



Survey of terrestrial vertebrate fauna (mammals, reptiles and birds) and degradation indicators of forest reserve in North-central, Nigeria

YAGER Gabriel Ortyom

Department of Wildlife and Range Management, Federal University of Agriculture, Makurdi, Benue State, Nigeria
gbrlyager@gmail.com

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Abstract

Habitat losses occasioned by vegetation degradation in forest structure had negatively impacted on fauna existence and survival. Field survey, questionnaire's, in-depth interview with hunters and village heads was adopted to determine fauna species list and forest degradation processes and indicators. Descriptive statistics was used for the analysis. Overall, 33 vertebrates species belonging to 27 families were recorded. Among the vertebrates species recorded based on abundance index; *Crocota crocota*, *Syncerus caffer*, *Ourebia ourebi*, *Naja nigricollis* were very rare in the study area. Only *Tragelaphus scriptus* was uncommon, while many of the species were common especially the class aves. Major forest degradation processes were; land clearing for farming (40.0%), logging/fire wood collections (25.0%) and sand excavation with (20.0%). More so, major degradation indicators identified were; reduced vegetation cover/composition (45.0%), loss of wild animals (20.0%) and soil erosion/land fragmentation with (18.0%). Loss in vegetation cover resulted to increase bare soil, which led to gullies formation and consequently decline in soil fertility. The most dominants woody stumps based on high utilization indicated were; *Tectona grandis* (18.8%), *Khaya senegalensis* (17.0%), *Daniella oliveri* (15.1%), *Gmelina arborea* and *Vatex doniana* with (13.3%) each, respectively. Knowledge on faunal existence and forest structure condition is paramount. It is recommended that afforestation and restoration programme be carried out and integration of scientific and local knowledge participation.

Keywords: Forest reserve, forest structure and degradation, vertebrate's species and habitat.

Introduction

Forest ecosystems are large potential home for plant and wild animals. The roles of vegetation (woody plants and herbs) in forest ecosystems are numerous. They are the most abundant component of forested ecosystem¹. Vegetation covers aid fauna prey species with cover for protection. Provide the much needed nutritious and palatable forage for forest-dwelling mammals². Its composition helps to contributes to carbon sequestration, nutrient cycling and organic composition³. Forest structure/condition and terrestrial animals had a unique co-existence⁴. Forest ecosystem also promotes habitat connectivity⁵.

The essential aim of survey in an anthropogenic conserved area is the determination of species gap⁶. An assessment of biodiversity within a Protected Area enhanced proper conservation approach and grossly explores the relationship, abundance and biodiversity within the nature⁷. Species listing approach is recommendable stage in the survey and documentation of animals and plants to promote proper management and conservation⁸. This challenge is evident considering fauna species list and the deterioration of protected areas of most Tropical regions where detailed scientific investigation most times are not carried out⁹. It is therefore paramount for the survey and observation on the environmental

degradation and faunal occupancy. This is because of great lost in habitats and its effects on fauna survival and reproduction.

An environmental indicator describes the state of the environment and its prevailing impact on both human and fauna species. Forest degradation indicator occurs as a result of reduction in the biomass quality and quantity, which have major contribution to soil erosion and loss of organic matter¹⁰⁻¹². Forest degradation indicators differ greatly from locality to locality¹³. Degradation of the vegetation and soil, due to agricultural expansion, grazing, and collecting of fuel and timber in many regions of Nigeria especially State forest reserves reached a stage when one would believe it is beyond any repair. FAO and Kosmas et al. reported various indicators of forest degradation^{14,15}; as a tool to understand how vulnerable an area is to land degradation, how rapidly the land degradation is progressing and how effective are the actions taken to mitigate the processes.

The persistence of species is not only dependent on the habitat availability but also on habitat suitability¹⁶. The increase in human population creates an increase in risks to biodiversity, through its uncontrolled exploitation.

The Mbaav 1 Forest Reserve had undergone high exploration due to anthropogenic activities and requires urgent conservation

measures. However, at moment information on its biodiversity and changes in the forest structure is limited. Therefore, vertebrate's species list and forest structures degradation processes and indicators were investigated.

Methodology

Study Area: The Mbaav 1 Forest Reserve (MFR) lies between Latitude 7°16'22''N – 7°17'15''N and 8°23'23''E - 8°24'5''E in the middle belt region of Nigeria (Figure-1) and a total area covering approximately 3km². It was created in 1976, sited in Ikyonov Council Ward of Gwer-East LGA Benue State. It has dry and wet season in the southern guinea savannah. Comprise of tropical sub-humid climate with average maximum and minimum daily temperature of 35° and 21°C in the wet season, 37°C and 16°C in dry season respectively. The mean annual rainfall value is 1200mm to 1500mm and relative humidity is between 60% and 80% wet but decreases in the early months of the dry season¹⁷.

Vegetation: The vegetation of the area is described as Northern Guinea savannah that stretches as far as Avetse River¹⁷. The forest reserve is known for its trees, climbers, shrubs, lianas and grasses. The forest area is classified with a mixture of fast growing pioneer tree species, such *Tectona grandis*, *Khaya senegalensis*, *Gmelina arborea*, *Vatex domiana*, *Prosopis africa*, *Annona senegalensis*, *Parkia biglobosa*, *Lophira alara*, *Afzella africana*, *Annona senegalensis* and *Parkia biglobosa*.

Data Sampling and Collection: Data were gathered using direct and participatory observation, structured questionnaire and 1-hour non-structured interview with local hunters and village heads who lived in the area over 50 years concerning the variety of wild-animals they encounter before and their view on some major forest degradation indicators in the study area. Behmanesha et al. forest degradation indicators approach was adopted¹⁸.

Direct observation along five 1.0km line transects laid apart at 10m broad (0.1ha) distributed randomly in the forest was adopted as reported by Osunsina et al¹⁹, and indirect indices (fecal dropping, foot marks, tracks, feathers, carcasses) was also adopted. Birds species were determined using walk over transect count method (all birds seen or heard at either sides of the line transect were identified and countered) thrice a month. Reptiles were also survey during random routes throughout sports, footpaths, dislodging logs and stones to expose any concealing reptiles. All direct survey were carried out in the morning hours between 6:00 to 9:00am and early evening time between 3:00 to 6:00pm only for dry season from October, 2019 to March, 2020.

Data Analysis: Descriptive statistics was adopted. Abundance index for species was empirically determined on the basis of the interview and field observation. Each species' abundance was placed into three groups: i. very rare, ii. uncommon and iii. common.

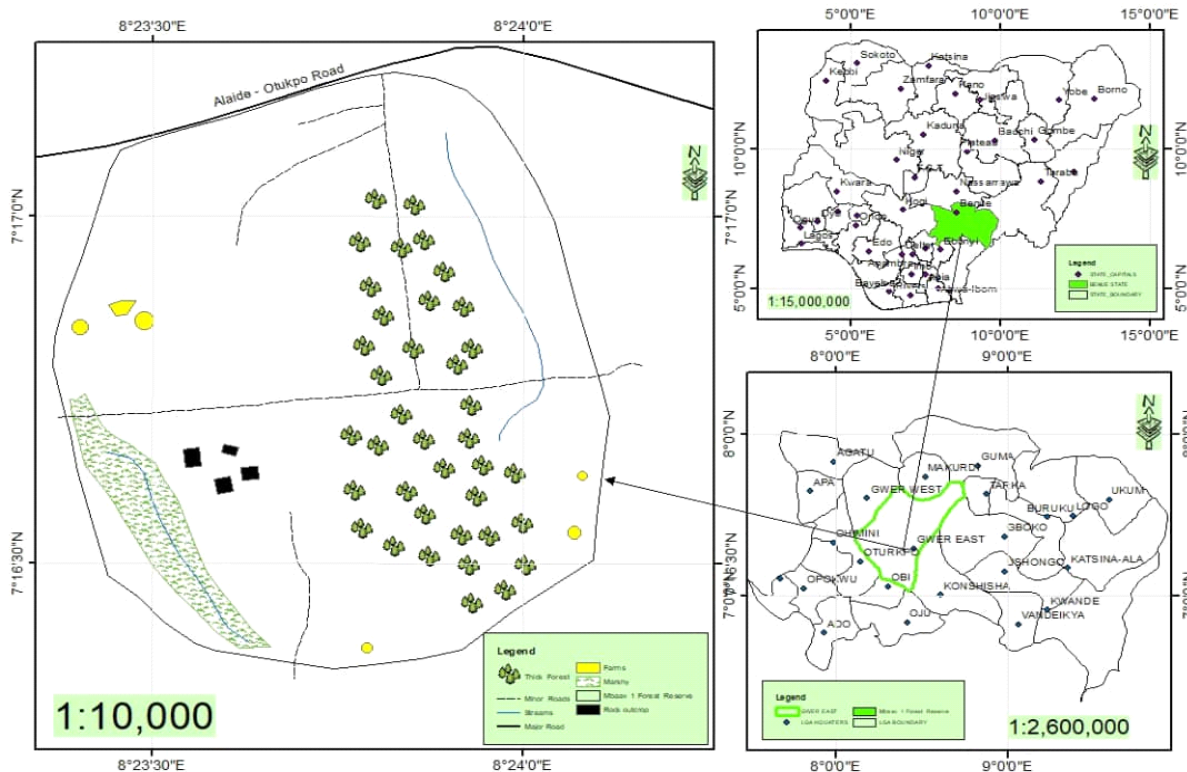


Figure-1: Map of Mbaav 1 Forest Reserve²⁰.

Results and discussion

The Demographic Characteristic of the Focus Group: The result of the focus group which includes farmers, hunters and village heads is presented in Table-1. The dominant gender was males with (56.0%), while females had 44.0% of the sampled population. Majority (48.0%) of the focus group fall within the age group between 31-40 years, followed by 50 years and above with 38.0% and the least was below age 30 years with 6.0%. farmers with 74.0% forms the highest group of the population sampled, followed by hunters (20.0%) and the least was the village head with 6.0%. Generally males were the dominant sex, however, farmers sampled, who had their farms within the reserve account for about 45.0% women out of the 75.5% farmers. This confirms to the report of FAO, Remain, Gideon and Yager, that women are most responsible and play vital roles in agricultural produce up to 60-80% at different stages mostly in rural communities²¹⁻²³.

Table-1: Demographic characteristic of the focus group (n=50).

Variables		Frequency	Percentage
Gender	Male	28	56
	Female	22	44
Age group (years)	Below 30	3	6
	31 – 40	24	48
	41 – 50	19	38
	Above 50	4	8
Focus group categories	Farmers	37	74
	Hunter	10	20
	Village head	3	6

Forest Degradation Process and Indicators: Result of Figure-1 and 2, reveals major range degradation processes and indicators in Mbaav 1 Forest Reserve. It was evident that land clearing for farming (40.0%) and logging/fire wood collection (25.0%) were highly regarded and indicated as the most factors that is degrading the reserve while sand excavation followed closely with 20.0%, soil erosion is 10.0% and wild fire/burning was the least degraded process with 5.0%. The major drives of the degradation process focused on the vegetation lost. This clearly shows high level of human encroachment through agricultural expansion. This confirms with the study of Omuto et al.²⁴ in Pandam Wildlife Park, which indicated a strong relationship between agricultural land expansion pattern and land degradation in the Park. Figure-2 clearly shows that, the most prioritized forest degradation indicator is reduced vegetation cover/composition with (45.0%). This was closely followed by loss of wild animal which stood at 20.0%, next is increase in soil erosion/land fragmentation 18.0%, while decrease in tree diversity/increased tree stumps and excessive

growing of invasive weeds with 16.0% and 7.0% respectively. The loss in vegetation cover/trees structure and soil erosion/land fragmentation was an indication of the impact of major degradation processes notable among them was the massive land clearing and logging activities in the area. Omuto et al. in Somali identify soil erosion as the major indicator of land degradation²⁵, while this finding reported reduced vegetation cover.

Percentage of Tree Stumps: The abundance and dominant trees stumps in the reserve are given in Figure-3. The result indicates five highly utilised trees species with dominant stumps, these include; *Tectona grandis* (18.8%), *Khaya senegalensis* (17.0%), *Daniella oliveri* (15.1%), *Gmelina arborea* and *Vatex domiana* both had 13.3% respectively. *Lophira alara* and *Afzella africana* were the less felled trees species in the area, thus with low percentage stumps counts. Majority of the trees were logged by the locals for construction (timber), electric poles, firewood and other uses. This however had a negative effect as it led to disappearance of some wild animals that were common within the reserve, mostly mammals. This could be explain by the key role the vegetation plays in wildlife conservation and range management strategies.

Famers Perception on Vegetation / Trees Reduction as Related to Soil: In Figure-4 above farmers around the community believed that the most highly common factors responsible for vegetation degradation related to soil within the forest reserve is increased in bare soil as a result of farming impact with (52.0%), which has consequently led to gullies formation which has resulted in loss of soil fertility accounting for 30.0% and 18.0% respectively.

Animal communities: The vertebrates' species survey presented in Table-2, indicates that there 33 vertebrate species comprising of 15 mammals, 6 reptiles and 12 birds inhabiting the forest. The species belong to 27 families out of which Bovidae and Cercopithecidae family were dominant. Most of the vertebrates' species recorded were confirmed by hunters, village heads and other assessment indices. However, bird's species form the major component of wild species in the forest that was sighted directly. This could probably be its high prolific nature and ability to thrive within the present condition of the forest. Generally, there seem to be paucity of animal species in the area. One possible explanation could be the degradation in vegetation structure/cover and the high rate of land conversion to agricultural activities in the area. Yager et al. Ekeoba and Okuomose, Belachew et al. reported that, the condition of the forest structure, food availability and hunting level determine fauna habituation²⁶⁻²⁸.

Five among the species listed, which include; *Crocota crocuta*, *Syncerus caffer*, *Ourebia ourebi*, *Sylvicapra grimmia* and *Naja nigricollis* were very rare. Only *Tragelaphus scriptus* was indicated as uncommon species, while the rest 27 species were regarded as common especially among the aves class.

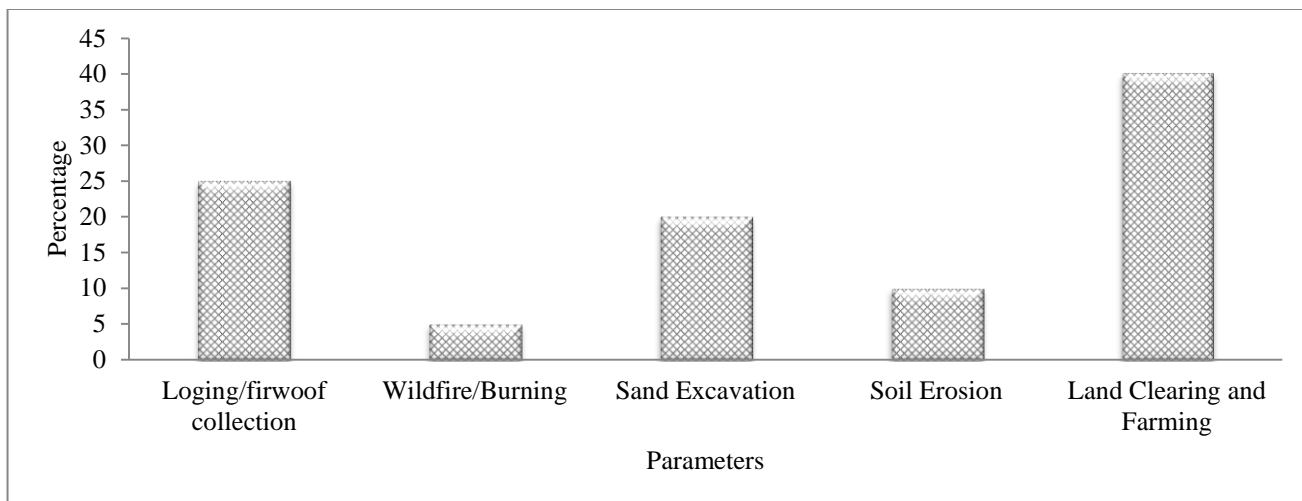


Figure -1: Percentage of Degradation Process in Mbaav 1 Forest Reserve.

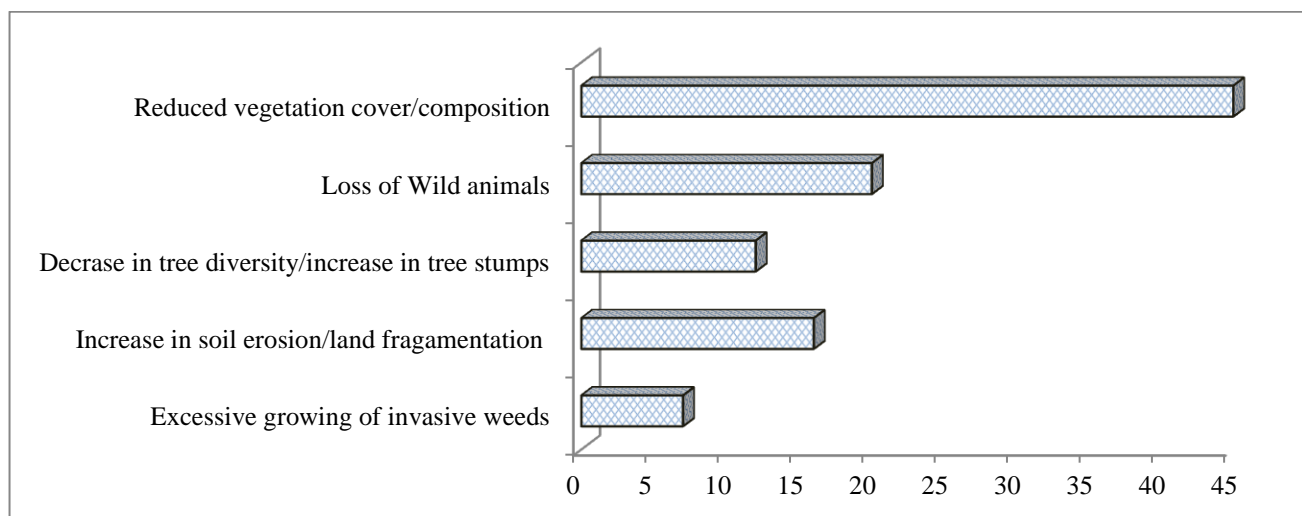


Figure-2: Prioritized Degradation Indicators Mbaav 1 Forest Reserve.

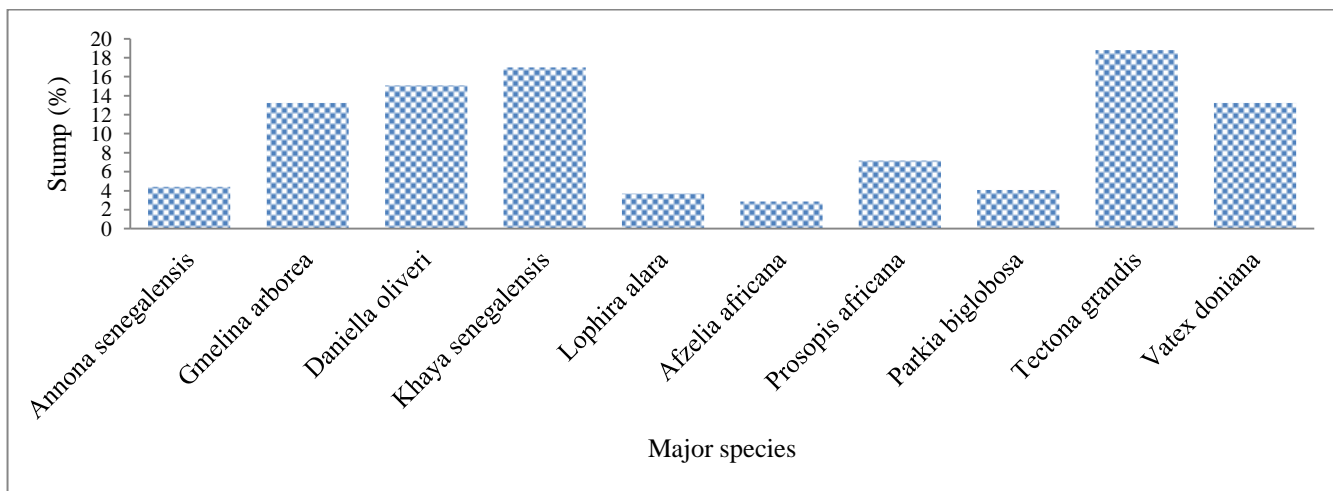


Figure-3: Percentage of Trees Stumps in Mbaav 1 Forest Reserve.

Table-2: List of Vertebrates and mode of sampling in Mbaav 1 Forest Reserve.

Species	Family	Mode of identification		Abundance Index
		Direct observation	Indices (Animal signs and activities)/IF	
Mammalia				
Arvicanthus niloticus	Murinae	Absent	Present	Common
Papio Anubis	Cercopituecidae	Absent	Present	Common
Cercopithecus mona	Cercopituecidae	Present	Present	Common
Chlorocebus tantalus	Cercopituecidae	Present	Present	Uncommon
Erythrocebus patas	Cercopituecidae	Present	Present	Common
Crocuta crocuta	Hyaenidae	Absent	Present	Very rare
Thryonomys swinderianus	Thryonomyidae	Absent	Present	Common
Cricetomys gambianus	Cricetidae	Absent	Present	Common
Rattus rattus	Cricetidae	Absent	Present	Common
Syncerus caffer	Bovidae	Absent	Present	Very rare
Sylvicapra grimmia	Bovidae	Absent	Present	Very rare
Tragelaphus scriptus	Bovidae	Absent	Present	Uncommon
Ourebia ourebi	Bovidae	Absent	Present	Very rare
Epixerus ebii	Sciuridae	Absent	Present	Common
Xerus erythropus	Sciuridae	Present	Present	Common
Reptilia				
Agama agama	Agamida	Present	Absent	Common
Bitis gabonica	Viperidae	Present	Absent	Common
Chameeleon gracilis	Chameoleonidae	Present	Absent	Common
Pelusios niger	Pelomedusidae	Present	Absent	Common
Naja nigricollis	Elapidae	Present	Absent	Very rare
Varanus niloticus	Varanidae	Absent	Present	Common
Birds				
Aegyptius occidentalis	Accipitridae	Present	Absent	Common
Alcedo atthis	Alcedinidae	Present	Absent	Common
Bubulcus ibis	Ardeidae	Present	Absent	Common

Cuculus canorus	Cuculidae	Present	Absent	Common
Dicrurus paradiseus	Dicruridae	Present	Absent	Common
Egretta garzetta	Ardeidae	Present	Present	Common
Musophaga violacea	Musophagidae	Present	Absent	Common
Milvus migrans	Accipitridae	Present	Absent	Common
Numida meleagris	Phasianidae	Present	Present	Common
Streptopelia semitorquata	Columbidae	Present	Absent	Common
Streptopelia senegalensis	Columbidae	Present	Absent	Common
Urotiorchis macrocurus	Accipitridae	Present	Absent	Common

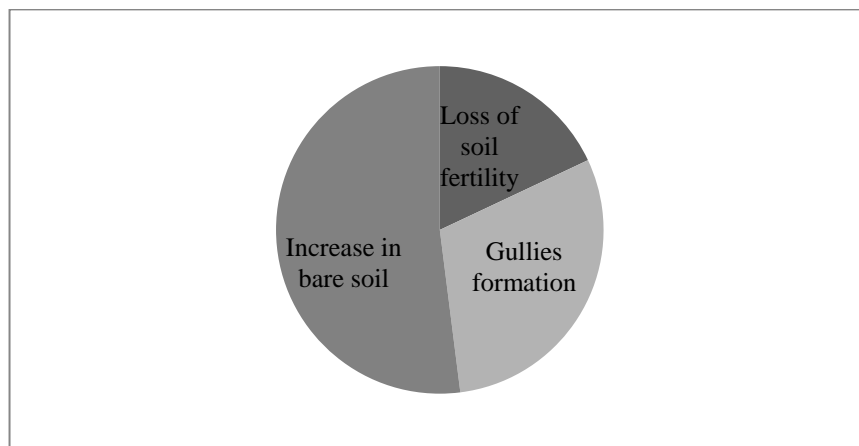


Figure-4: Farmers Perception on Vegetation Degradation Related to Soil of Mbaav 1 Forest Reserve.

Conclusion

The knowledge of local communities on forest degradation and fauna species is paramount to facilitate management of range resources. Information on the forest condition can provide useful insight for the restoration, sustainable utilization and conservation of the rangelands. The loss and fragmentation of the forest ecosystem is a direct threats towards biodiversity habituation especially the wild animals. I hereby recommend that; Community education and participation should be encouraged to promote protection of wildlife and restoration strategies.

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