Woreda. Located at $6^0$ 35' 0"E - $6^0$ 36'30"N longitudes & $37^0$19'30" E-$37^0$ 21'0"E E. It lies in between Daho kebele & woyde woshe (Bala Barsa Woyde) kebele. The elevation is ranging between 1,6000m and 2,250ml. It is about 20 km from Alpha Woreda (Toko city). Woyde Woshe (Bala Barsa Woyde) community Reserve forest area is 75 km far from the Selamber town administrate Kucha Zuriya district, & 235 km from Arba Minch & Gamo zone administrate. The community Reserve forest area encompasses about 1,548 hectares. Boundary designated and the forest was established in 2000. However, the boundary was redemarcated and being legalized by SNNPRS in 2001. It is the community managed forest which is bordered by five kebeles namely: Woshe, Obe, Uruka, Shile and Yagara kebeles. As obtained from our preliminary information conducted with the local communities in the surrounding area; the forest reserve is believed to possess a variety of indigenous plants and mammals.

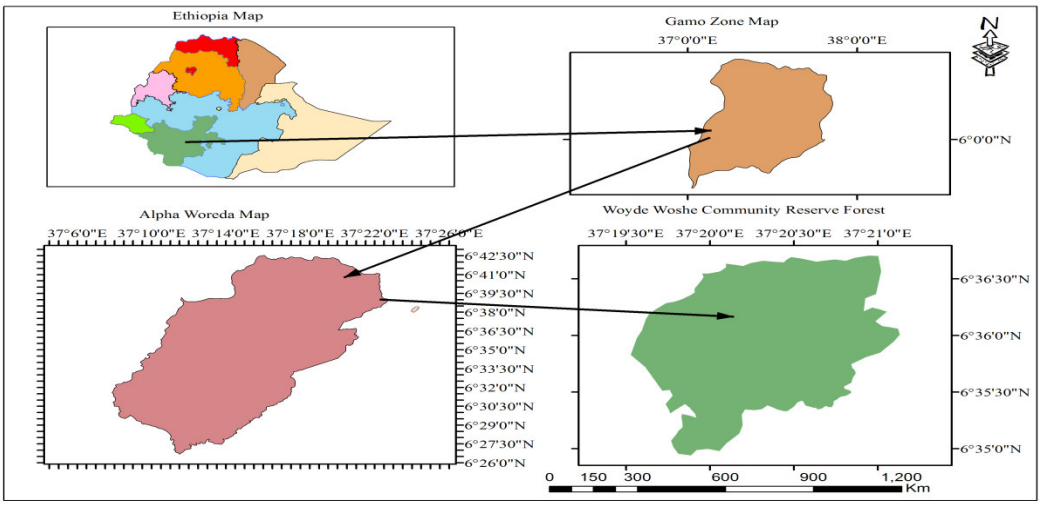


**Figure 1**: Location of the study area (Woyde Woshe Forest Reserve).

The most dominant plant species in the forestland are : *Podocarpus falcatus*, *Asparagus africanus*, Vernonia species, *Olea* africana, *Croton macrostachyus, Syzygium guineense, Euphorbia ampliphyla, Maesa lanceolata, Flacourtia indica, Ficus vasta, Carissa edulis, Hagenia abyssinica, Embelia schimperi, Dombeya torrida, Coffee arabica, Erythrina burana, Celtis* Africana, *Yushania arudinaria alipna* (Highland Bamboo)

**Study Design & Sampling Technique:** Transects direct survey methods were used to collect data on count wildlife in the study area. Moreover, beside existing routs/roads in the forest were used for indirect survey methods of medium and large-sized mammals such as fresh tracks, fecal droppings, dens/burrows, hair, and digging. Line transect sampling method were used so as to survey the Species composition and relative abundance of medium and large mammals species in the forest following [11]. Transect lines were delineated by GPS and natural signs. Systematic Random sampling design frame were employed to ensure the representativeness of the study population by sampling the total area of the forest. The length of transect line was varied from 1km to 2.1 km depending on the forest. The gap between consecutive transects were maintained at a minimum of 0.5km in order to avoid any double counting of mammals in the study area. To avoid edge effects, steep flates and clip area, transects were spaced 0.1km from the edge of the of forest.

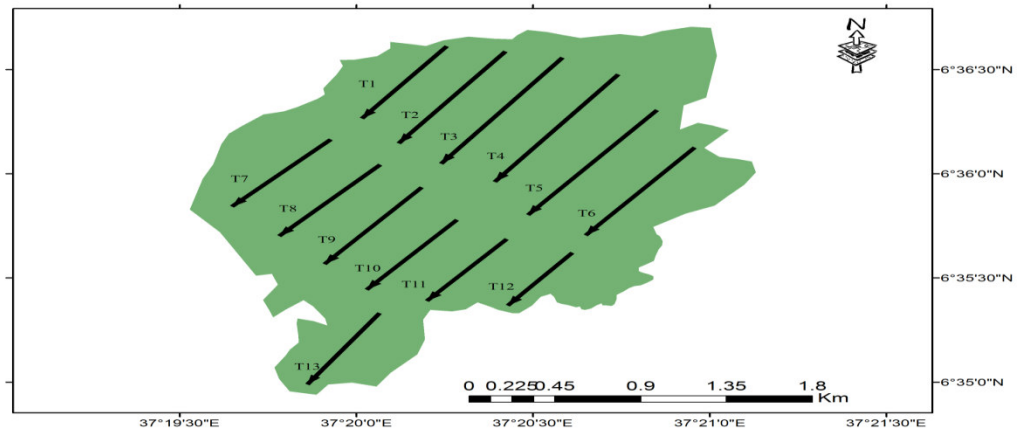


Figure 2: The number of sampled transects in the study area

**Data Collection:** From information gathered during preliminary survey, the study area has long short dry season (January to March, 2022) & wet season (June to August). Thus, intensive field work for ecological aspects of the mammals was searched the study area over a 44 day period (January, 202 to August, 2022) to include both seasons in the study. A total 6 month population survey has been used. In order to enhance the sampling effort both direct and indirect methods were used. The former method includes line transect survey [12] identification of the mammals orders, family and species [2] counting all the individuals of every species directly observed with naked eyes and by using binoculars more ever, indirect evidences of animals presence such as tracks/imprints, fecal/scat and den/burrow found along the transect line were also recorded [13]. Transects were traversed on foot. The starting and ending points of each transect, distribution were marked by GPS [14]. The average speed for walking transects was 1- 1.5 km/h based on the vegetation and accessibility of the area. To enhance sampling effort, in a single visit, each transect were walked twice from 06:00–09:00 AM and 04:00–07:00 PM when many mammals are become active for feeding and maximum observation animals was possible [14] and were visited bi-monthly during the data collection periods of both seasons. During transect visit, two researcher and three trained field assistant were traverse the track lines. Both were assigned to the left or right side of the transect line and scanned the route following [15]. In each observation event, species type, group size/number of individuals, sighting distance as well as distance traveled on transect line were recorded on the data sheet.

**Data analysis:** The identified species were taxonomically grouped into their respective order & family. The conservation status of each species was also identified based on the data generated from IUCN Redlist Species version 2021-1.*http//www.iucnredlist.organizatiion* [16]. For species richness computation, the minimum numbers of species identified were considered. Species richness was analyised by Microsoft EXCEL programs. The relative abundance of each species observed medium& large sized mammals in the forest was computed using the formula

$$\text{Abundance}=\frac{\text{total number of individual of a species} * 100}{\text{Total number of individual's species in the sampe forest}}.$$

**Result**

**Species composition and richness of medium and large sized mammals in WWCRF**

Overall 17 mammalian species belonging to six orders and eleven families of medium and large mammals were identified in woyde woshe Community Reserve forest areas (Table1). Representing 6 Carnivora species from the families Felidae, Family Hyeanidea, Viverridae & Canidae was recorded, 4 Artiodactyla species from families Bovidae & Suidae was recorded, 4 Primates species from the families of Cercopithecidae & colobidae. 1 Rodentia species from families Hystricidae was recorded. 1 Tubulidentata species from families Orycteropodidae was observed and lastly 1 Lagomorpha species from Family Leporidae was recorded.

**Table 1: List of medium and large mammals recorded in WWCRF**

| Scientific Name | Common name | Local Name | IUCN Category | CITES | Identification Methods |
|---|---|---|---|---|---|
| order Primates | | | | | |
| Family Cercopithecidae | | | | | |
| *Cercopithecus pygerythrus* | Vervet Monkey | Qare | | | Direct |
| *Papio Anubis* | Anubis Baboon | Gelesho | Least Concern | Appendix II | Direct |
| *Cercopitheus neglectus* | DE-Brazza's monkey | Boleqon do | Least Concern | Appendix II | Direct |
| Family colobidae | | | | | |
| *Colobus guereza* | Colobus monkey | Wono | Near-Threatened | Appendix II | Direct |
| Odrder Artiodactyla | | | | | |
| Family Bovidae | | | | | |
| *Traglaphus Scriptus* | Bushbuck | Gara | Least Concern | Appendix II | Direct |
| *Sylvicapra grimma* | Bush Duiker | Ge naa | Least Concern | Appendix II | Direct |
| *Oreotragus oreotragus* | Klipspringer | Gufale | Least Concern | Appendix II | Direct |
| Family Suidae | | | | | |
| *Potamochoerus larvatus* | Bushpig | Gudunth a | Least Concern | Appendix II | Indirect |
| Order Rodentia | | | | | |

| Scientific Name | Common name | Local Name | IUCN Category | CITES | Identification Methods |
|---|---|---|---|---|---|
| Family Hystricidae | | | | | |
| *Hystrix Cristata* | Crested porcupine | Kotariss a | Threatened | Appendix II | Indirect |
| Order Carnivora | | | | | |
| Family Felidae-cats | | | | | |
| Panthera paradus | Leopard | Mahe | Threatened | Appendix II | Direct |
| *Felis Caracal* | Caracal | Fuge | Threatened | Appendix II | Direct |
| *Felis Serval* | Serval cat | Zerusa | Threatened | Appendix II | Direct |
| Family Hyeanidea-Hyaenas | | | | | |
| Crocuta crocuta | Spotted Hyena | Godare | Threatened | Appendix II | Direct |
| Family Viverridae | | | | | |
| Genetta feline | Common Genet | Shururut e | Threatened | Appendix II | Direct |
| Family Canidae –Dogs | | | | | |
| *Canis adustus* | Common jackal | Warkana | Threatened | Appendix II | Direct |
| Lagomorpha | | | | | |
| Leporidae | | | | | |
| Lepus habessinicus | Abyssinian hare | Harbayn o | Threatened | Appendix II | Direct |
| Order Tubulidentata | | | | | |
| Family Orycteropodidae | | | | | |
| Orycteropus afer | Aardvark | Babanta | Threatened | Appendix II | Indirect |

**Abbreviations:** TH = Threatened, NT=Near -Threatened, LC=Least Concerne. Data generated from IUCN Red list Species *version 2020-1.http//www.iucnredlist.organizatiion.* According, to Ethiopia Wildlife Conservation Authority (EWCA, 2020). Appendix II, Appendix II: lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. International trade in specimens of Appendix-II species may be authorized by the granting of an export permit or re-export certificate.

**Relative Abundance**

A total of 899±19 individual medium and large mammals large mammals' species were recorded in Woyde woshe Community Reserve forest areas in both season. Of all Mammals 532±10 (59.18%) individual were recorded in wet season and 367±7 (40.82) individual were recorded in dry season. The majority of the mammalian species in the area were Anubis Baboon (*Papio anubis)* was the most abundant *(n=250 & n=134)* followed by, Vervet Monkey (*Cercopithecus pygerythrus*) (n=56 & n=47), Colobus monkey (*Colobus guereza*) (n=69 & n=57), DE-Brazza's monkey (*cercopitheus neglectus*) (n=48 & n=45), Bush Duiker (*Sylvicapra grimma) &* Spotted Hyena (Crocuta crocuta) (n=23 & n=14), Bushpig (*Potamochoerus larvatus)* (n=15 & n=9), Crested porcupine(*Hystrix Cristata)* (n= 7 & n=16), Bushbuck (*Traglaphus Scriptus (*(n=14 & n=4), Aardvark Orycteropus afer (n= 8 & n=4), Klipspringer (*Oreotragus oreotragus)* (n= 7 & n=4), Common Genet (*Genetta feline)* (n= 3 & n=8), Abyssinian hare (*Lepus habessinicus*) (n= 2 & n=5), Caracal (*Felis Caracal*) (n= 4 & n=2), Leopard (*Panthera paradus*) (n= 2 & n=3), Serval cat(*Felis Serval*) (n= 2 & n=2), Common jackal (*Canis adustus*) (n= 1 & n=3), were recorded both wet and dry season respectively. The seasonal variation in the number of species of mammals was significantly different ($p<0.05$).

Table1: Relative Abundance of medium and large sized mammals in WWCRF

| order | Family | *Scientific Names* | *Comman name* | Wet | Dry | Relative Abundance |
|---|---|---|---|---|---|---|
| Primates | Cercopithecidae | *Cercopithecus pygerythrus* | Vervet Monkey | 56 | 47 | 11.46 |
| | | *Papio anubis* | Anubis Baboon | 250 | 134 | 42.71 |
| | | *cercopitheus neglectus* | DE-Brazza's monkey | 48 | 45 | 10.34 |
| | colobidae | *Colobus guereza* | Colobus monkey | 69 | 56 | 13.90 |
| Artiodactyla | Bovidae | *Traglaphus Scriptus* | Bushbuck | 14 | 4 | 2.0 |
| | | *Sylvicapra grimma* | Bush Duiker | 23 | 14 | 4.12 |
| | | *Oreotragus oreotragus* | Klipspringer | 7 | 4 | 1.22 |
| | Suidae | *Potamochoerus larvatus* | Bushpig | 15 | 9 | 2.67 |
| Rodentia | Hystricidae | *Hystrix Cristata* | Crested porcupine | 7 | 16 | 2.56 |
| Carnivora | Felidae | *Panthera paradus* | Leopard | 2 | 3 | 0.56 |
| | | *Felis Caracal* | Caracal | 4 | 2 | 0.67 |
| | | *Felis Serval* | Serval cat | 2 | 2 | 0.44 |
| | Hyeanidea | *Crocuta crocuta* | Spotted Hyena | 23 | 14 | 4.12 |
| | Viverridae | *Genetta feline* | Common Genet | 3 | 8 | 1.22 |
| | Canidae | *Canis adustus* | Common jackal | 1 | 3 | 0.44 |
| Lagomorpha | Leporidae | *Lepus habessinicus* | Abyssinian hare | 2 | 5 | 0.78 |
| Tubulidentata | Orycteropodidae | *Orycteropus afer* | Aardvark | 8 | 4 | 1.33 |
| Total (6) | 11 | 17 | 17 | 532 | 367 | 100% |

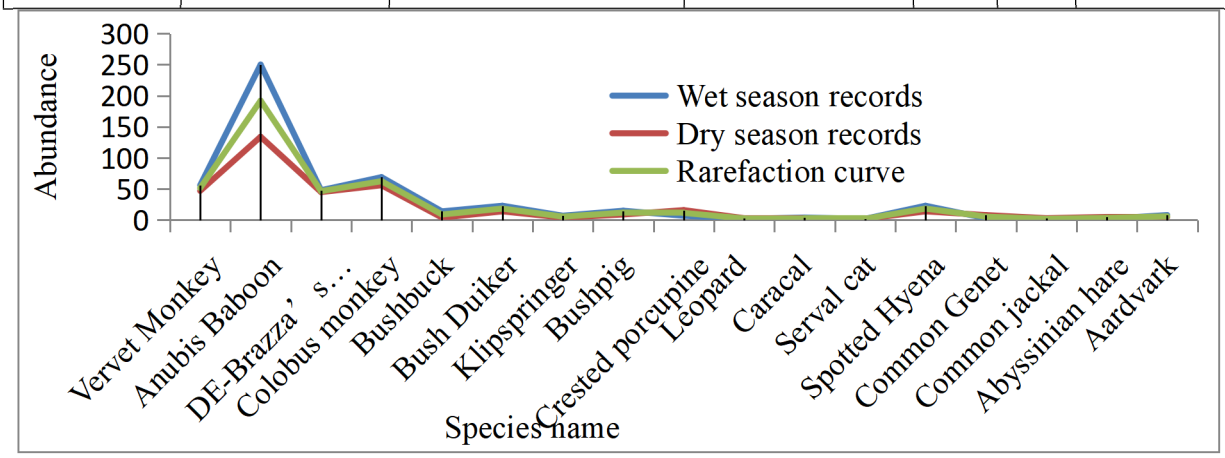


Figure 8: Mean number of species richness and frequency of records computed by rarefaction curve two seasons.

**Discussion:** The six orders & eleven families of medium and large mammal's species recorded in Woyde Woshe Community Reserve forest areas. The orders of mammalian species recorded in Woyde Woshe Community Reserve forest areas (WWCRF) were lower and higher than in the study conducted on mammals at different localities of Ethiopia .For example, lower records include five orders and seven families in Geremba Mountain Fragments community managed area, Southern Ethiopia [14]. Five orders and nine families in Nensebo Forest, Southern Ethiopia [17]. Four orders and five families in the Humbo Community-Based Forest Area, Southern Ethiopia [18]. Four orders and twelve families Identified in and around Wondo Genet Forest Patches [19] & Five orders and eleven family of mammalian Michole Community Protected Forest, Southern Ethiopia [20]. On others hand, seven orders and threeten families were identified in Nono Salle Forest priority area in documented Nono Salle Forest priority areas, Southwest Ethiopia [21]. Seven orders and threeten family of mammalian were recorded in Faragosa Fura landscape, Gamo Zone, Southern Ethiopia [22].

The present study 17 different large herbivores mammals' species were identified in Woyde Woshe

Community Reserve forest areas (WWCRF). In terms of species composition the study area comprises relatively lower and higher number of species as compared to other similar studies in the country. For instance, lower records include 10 Species richness are documented in Geremba Mountain Fragments, Southern Ethiopia [14], 16 species richness in Nensebo Forest, Southern Ethiopia 17, & 8 Species richness in Humbo Community-Based Forest Area, Southern Ethiopia 18. On other hand, high species of 19 Species richness in the in and around Wondo Genet Forest Patches 19, 19 species richness in Michole Community Protected Forest, Southern Ethiopia 20, 26 species richness were recorded in documented Nono Salle Forest priority areas, Southwest Ethiopia 21, 21 species of mammalian were recorded in the Faragosa-Fura landscape, Gamo Zone, Southern Ethiopia 22. In general, research design, sampling techniques, ecological units, anthropogenic pressure, data collection season, management aspects; Ecological units, Elevation, Environmental parameter, & area coverage may be effect on the species composition.

Overall 899±19 individuals of medium and large mammals were recorded during the study area in both seasons in Woyde Woshe Community Reserve forest areas, from which 532±10 were observed during the wet season & 362±7 during the dry season. This studies at different parts of the country reported both lower and higher numbers of individual mammals compared to the present finding. For instance 227 numbers of individuals in Geremba Mountain Fragments, Southern Ethiopia [14] & 647 numbers of individuals are found in Michole Community Protected Forest, Southern Ethiopia, Southern Ethiopia[20]. On other hands, 920 numbers of individuals in Nensebo Forest, Southern Ethiopia [17], 3,648 numbers of individuals are found in Humbo Community-Based Forest Area, Southern Ethiopia [18], 7168 number of individuals are recorded in the in and around Wondo Genet Forest Patches [19], 925 numbers of individual are observed in documented Nono Salle Forest priority areas, Southwest Ethiopia [21]. Data collection season, habitat types, sample design, species types, management aspects, seasonal data collection interval might contribute to such variation of reported results.

**Conclusion & Recommendation:** The present study identified 17 different medium & large sized mammals' species were recorded in Woyde Woshe Community Reserve forest areas. Out of these 6 carnivore, 4 primate, 4 Artiodactyla,1 Rodentia,1 Tubulidentata,1 legomorpha species were observed. The carnivore highest species richness than others order. The numbers of medium and large mammals in Woyde Woshe Community Reserve forest areas varied seasonally. The primate species are most abundance compared with the others orders. The human induced factors results to local extinction and migration of animals in the area. Which is clearly viewed on the species of lion and also currently this trend similar occurred on the some species migration. Therefore, the following recommendations are forwarded for the sustainable conservation of the mammal species in the study area such as: Illegal activities such as hunting and poaching, firebreak, fuel wood collection grass cutting and other disturbances in the Woyde Woshe Community Reserve forest should be controlled, Other ecological aspects of medium and large mammals species such as feeding ecology, diurnal activity pattern and so on should be studied in order to make the ecological information about the mammals species complete, survey on small mammals, birds, and ecosystem service is not at that studied in Woyde Woshe Community Reserve forest, Zonal and Woreda government should encourage local and international researchers to carry out studies on listed topic to collect scientific information so as to formulate strong conservation plan for nature, & Zonal & Woreda government installing Beacons around Woyde Woshe Community Reserve forest area boundary following GPS Coordinate is basic minimum reqiurment to protect nature and wildlife resource, from other land use complexes

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