

**CLIMATE CHANGE ADAPTATION AND PRIMATES' CONSERVATION IN  
BUDONGO-BUGOMA CORRIDOR PRIVATELY OWNED FORESTS**

**BY**

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## DECLARATION

I, Abowe Daniel, hereby declare that the contents of this research thesis are my original work and were fully prepared and written by me, except where duly acknowledged. This thesis has not been previously presented to any academic institution for the award of a degree or any other qualification.

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## **APPROVAL**

This thesis entitled “Primates Conservation and Climate Change Adaptation Strategies Employed in Budongo-Bugoma Corridor Private Forests”, has been under supervision and submitted to the Directorate of Research and Graduate Training, Kyambogo University with the approval of the following supervisors:

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## Table of Contents

<b>DECLARATION</b> .....	<b>i</b>
<b>APPROVAL</b> .....	<b>ii</b>
<b>ACKNOWLEDGEMENT</b> .....	<b>iii</b>
<b>LIST OF TABLES</b> .....	<b>vii</b>
<b>LIST OF FIGURES</b> .....	<b>viii</b>
<b>LIST OF ACRONYMS</b> .....	<b>ix</b>
<b>ABSTRACT</b> .....	<b>xi</b>
<b>CHAPTER ONE: INTRODUCTION</b> .....	<b>1</b>
1.1 Background .....	1
1.2 Statement of the Problem .....	4
1.3 Objectives of the study .....	5
1.3.1 General objective .....	5
1.3.2 Specific objectives .....	5
1.3.3 Research Questions.....	6
1.4 Justification of the Study .....	6
1.5 Definition of terms .....	7
1.6 Scope of the Study.....	9
1.6.1 Geographical Scope of the Study .....	9
1.6.2 Time scope.....	9
1.7 Conceptual Framework of the study .....	9
<b>CHAPTER TWO: LITERATURE REVIEW</b> .....	<b>12</b>
2.1 Introduction to the Literature Review .....	12
2.2 Private Forest Conservation and Climate Change Adaptation Strategies .....	13
2.2.1 Conservation Strategies within the Budongo-Bugoma Corridor.....	14
2.2.2 Private Forest Restoration and Biodiversity Conservation in Degraded Habitats...	15
2.2.3 Best Practices in Private Forest Conservation and Climate Change Adaptation ....	16
2.2.4 Challenges in Implementing Conservation and Adaptation Strategies in Private Forests.....	17
2.3 Primate Diversity in the Albertine Rift and Distribution in Private Forests of the BBC .....	18

2.3.1. Comparing Primate Biodiversity in Protected Areas and Privately-Owned Forests .....	19
2.4 People’s attitudes towards NGOs’ private forest and biodiversity conservation strategies.....	20
2.4.1 People’s attitudes towards primate conservation efforts .....	20
2.4.2 People’s Perspectives on Climate Adaptation Strategies .....	21
2.4.3 Human-Wildlife Conflicts and Their Impact on Conservation Attitudes.....	22
2.4.4 Community Engagement and Participation in Conservation Efforts .....	23
<b>CHAPTER THREE: MATERIALS AND METHODS .....</b>	<b>24</b>
3.1 Introduction .....	24
3.2 Description of the Study Area.....	24
3.2.1 Rainfall and Temperature .....	26
3.2.2 Population.....	26
3.2.4 Main economic activities.....	26
3.2.5 Land tenure and forest restoration .....	27
3.3 Research design and sample size .....	28
3.4 Study Population .....	28
3.5 Sample size determination .....	28
3.6 Sampling Techniques and Procedures.....	29
3.7 Data collection methods .....	30
3.8 Secondary data sources .....	35
3.9 Data analysis .....	36
<b>CHAPTER FOUR: PRESENTATION AND INTERPRETATION OF FINDINGS .....</b>	<b>39</b>
4.1 Introduction .....	39
4.2 Background Information of Respondents .....	39
4.3 Private Forest conservation and climate change adaptation strategies used by conservation NGOs. ....	41
4.3.1 Climate Change Adaptation Strategies.....	45
4.3.2 Results from ANOVA analysis .....	52
4.4 Species diversity of primates in the privately owned forests within the BBC.....	53
4.4.1 Habitat Disturbance and Primate Threats.....	59
4.5 Private FOs’ Attitudes and Perceptions Towards Primate Conservation in Private Forests .....	70

4.5.1: Results from Pearson correlation analysis.....	79
<b>CHAPTER FIVE: DISCUSSION OF FINDINGS.....</b>	<b>82</b>
5.1 Introduction .....	82
5.2 Forest conservation and climate change adaptation strategies.....	83
5.3 Species diversity of primates in private forests within the BBC.....	91
5.4 Private FOs’ attitudes and perceptions towards primate conservation in private forests. .....	98
<b>CHAPTER SIX: SUMMARY OF THE FINDINGS, CONCLUSIONS AND RECOMMENDATIONS.....</b>	<b>106</b>
6.1 Introduction .....	106
6.2 Summary of the Findings .....	106
6.3 Conclusions .....	107
6.5 Recommendations from the study.....	108
6.6 Problems encountered during the study .....	109
6.7 Recommendations for further research .....	110
<b>REFERENCES.....</b>	<b>111</b>
<b>APPENDICES .....</b>	<b>125</b>
APPENDIX 1: POST HOC SHOWING MULTIPLE COMPARISONS BETWEEN OCCUPATION OF RESPONDENTS AND CCA STRATEGIES USING TUKEY HSD .....	125
APPENDIX 2: SHANNON-WIENER DIVERSITY INDICES OF PRIMATE SPECIES ENCOUNTERED PER PARISH.....	126
APPENDIX 3: POST HOC OF MULTIPLE COMPARISONS BETWEEN PARISHES AND PRIMATE SPECIES USING LSD AND TAMHANE.....	127
APPENDIX 4: FOREST OWNERS’ SURVEY QUESTIONNAIRE.....	128
APPENDIX 5: FOCUS GROUP DISCUSSIONS GUIDE .....	134
APPENDIX 6: KEY INFORMANT INTERVIEW GUIDE .....	135
APPENDIX 7: PRIMATES SPECIES SURVEY FORM .....	136

## LIST OF TABLES

Table 3.1: Number of forest owners and sample size per parish .....	29
Table 4.1: Background Characteristics of the Respondents .....	40
Table 4.2 Comparison of Forest Land Ownership per Parish in 2010 and 2022.....	44
Table 4.3: Climate change adaptation strategies used by conservation NGOs among forest owners in the BBC .....	46
Table 4.4: Household Members' Engagement with Conservation NGOs/Institutions.....	48
Table 4.5: Test of homogeneity of variances .....	53
Table 4.6: Results from ANOVA analysis .....	53
Table 4.7: Distance walked per recce by parish and sub-county in Hoima and Kikuube districts.....	54
Table 4.8: Observed primate species' Population.....	55
Table 4.9: Distance Walked, Observed Primate Species Counts, and Encounter Rates (ERs) per Kilometer per Parish .....	58
Table 4.10: Threats/indicators of disturbance recorded during the primates' survey and Encounter Rates per Parish .....	60
Table 4.11: Shannon-Wiener primate species diversity index for the entire study area.....	68
Table 4.12: Test of Homogeneity of Variances Between Primate Species Groups.....	69
Table 4.13: ANOVA Results Between Parishes and Different Primate Species Groups .....	69
Table 4.14: Conservation NGOs' Staff Visit to Forest Owners by Relationship Quality .....	71
Table 4.15: Conservation NGOs' Staff Visit Frequency by Relationship Quality.....	72
Table 4.16: Human-wildlife conflicts and routine of occurrence in the BBC .....	76
Table 4.17: Influence of Conservation Approaches by NGOs on Respondents' Attitudes and Perceptions and the Reasons .....	77
Table 4.18: Local communities' involvement in conservation activities, decision making and Level of Involvement.....	78
Table 4.19: Pearson Correlations results .....	80
Table 4.20: Pearson Correlations Results .....	81

## LIST OF FIGURES

Figure 3.1: Location of Budongo-Bugoma Corridor forests and study selected area .....	25
Figure 3.2: Primates survey recces in the four study parishes. ....	33
Figure 3.3: Primates survey recces in Birungu and Kibanjwa parishes.....	33
Figure 3.4: Primates survey recces in Kidoma and Munteme parishes. ....	34
Figure 4.1: The sizes of the forest land ownership distribution in 2022 and 2010 in the BBC .....	42
Figure 4.2: The most preferred climate change adaptation strategies by households .....	47
Figure 4.3: Development initiatives supported by conservation NGOs in the BBC .....	50
Figure 4.4: Reason for low adaptation to NGOs' implemented initiative.....	51
Figure 4.5: Primate species encountered per habitat status category in the study parishes.....	63
Figure 4.6: Distribution of red-tailed monkeys observed in the study parishes. ....	64
Figure 4.7: Distribution of black and white colobus monkeys observed in the study parishes. .....	65
Figure 4.8: Distribution of vervet monkeys observed in the study parishes.....	65
Figure 4.9: Distribution of olive baboons observed in the study parishes.....	66
Figure 4.10: Distribution of grey-cheeked mangabeys observed in the study parishes.....	66
Figure 4.11: Distribution of blue monkeys observed in the study parishes.....	67
Figure 4.12: Distribution of chimpanzees observed in the study area - counts and nests. ....	67
Figure 4.13: Respondents' choice on the importance of primates to forest owners .....	70
Figure 4.14: Perceived benefits of having healthy Private Forests in BBC.....	73
Figure 4.15: Challenges associated with conserving private forests in the BBC .....	74
Figure 4.16: Respondents' participation in developmental conservation projects.....	76
Figure 4.17: Ways through which communities could contribute towards private forests and primates' conservation. ....	79

## LIST OF ACRONYMS

<b>Acronym</b>	<b>Description</b>
AR	Albertine Rift
BBC	Budongo-Bugoma Corridor
CBD	Convention on Biological Diversity
CCA	Climate Change Adaptation
ECOTRUST	Environmental Conservation Trust of Uganda
ERs	Encounter Rate(s)
FFI	Flora and Fauna International
FGDs	Focus Group Discussions
GIS & RS	Geographical Information System and Remote Sensing
HWCs	Human-wildlife conflicts
JGI	Jane Goodall Institute
KBAs	Key Biodiversity Areas
KIs	Key Informants
KIIs	Key Informant Interviews
MWE	Ministry of Water and Environment of Uganda
NARCG	Northern Albertine Rift Conservation Group
NGOs	Non-Governmental Organizations

NBSAP	National Biodiversity Strategy and Action Plans
PAs	Protected Areas
PES	Payment for Ecosystem Services
FOs	Forest Owners
PFOAs	Private Forest Owners' Associations
REDD+	Reducing Emissions from Forest Degradation and Deforestation and Enhancement of Carbon Stocks
UBOS	Uganda Bureau of Statistics
UNFCCC	United Nations Framework Convention on Climate Change
WCS	Wildlife Conservation Society
WRI	World Resource Institute
WWF	World Wide Fund for Nature Uganda

## ABSTRACT

This study examined the strategies used by conservation NGOs in Uganda's Budongo-Bugoma Corridor (BBC) to support primate conservation and climate change adaptation (CCA). The objectives included characterizing forest conservation and CCA practices used by NGOs, determining primate species diversity, and assessing private forest owners' attitudes toward primate conservation and CCA. Using a mixed-methods research design, the study collected quantitative data through household surveys and qualitative data through key informant interviews (KIIs) and focus group discussions (FGDs). A total of 206 private forest owners' households across four parishes—Munteme, Kidoma, Kibanjwa, and Birungu—were surveyed, while 20 KIIs and 8 FGDs provided further insights. Descriptive statistics were used to describe study findings while SPSS and Atlas ti analyzed quantitative and qualitative data respectively. Primate surveys were conducted through reconnaissance walks in private forests to record species sightings. Remote sensing and GIS tools analyzed habitat conditions and spatial distribution of primate species, while encounter rates (ERs) and the Shannon-Wiener Diversity Index measured primate abundance and diversity. The study found that tree planting was the most common CCA strategy (65%), and conservation NGO efforts positively influenced forest conditions, with 69.4% of respondents reporting improvements. Forest ownership increased over time, with 68.5% of respondents owning forests between 1–2 acres in 2022, compared to 52.4% in 2010. Additionally, 82% of respondents indicated NGO support for development initiatives, such as tree farming, water access, education, and healthcare. Analysis of variance (ANOVA) results showed significant differences in primate conservation and CCA efforts based on respondents' occupations ( $p \leq 0.05$ ). Pearson correlation analysis revealed a negative relationship between gender (male) and community contributions to conservation ( $p \leq 0.05$ ) and a positive relationship between occupation and the perceived importance of conservation ( $p \leq 0.05$ ). Twenty-three reconnaissance surveys were conducted, covering 109.3 km, with an average distance of 4.752 km per survey: Birungu (36.6 km), Kibanjwa (26.6 km), Kidoma (34.4 km), and Munteme (11.5 km). The primate surveys recorded seven species, including Chimpanzee, Grey-cheeked Mangabey, Olive Baboon, Black-and-white Colobus, Blue Monkey, Red-tailed Monkey, and Vervet Monkey. The diversity of primate species underscores the importance of continued conservation efforts in the BBC. To enhance effectiveness, the study recommends that future conservation and CCA initiatives consider private forest owners' tree planting practices and occupations. An integrated approach combining preferred conservation and CCA strategies is suggested to optimize conservation outcomes. Conservation actions, it concludes, should be evidence-based, informed by scientific research, and tailored to local conditions to ensure sustainable protection of primate species and their habitats in the corridor.

## CHAPTER ONE: INTRODUCTION

### 1.1 Background

Conservation of biodiversity and climate change adaptation are increasingly vital issues for sustainable development, with both protected areas (PAs) and private forests playing essential roles in preserving ecological integrity. Globally, private forests comprise over 70% of the Earth's forested land, making them critical to achieving international conservation targets, including those outlined in the Convention on Biological Diversity (CBD) (Watson *et al.*, 2018). Climate change, however, poses significant conservation challenges, intensifying biodiversity loss, habitat degradation, and ecosystem instability—especially in regions where private ownership complicates unified conservation strategies (Perfecto *et al.*, 2019). In response, global conservation frameworks now prioritize adaptive management practices that enhance ecosystem resilience across both public and private lands within larger landscape-level strategies, emphasizing the importance of engaging private landowners to build climate-resilient, interconnected landscapes (Pedroza-Arceo *et al.*, 2022).

In East Africa, where biodiversity is exceptionally high and socio-economic conditions often depend on natural resources, integrating climate change adaptation (CCA) into conservation strategies is a growing priority. East Africa is home to globally significant biodiversity hotspots, notably the Albertine Rift (AR), a region focused on ecological connectivity across fragmented landscapes to bolster species resilience (Plumptre *et al.*, 2021). These landscapes, however, face significant pressures from human activities and climate-induced stressors, necessitating adaptive conservation approaches that include active engagement with local communities and stakeholders (Ranjan *et al.*, 2019). Conservation NGOs and government entities across East Africa have collaborated to support sustainable land management and create climate-resilient corridors to protect biodiversity while addressing local livelihoods and climate vulnerabilities (Aganyira *et al.*, 2020).

The AR, a recognized biodiversity hotspot by the International Union for Conservation of Nature, is among the world's top 25 biodiversity hotspots (WWF, 2023). This region encompasses a network of PAs and human-modified habitats, housing a significant proportion of Uganda's biodiversity, including endemic and endangered species such as the chimpanzee (NEMA, 2021). The Rift spans multiple countries—Uganda, the Democratic Republic of Congo, Rwanda, Burundi, and Tanzania—and contains Uganda's highest concentrations of key biodiversity areas (KBAs), with 90% of the country's KBAs, 52% of Africa's bird species, 39% of its mammals, 19% of amphibians, and 14% of reptile species (NEMA, 2021; Plumptre *et al.*, 2021).

In Uganda, biodiversity conservation within private forests, especially in sensitive regions like the Budongo-Bugoma Corridor (BBC), is critical to maintaining ecological connectivity and resilience amid climate change. As part of the AR, the BBC serves as a crucial wildlife corridor for species such as chimpanzees, with privately owned forests contributing essential ecosystem services and landscape resilience (McCarthy *et al.*, 2018). Yet, these privately held forests are threatened by deforestation, agricultural expansion, and habitat fragmentation, factors that compromise conservation efforts in the region (Fashina *et al.*, 2018). The success of conservation initiatives in Uganda often depends on the cooperation of private forest owners (PFOs), as their participation in sustainable forest management is crucial for ecological connectivity (Katusiime *et al.*, 2023).

Home to substantial wildlife populations, including an estimated 260-320 endangered chimpanzees (*Pan troglodytes schweinfurthii*), the BBC forms part of the Murchison-Semliki landscape within the AR (Zimmermann *et al.*, 2020). This 50-km corridor links the Budongo and Bugoma Central Forest Reserves, two critical ecosystems managed by the National Forestry Authority (NFA) but surrounded by privately owned, degraded forest patches (Katswera *et al.*, 2022). Given the BBC's ecological significance, conservation NGOs—

primarily members of the Northern Albertine Rift Conservation Group (NARCG)—have implemented long-term projects focused on forest conservation and restoration to enhance biodiversity and climate resilience. Key NARCG members, including the Wildlife Conservation Society (WCS), the Jane Goodall Institute (JGI), ECOTRUST, Flora and Fauna International (FFI), WWF Uganda, and the Chimpanzee Trust, collaborate with PFOs through initiatives such as REDD+, Payment for Ecosystem Services (PES), and other adaptive conservation approaches (Snilsveit *et al.*, 2019).

The conservation projects managed by NARCG NGOs employ a variety of strategies aimed at reducing deforestation and restoring forest landscapes to generate biodiversity and community co-benefits. These projects include activities such as conservation farming, business saving groups, beekeeping, nursery bed establishment, tree planting, and animal husbandry. By focusing on restoring forests in areas around potential wildlife corridors, NARCG members have engaged PFOs, organized through parish-based Private Forest Owners' Associations (PFOAs), and worked with forest-adjacent communities to ensure community-wide conservation benefits (Monroe *et al.*, 2019).

Despite these efforts, forest loss within the BBC persists, with annual deforestation rates at 3.2%, resulting in a loss of over 310,000 hectares between 2005 and 2015 (WCS, 2021). Key drivers of biodiversity loss include habitat conversion, over-exploitation, climate change, and population growth (Akinyemi, 2017; Bamwesigye *et al.*, 2022). Further compounding these challenges, the discovery of commercially viable oil in the AR has led to infrastructure projects—including an international airport, processing facilities, and the East African Crude Oil Pipeline—which threaten to exacerbate forest loss, biodiversity decline, and climate risks (Petroleum Authority of Uganda, 2022; (WWF & CSCO, 2017).

Moreover, agricultural expansion among rural Ugandans, 83% of whom rely on agriculture, has led to significant forest and wetland conversion, reducing forest areas, and jeopardizing the biodiversity within private forests (FAO, 2016). Consequently, private forests continue to face conversion into competing land uses, posing threats to biodiversity and low adoption rates of conservation initiatives (Monroe *et al.*, 2019; Okumu & Muchapondwa, 2020).

As forest loss and habitat fragmentation worsen, primates such as chimpanzees face increasing risk, while fragmented forests hinder landscape-level ecological resilience. Although conservation NGOs have implemented various initiatives to address these issues, factors affecting PFOs' acceptance of conservation practices remain underexplored. Understanding PFOs' perspectives on conservation initiatives is vital to identifying barriers to adoption and ensuring sustainable conservation outcomes. This study seeks to assess strategies employed by conservation NGOs that foster primate conservation and climate adaptation, to understand the conditions under which PFOs are more likely to engage in sustainable forest management. By clarifying these factors, this research aims to guide future conservation efforts in the BBC, promoting ecological connectivity and resilience in the face of ongoing environmental pressures (Blake *et al.*, 2018; Plumptre *et al.*, 2021).

## **1.2 Statement of the Problem**

The Budongo-Bugoma Corridor (BBC) has experienced a significant loss of private forests, particularly in riverine patches and areas linking PAs (Akinyemi, 2017). This has led to the fragmentation of primate habitats and heightened threats to biodiversity conservation, and climate change adaptation efforts. As a result, primate species including the globally endangered chimpanzees, face increasing risks (Plumptre *et al.*, 2021). The expansion of oil sector infrastructure in the region further threatens biodiversity, ecosystem health, and climate change adaptation (CCA) initiatives (Kassim, 2020; MacKenzie *et al.*, 2017).

Despite the challenges, the BBC has benefitted from several pilot forest conservation projects focused on improving livelihoods in return for the conservation of private forests by conservation NGOs (Okumu & Muchapondwa, 2020). However, adoption of piloted conservation and climate change adaptation strategies by forest owners (FOs) remains low, preferred conservation strategies are unknown, and yet, forest cover continues to decline. The reasons for this low uptake of conservation strategies remain unclear, and no comprehensive research has been conducted to bridge the existing knowledge gap (Blake *et al.*, 2018).

This research attempts to investigate the factors contributing to the low adoption of piloted forest conservation and CCA strategies among FOs. It seeks to characterize the piloted conservation strategies and point out the most preferred conservation strategies that contribute to primate conservation, ecosystem restoration, and climate resilience in the BBC. The study aims to guide future interventions that enhance CCA, secure primate habitats, and support the sustainable management of private forests.

### **1.3 Objectives of the study**

#### **1.3.1 General objective**

To assess climate change adaptation and primates' conservation strategies used by conservation NGOs in the Budongo-Bugoma corridor privately-owned forests.

#### **1.3.2 Specific objectives**

- (i) To characterize private forest conservation and climate change adaptation strategies used by conservation NGOs to conserve private forests in the Budongo-Bugoma corridor.
- (ii) To determine the species diversity of primates that are present in the privately owned forests within the Budongo-Bugoma corridor.

- (iii) To assess private forest owners' attitudes and perceptions towards primate conservation in private forests and climate change adaptation within the Budongo-Bugoma corridor.

### **1.3.3 Research Questions**

- (i) Which forest conservation and CCA strategies are used by NGOs to conserve private forests in the Budongo-Bugoma corridor?
- (ii) What is the species diversity of primates that are present in the privately owned forests within the Budongo-Bugoma corridor?
- (iii) What are the private FOs' attitudes and perceptions towards primate conservation in private forests and climate change adaptation within the Budongo-Bugoma corridor?

### **1.4 Justification of the Study**

The study aims to identify and characterize effective private forest conservation and climate change adaptation (CCA) strategies used by conservation NGOs in the Bugoma-Budongo Corridor (BBC) while assessing primate species diversity in the region. By evaluating existing conservation initiatives and local attitudes, the research provides insights into the preferences of forest owners for conserving private forests, protecting biodiversity, restoring ecosystems, and adapting to climate change.

These findings will guide conservation organizations in prioritizing effective approaches and inform stakeholders, including NGOs and government agencies, about household willingness to adopt conservation measures. This research addresses a gap in the existing literature by focusing specifically on the BBC and offers actionable recommendations to enhance ecological integrity, wildlife connectivity, and resilience to climate change.

The study aligns with Uganda's National Development Plan III and the Sustainable Development Goals (SDGs), particularly SDG 15 and SDG 13, by supporting efforts to protect terrestrial ecosystems and combat climate change. Overall, the research provides a foundation for optimizing conservation strategies, securing community support, and fostering further research in similar ecosystems.

Although previous research on the AR has highlighted key corridors and landscapes for conservation, no comprehensive study has been conducted to determine the most appropriate strategies specific to the BBC. This research fills that gap by providing actionable recommendations to conservation organizations and interested stakeholders in the BBC.

### **1.5 Definition of terms**

**Attitude:** Beliefs, norms, and feelings held by private forest owners while taking part in decision-making processes, uptake of new conservation initiatives, or when participating in conservation interventions (Meijer *et al.*, 2015). Attitude means a positive or negative inclination about an existing situation, particularly a conservation or CCA strategy.

**Biodiversity:** The full variety of life forms on earth including diversity within a species (genetic diversity), diversity among species (species diversity), and diversity within ecosystems (ecosystems diversity). In this research, diversity refers to the species of primates in the BBC.

**Climate change:** Long-term change in weather patterns (mainly temperatures and rainfall) of the BBC resulting from natural shifts or artificial causes. It also means any significant and long-term changes in parameters of the BBC's climate occurring over a few decades or longer periods.

**Climate change adaptation:** The process of adjusting to the current or expected impacts of climate change in the BBC. It involves implementing actions, strategies, and policies

designed to reduce the vulnerability of private forests and associated biodiversity to the effects of climate change and to enhance their capacity to cope with and recover from climate-related events.

**Conservation Corridor:** A piece or piece of land connecting two PAs or an effective pattern of habitats connecting remaining PAs to ensure ecological connectivity for wildlife species, communities, and any ecological processes. In this research, the corridor means the BBC.

**Payment for Ecosystem Services (PES):** An approach for compensating forest owners in the BBC for actions towards increasing ecosystem services provisions such as carbon storage, water purification, flood control, and mitigation, or nutrient recycling.

**Perceptions:** The way individuals interpret, understand, and form opinions or beliefs about private forests/primates and/or climate change adaptation strategies in the BBC. These perceptions are subjective and can be influenced by forest owners' experiences, cultural backgrounds, education, social context, and cognitive biases. Understanding people's perceptions is critical for evaluating attitudes, behaviors, or reactions to issues, policies, or interventions.

**Private Forests:** Forests that private individuals, schools, churches, and other private institutions other than the National Forestry Authority of Uganda own. Private forests form the biggest part of the BBC and are mostly riverine.

**REDD+:** An approach (piloted in the BBC) to reducing atmospheric carbon emissions that cause Climate Change using natural forests through the provision of financial incentives from developed countries to individuals and developing countries. REDD+ primarily aims at reducing carbon emissions, but also emphasizes livelihood improvement among participating FOs, sustainable forest management, and enhancement of forest carbon stock.

## **1.6 Scope of the Study**

### **1.6.1 Geographical Scope of the Study**

The study was carried out in Hoima and Kikuube districts which are located approximately 225 km from Kampala City in the southwest part of Uganda. The Budongo-Bugoma corridor stretches from the southern part of Budongo central forest in Masindi District through the sub-counties of Kyabigambire, Kitoba, and Kigorobyia (Hoima District), and Kiziramfumbi, Bugambe, and Kabwoya (Kikuube District). Two sub-counties were selected purposively for the study: Kitoba in Hoima and Kiziranfumbi in Kikuube District (Figure 3.1).

### **1.6.2 Time scope**

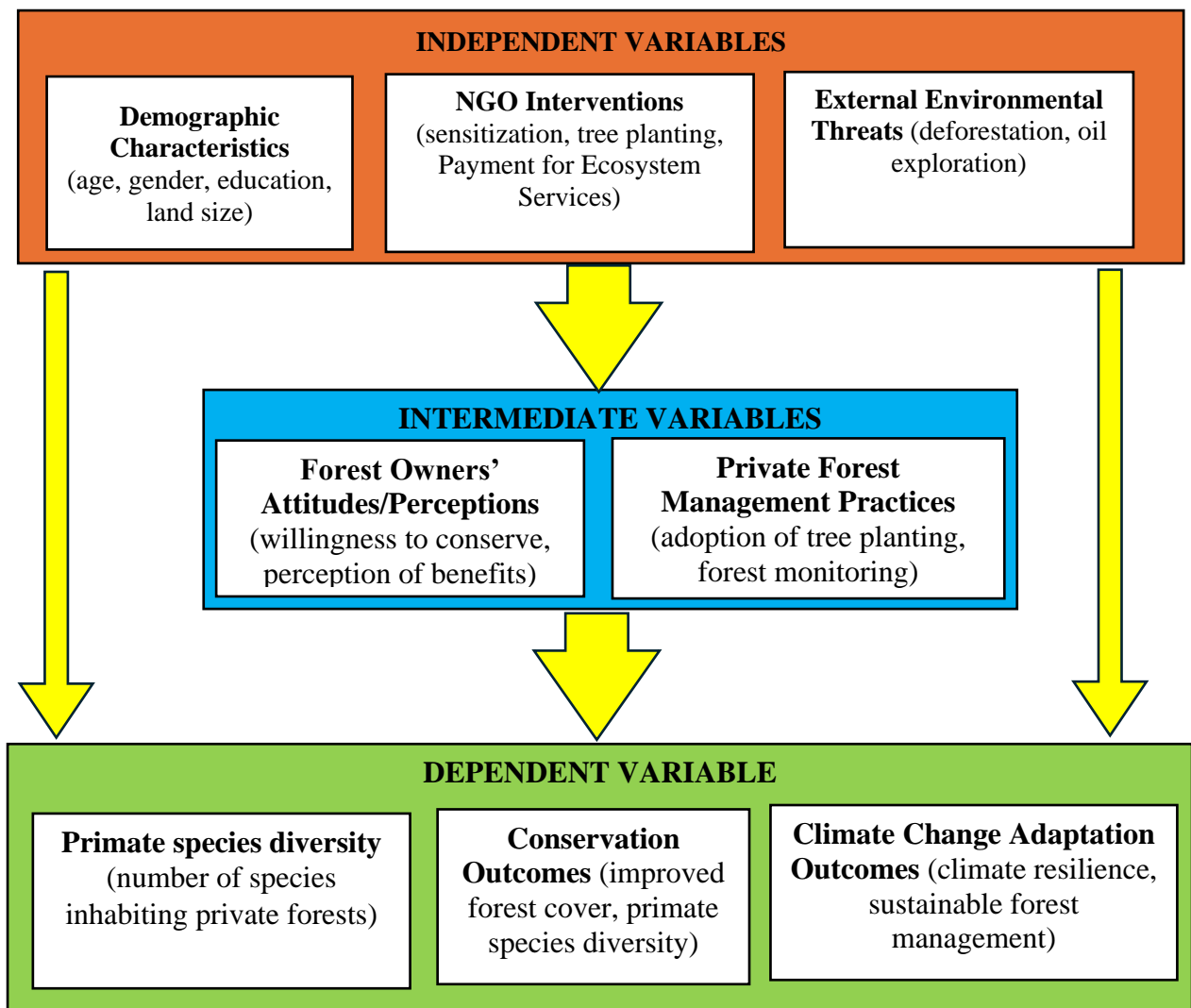
The study spanned twelve months and included several phases: proposal development, reconnaissance, data collection, data entry and cleaning, data transformation, data analysis, and report writing. Notably, the data collection phase lasted two months, with one month dedicated to focused group discussions, households, and key informant interviews and the second month focused on the primate survey.

## **1.7 Conceptual Framework of the study**

The Budongo-Bugoma Corridor (BBC) is experiencing significant deforestation, which threatens primate species and overall biodiversity. Effective conservation efforts by non-governmental organizations (NGOs) are crucial; however, the uptake of conservation and climate change adaptation (CCA) strategies among private forest owners (PFOs) remains low. This study aimed to understand the relationships between conservation NGO interventions, private forest owners' perceptions, and the resulting conservation outcomes on private forests and primates' diversity. The conceptual framework illustrates how independent variables influence intermediate variables, which in turn impact dependent variables related to primate conservation and climate change adaptation in the BBC. The

independent variables (IV) included background factors such as age, gender, education, land size, settlement duration, and occupation of respondents; Conservation NGO interventions such as sensitization, development initiatives, and conservation incentives; and community characteristics such as Private Forest Owners involvement, conservation attitudes/perceptions, and community support. The Intermediate Variables (IV) included private forest management such as tree planting, forest monitoring, and conservation practices; and attitudes/perceptions such as community perceptions of primates' conservation, and willingness to adopt CCA strategies. The dependent variables (DV) included primate conservation outcomes such as primate species diversity, forest cover, and community involvement in conservation; and forest and biodiversity outcomes such as improved forest conditions, and climate resilience.

The study used a cross-sectional research design using a mixed data collection methods approach on conservation strategies, primate species diversity, and attitudes and perceptions of private forest owners to forest conservation and CCA strategies. Quantitative data were collected from households and analyzed using software and ANOVA and Pearson correlation to determine relationships between background characteristics and conservation attitudes/perceptions. Qualitative data were gathered through key informant interviews (KIIs) and Focus Group Discussions (FGDs), providing insights into community attitudes and NGO interventions. Primate surveys involved reconnaissance walks to assess species diversity, abundance, and distribution, analyzed using the Shannon-Wiener Diversity Index and GIS and Remote Sensing. The findings were recorded and analyzed to generate insights and highlights about the study which informed the discussions, conclusions, and recommendations.



**Figure 1.1:** Illustration of the relationships between independent variables (demographic characteristics, NGO interventions, and environmental threats), intermediate variables (forest owners' attitudes and private forest management practices), and dependent variables (conservation outcomes, primate species diversity, and climate change adaptation outcomes), highlighting the dynamic interactions that influence effective conservation strategies.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Introduction to the Literature Review

The Budongo-Bugoma Corridor (BBC) in Uganda is a significant component of the Albertine Rift, renowned for its high biodiversity and critical role in conservation. This corridor supports a diverse range of species, particularly primates, and acts as an essential habitat for wildlife (Kiribou *et al.*, 2024). Privately owned forests within this corridor not only sustain unique ecosystems but also serve as vital connections between the Budongo and Bugoma central forest reserves, enabling the movement of species across the landscape (McCarthy *et al.*, 2018). However, these privately owned forests face increasing threats from deforestation, habitat degradation, and climate change, which jeopardize wildlife connectivity in the area (Zemanova *et al.*, 2017). Given these challenges, the need for effective conservation and climate change adaptation (CCA) strategies within the BBC is more urgent than ever, especially within privately owned forests.

The conservation and resilience of the BBC hinge on the successful implementation of sustainable climate-resilient forest management strategies that engage local communities and stakeholders. Conservation NGOs play a central role in these efforts, promoting forest management practices that are not only sustainable but also adaptive to the effects of climate change (Ranjan *et al.*, 2019). However, the effectiveness of these initiatives requires a thorough evaluation to ensure they are effective. Research suggests that conservation strategies are more likely to succeed when they are tailored to local needs and constraints, incorporating community input, and adapting to the specific pressures and opportunities of the region (Hoffmann, 2022).

Primate species, as flagship species within the BBC, are particularly vulnerable to the impacts of habitat fragmentation and degradation. These species are vital to the BBC's ecological health, serving critical functions that support biodiversity and ecosystem stability. Thus, understanding the primate diversity within these forests is essential for developing targeted conservation measures that can mitigate habitat loss and fragmentation (Fashina *et al.*, 2018). Effective conservation of these primate populations contributes not only to preserving the BBC's biodiversity but also to maintaining its overall ecological integrity.

An essential aspect of conservation in the BBC lies in understanding the attitudes and perceptions of private forest owners (PFOs) toward conservation efforts. The willingness of landowners to adopt conservation initiatives significantly affects the long-term success of conservation and adaptation initiatives (Katusiime *et al.*, 2023). Studies have shown that positive relationships between PFOs and conservation organizations can foster greater participation in conservation activities, making these relationships a critical element in achieving sustainable conservation outcomes (Kuhfuss *et al.*, 2018).

## **2.2 Private Forest Conservation and Climate Change Adaptation Strategies**

Climate adaptation strategies outlined by the World Resources Institute (WRI) emphasize building adaptive capacity and reducing emissions (Jandl *et al.*, 2019). Effective strategies include wetland protection, sustainable agroforestry, and securing land rights (Webb *et al.*, 2017). Globally, adaptation strategies in privately owned forests aim to enhance ecosystem resilience and carbon stocks while mitigating the impacts of deforestation and habitat degradation. Under the Paris Agreement, countries are encouraged to incorporate forest-based climate solutions into their Nationally Determined Contributions (NDCs), emphasizing adaptive management practices such as afforestation and sustainable forest management (Stubenrauch *et al.*, 2022).

The Convention on Biological Diversity (CBD) promotes biodiversity conservation as integral to climate adaptation strategies, particularly within biodiversity hotspots. Initiatives like REDD+ (Reducing Emissions from Deforestation and Forest Degradation) incentivize private forest owners to adopt sustainable management practices that contribute to both carbon storage and biodiversity protection (Morita & Matsumoto, 2023). Furthermore, ecosystem-based adaptation (EbA) has emerged as a key strategy, leveraging biodiversity and ecosystem services to facilitate human adaptation to climate change (Munang *et al.*, 2019).

In Africa's Albertine Rift, climate change adaptation efforts are often integrated into broader conservation strategies. Programs like the African Forest Landscape Restoration Initiative (AFR100) aim to restore 100 million hectares of deforested and degraded land by 2030, which includes privately owned forests (Djenontin *et al.*, 2021).

Nationally, Uganda's climate policies prioritize forest management as a key adaptation strategy. The Uganda National Climate Change Policy recognizes forests' roles in carbon sequestration and biodiversity conservation, particularly in high-biodiversity areas such as the BBC (UBOS, 2021). The BBC is home to numerous endemic species and faces threats from climate change, deforestation, and land-use change (Plumptre *et al.*, 2021).

### **2.2.1 Conservation Strategies within the Budongo-Bugoma Corridor**

Conservation NGOs play a vital role in implementing climate change adaptation strategies in the BBC. Their efforts focus on ecosystem-based approaches that restore degraded areas, promote agroforestry, and support community-based conservation initiatives. Reforestation initiatives aim to create buffer zones around private forests and connect fragmented habitats to facilitate wildlife movement (Kiribou *et al.*, 2024). Local communities and private landowners are encouraged to adopt climate-resilient agricultural practices and sustainable

forest management approaches that balance biodiversity conservation with livelihood needs (Kiribou *et al.*, 2024).

Research indicates that effective biodiversity management is crucial for strengthening ecosystem resilience, thereby supporting successful adaptation strategies (ACODE, 2021). Enhanced protection of plant and animal species, particularly within critical habitats like the BBC, not only sustains biodiversity but also supports human livelihoods that depend on healthy ecosystems (Sintayehu, 2018). Therefore, effective adaptation strategies tailored to local socio-economic contexts are essential for vulnerable communities in the face of climate change (UNFCCC, 2021).

The BBC's private forests are vital for carbon sequestration and support species like endangered chimpanzees, contributing significantly to both biodiversity conservation and climate mitigation efforts (Ministry of Water and Environment, 2020). However, the corridor faces increasing vulnerability to climate impacts due to deforestation and degradation driven by human activities, necessitating urgent conservation actions (Bamwesigye *et al.*, 2022).

### **2.2.2 Private Forest Restoration and Biodiversity Conservation in Degraded Habitats**

Deforestation, forest fragmentation, and forest degradation on private lands pose significant threats to biodiversity and ecosystem services globally (Brown, 2022). Forest restoration has become a global conservation priority, with initiatives like the New York Declaration on Forests and the Bonn Challenge aiming to restore 350 million hectares of degraded ecosystems by 2030 (Global Forests Coalition, 2021). Successful restoration efforts are influenced by landscape characteristics such as population density, which impacts natural regeneration rates (Crouzeilles *et al.*, 2017). Conservation corridors are recognized as priority

areas for restoration due to their crucial biodiversity and ecosystem service benefits (Vincent *et al.*, 2021).

In the BBC, which supports a variety of species, including endangered chimpanzees, restoration initiatives focus on improving ecosystem services such as water regulation, nutrient cycling, and micro-climate modification essential for sustaining biodiversity (Zimmermann *et al.*, 2020).

International conservation NGOs have led efforts to preserve the BBC by engaging private forest owners in sustainable forest management practices. Strategies include the establishment of community forest management groups, offering technical and financial support for restoration projects, and promoting conservation-friendly land-use practices (Kiribou *et al.*, 2024). For instance, the Jane Goodall Institute (JGI) has collaborated with local communities and forest owners to protect chimpanzee habitats and enhance forest connectivity. Their initiatives include creating conservation corridors to facilitate wildlife movement between fragmented forest patches, thereby reducing the risk of species isolation and increasing ecosystem resilience to climate change (McCarthy *et al.*, 2018). Furthermore, the Wildlife Conservation Society (WCS) promotes climate-smart agriculture and agroforestry within the corridor, providing alternative livelihoods for local communities while reducing pressure on forest resources (Bamwesigye *et al.*, 2022).

### **2.2.3 Best Practices in Private Forest Conservation and Climate Change Adaptation**

The BBC Corridor plays a vital role in biodiversity conservation, particularly for primates, while supporting essential ecosystem services like carbon sequestration and water regulation. The key strategies for restoring degraded areas and increasing forest cover in the BBC include planting native tree species ecologically suited to the region, which enhances

biodiversity and restores soil health (McCarthy *et al.*, 2018). Engaging local communities in these efforts fosters ownership and ensures long-term sustainability (Obradović *et al.*, 2023).

The agroforestry approach integrates trees into agricultural landscapes, balancing environmental conservation with agricultural productivity. Successful agroforestry practices in the BBC include planting fast-growing species alongside crops like coffee and bananas, enhancing soil fertility and reducing erosion (Kiribou *et al.*, 2024). Local NGOs train farmers in sustainable practices, providing technical support and access to tree seedlings (Mashizi & Sharafatmandrad, 2021).

Ecosystem Restoration is focused on rehabilitating degraded areas and restoring ecological connectivity. Initiatives led by the WCS, FFI, WWF, and JGI aim to create wildlife corridors that reconnect isolated patches, facilitating species movement and reducing genetic isolation risks (McCarthy *et al.*, 2018). Participatory approaches engaging local communities in monitoring and managing restored areas enhance long-term success (Bamwesigye *et al.*, 2022; Plumptre *et al.*, 2021). Conservation NGOs also support developing forest management plans that integrate biodiversity conservation and climate adaptation (Djenontin *et al.*, 2021).

#### **2.2.4 Challenges in Implementing Conservation and Adaptation Strategies in Private Forests**

Despite the significant conservation efforts in the BBC, challenges hinder effective climate change adaptation and conservation measures in privately owned forests. One primary issue is the lack of secure land tenure, which deters private landowners from investing in long-term sustainable practices. Ambiguous land tenure and weak enforcement of property rights have led to widespread deforestation (McCarthy *et al.*, 2018). Without secure rights, landowners may hesitate to engage in conservation efforts (Katusiime *et al.*, 2023). Economic pressures

compel many private forest owners to convert forests to farmland or extract timber for short-term gain (Fashina *et al.*, 2018). Incorporating economic incentives, such as payments for ecosystem services (PES), could help balance environmental and economic needs (Kuhfuss *et al.*, 2018). Limited awareness and engagement with conservation goals can hinder implementation. Strengthening governance structures and ensuring policy coherence among private landowners, conservation NGOs, and local communities is essential (Ranjan *et al.*, 2019). Collaborative management frameworks can foster a sense of collective responsibility for sustainable land use (Aganyira *et al.*, 2020).

### **2.3 Primate Diversity in the Albertine Rift and Distribution in Private Forests of the BBC**

The Albertine Rift is acclaimed for its exceptional biodiversity, particularly in primate species. This region hosts approximately 17 primate species, making it one of Africa's most diverse primate regions (Plumptre *et al.*, 2021). Among the notable species are Mountain Gorillas (*Gorilla beringei beringei*) and chimpanzees (*Pan troglodytes*) (Plumptre *et al.*, 2021; Rich *et al.*, 2020). Blue Monkeys (*Cercopithecus mitis*) and Vervet Monkeys (*Chlorocebus pygerythrus*) are common in various forest types, and they play crucial roles in seed dispersal and maintaining forest health (Plumptre *et al.*, 2021). The BBC supports several primate species, including red-tailed monkeys (*Cercopithecus ascanius*), and black-and-white colobus monkeys (*Colobus guereza*). This corridor is crucial for maintaining biodiversity, ecosystem functioning, and research and ecotourism opportunities (Lamprey *et al.*, 2022).

Despite its significance, the BBC faces numerous threats, including Deforestation and Habitat Loss, Human-Wildlife Conflicts, and Climate Change resulting from altered climate patterns can affect habitat suitability for primates, impacting their distribution and survival (Plumptre

*et al.*, 2021). The combined effects of deforestation, degradation, and fragmentation threaten primate populations and broader species diversity within the BBC. The decline of primate populations serves as an indicator of biodiversity loss, as primates are critical to ecosystem functioning, particularly in seed dispersal (Galán-Acedo *et al.*, 2019).

The distribution of primate species within the corridor reflects distinct habitat preferences, particularly in privately owned forests. These areas are vital for Food Resources because of abundant fruiting trees and foliage attract primates, supporting their dietary needs, and tree canopies offer protection from predators and harsh weather conditions (Plumptre *et al.*, 2021).

Primate movement in the Budongo-Bugoma Corridor is influenced by the time of day, as most species, including chimpanzees and monkeys, are diurnal. They are most active during the cooler early morning and late afternoon when foraging is optimal. In contrast, during the hottest part of the day, they seek shade to avoid heat stress, resulting in decreased movement. Social interactions, such as grooming, are also more frequent during these cooler periods, indicating that their activity patterns are closely linked to changes in light and temperature throughout the day (Pruetz, 2018).

### **2.3.1. Comparing Primate Biodiversity in Protected Areas and Privately-Owned Forests**

Protected areas such as Budongo and Bugoma forests offer legal protections against hunting and logging, resulting in higher species richness and population densities of primates. Protected areas have greater species richness and population densities and stable habitats that have less human disturbance (Bryson-Morrison *et al.*, 2017). The Budongo Forest is known for its large chimpanzee populations and supports species like blue monkeys and red-tailed monkeys. In contrast, privately owned forests within the corridor exhibit notable primate

diversity but generally lower population densities compared to PAs, primarily due to habitat quality, human encroachment, and hunting pressures (Galán-Acedo *et al.*, 2019).

## **2.4 People's attitudes towards NGOs' private forest and biodiversity conservation strategies**

Recent conservation efforts emphasize the importance of involving local communities, as collaborative management strategies have emerged as vital for biodiversity conservation, particularly outside PAs (African Wildlife Foundation, 2023; (Rahman *et al.*, 2017).

Conservation NGOs play a significant role in implementing strategies for primate conservation and climate change adaptation within the BBC. The key factors influencing PFOs' perceptions of conservation NGOs include Communication and Outreach. Research indicates that PFOs who receive clear and consistent information about conservation efforts tend to have more positive views of NGOs and their work (Yasué *et al.*, 2019). Programs that integrate sustainable land-use practices and provide financial incentives for conservation often garner more support from forest owners. Visibility of Impact is another factor, PFOs are more likely to support conservation initiatives if they can observe tangible benefits from NGO-led projects (Young *et al.*, 2021).

### **2.4.1 People's attitudes towards primate conservation efforts**

Several factors influence the perceptions of PFOs regarding primate conservation initiatives: Private Forest owners who understand the role of primates in maintaining ecosystem balance and other benefits are more likely to support conservation initiatives (Galán-Acedo *et al.*, 2019). Education campaigns highlighting the importance of primates enhance understanding and promote positive attitudes toward conservation efforts. Some PFOs may view NGO-led primate conservation efforts as conflicting with their land-use practices. Issues such as crop

damage caused by primates can lead to negative perceptions of conservation NGOs, particularly if these organizations do not effectively address the concerns of local landowners (Twongyirwe *et al.*, 2018). PFOs who are actively involved in conservation initiatives tend to hold more favorable views of NGOs. Participatory approaches that include PFOs in decision-making processes can foster increased ownership and support for conservation efforts (Bonebrake *et al.*, 2018).

#### **2.4.2 People's Perspectives on Climate Adaptation Strategies**

Climate change adaptation is increasingly recognized as a critical component of conservation efforts. PFOs' perceptions of climate adaptation strategies implemented by NGOs encompass relevance and practicality, financial incentives and support, and trust and relationships. PFOs are more likely to support climate adaptation strategies perceived as relevant to their specific circumstances and challenges. NGOs that tailor their initiatives to address local climate impacts and provide practical solutions, such as agroforestry or water conservation techniques, are viewed positively by PFOs (Bryson-Morrison *et al.*, 2017). Economic considerations significantly influence PFOs' perceptions of climate adaptation initiatives. Programs offering financial incentives, such as payments for ecosystem services or access to markets for sustainable products, are likely to receive greater support from forest owners (Young *et al.*, 2021). Trust between PFOs and conservation NGOs is fundamental for the successful implementation of climate adaptation strategies. NGOs that cultivate strong relationships with local communities and demonstrate transparency in their operations are more likely to secure PFOs' support (Galán-Acedo *et al.*, 2019).

### 2.4.3 Human-Wildlife Conflicts and Their Impact on Conservation Attitudes

Human-wildlife conflict (HWC) poses a significant challenge to biodiversity conservation, especially in regions where human activities intersect with wildlife habitats. In the BBC, conflicts with olive baboons (*Papio anubis*) and chimpanzees (*Pan troglodytes*), create unique challenges for private landowners. Understanding the dynamics of HWCs and their effects on conservation attitudes among private landowners is crucial for developing effective conservation strategies that promote coexistence between humans and wildlife (Twongyirwe *et al.*, 2018).

HWCs frequently arises from competition for resources, particularly in agricultural areas bordering wildlife habitats. Private landowners often experience damage to crops and property due to foraging primates, leading to frustration and resentment towards wildlife (Twongyirwe *et al.*, 2018). Primates are notorious for raiding crops, causing significant economic losses for private landowners. This often leads to negative attitudes towards conservation and wildlife protection, as farmers perceive wildlife as a direct threat to their livelihoods (Kolinski & Milich, 2021). In some cases, primates may prey on livestock or compete for forage, further exacerbating tensions between landowners and wildlife (Lamprey *et al.*, 2022). The proximity of wildlife to human populations poses health risks concerning zoonotic diseases. Fears of disease transmission can heighten tensions and contribute to negative perceptions of wildlife (Bonebrake *et al.*, 2018).

The impact of HWC on private landowners' attitudes towards conservation efforts in the BBC is multifaceted. Landowners affected by HWC may develop negative perceptions of conservation initiatives and organizations that advocate for wildlife protection. When wildlife is seen as a nuisance or threat, landowners may resist participating in conservation programs, viewing them as favoring wildlife over their agricultural interests (Twongyirwe *et al.*, 2018).

Economic losses associated with HWC can diminish landowners' willingness to engage in conservation practices. When wildlife is perceived as detrimental to livelihoods, immediate economic concerns often take precedence over long-term conservation benefits (Kolinski & Milich, 2021). Persistent conflicts can lead to retaliatory behaviors against wildlife, including poaching and habitat destruction, undermining conservation efforts, and threatening primate populations (Lamprey *et al.*, 2022).

#### **2.4.4 Community Engagement and Participation in Conservation Efforts**

Engaging local communities in conservation efforts creates a sense of ownership and responsibility. This results from increased awareness about the ecological significance of forests and primates, emphasizing the benefits of biodiversity conservation (Lamprey *et al.*, 2022). Educational programs targeting private forest owners instill knowledge about sustainable land management practices; and engagement fosters collaboration among local communities, NGOs, and governmental agencies, enhancing information sharing and creating a unified front in conservation efforts (Bonebrake *et al.*, 2018).

The existing literature revealed that gaps remain in understanding the specific contributions of private forest owners to primate conservation and their perceptions of climate change adaptation. Specifically, identification and characterization of private forest conservation and climate change adaptation strategies used by NGOs in the BBC; Conducting comprehensive surveys to determine the diversity of primates and other species in privately owned forests; and investigation of private forest owners' attitudes and perceptions toward primate conservation and climate change adaptation. These perspectives will inform the development of targeted interventions.

## CHAPTER THREE: MATERIALS AND METHODS

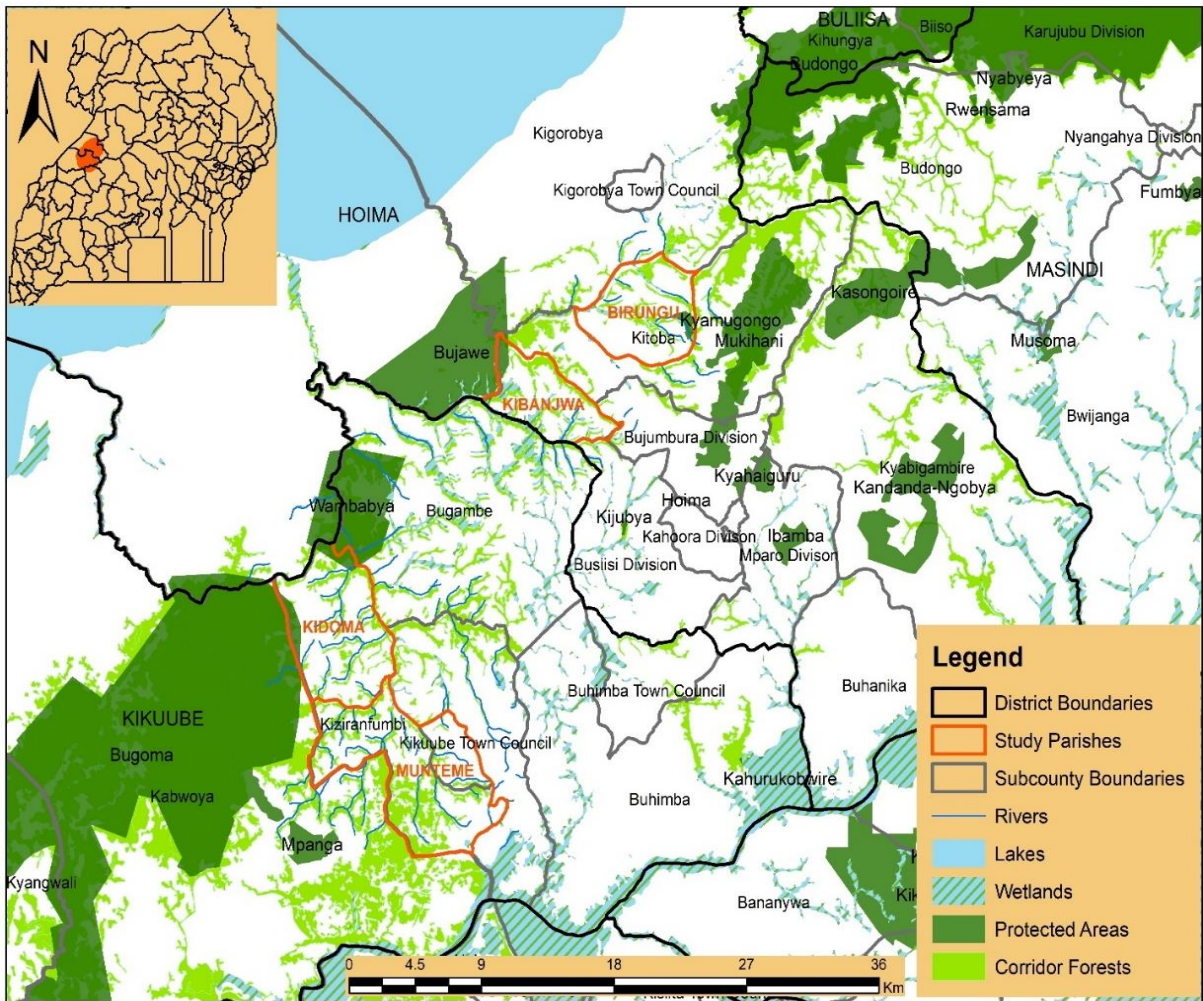
### 3.1 Introduction

This chapter describes the study area, materials, and methods utilized for data collection and analysis. It is organized into the following sections: a description of the study area, research design and sample size, data collection methods, sources of secondary data, and data analysis aligned with the study objectives. Each section details the approach and tools used to ensure reliable and valid results throughout the research process.

### 3.2 Description of the Study Area

The study was conducted in Hoima and Kikuube districts, where two parishes were purposively selected from one sub-county in each district, based on the number of forest owner (FO) associations (PFOAs) listed by sub-county chairpersons. In Kikuube District, Munteme and Kidoma-Bulimya parishes from Kiziranfumbi Sub County were selected, while in Hoima District, Kibanjwa and Birungu parishes from Kitoba Sub County were chosen. Each of these parishes includes private FO associations that have participated in various forest conservation initiatives over the years in collaboration with multiple conservation stakeholders (Kazoora *et al.*, 2019).

The study involved a random selection of participants from the provided PFOA lists, employing a suitable statistical sampling method to ensure a representative sample. Additionally, private forested areas within each parish were surveyed for primate species presence, with distances traversed measured in kilometers according to the length of the forested areas (Chapman *et al.*, 2023).



**Figure 3.1: Location of Budongo-Bugoma Corridor forests and study selected area**

**Source of Spatial Data:** Uganda Bureau of Statistics 2020.

The vegetation cover in Hoima and Kikuube districts consists of a mosaic of forests and scattered woodlands intermixed with expansive grasslands that support wildlife grazing. Valleys within the study area contain *Cyperus papyrus* (papyrus) swamps, bordered by dense clusters of *Phoenix reclinata* (wild date palm). The landscape toward the west is bounded by Lake Albert, resulting in a drier climate with grassland-dominated vegetation. Moving eastward from the western rift valley escarpment, the area transitions from savanna woodlands to patches of high tropical forest. Approximately 350,000 hectares of natural forest patches in the region are under private ownership (Nature Uganda, 2016).

### **3.2.1 Rainfall and Temperature**

The mean annual rainfall amount is 1,400 mm arising from a bimodal distribution pattern that peaks in April – May, and August – November. December – March are usually dry months. The temperatures are moderate, with an average of 18 – 30°C (MWE, 2016). The districts have a land area of 59,327 sq. km (Mbabazi *et al.*, 2019) and 67% is arable land. The relief generally features broad hills, gentle slopes, and valleys with a few steep slopes, especially along the escarpment. The mean elevation of the districts is approximately 1,100m above sea level.

### **3.2.2 Population**

Hoima and Kikuube districts have an estimated population of 573,903 people, and the majority (50.2%) of them are males (UBOS, 2016). There is a high human density of approximately 246 persons per sq. km coupled with a growth rate of 2.2% (NEMA, 2019). It is estimated that 81% of the population is rural. The number of households in the districts is 125,399, of which 78 percent of these households are headed by males (UBOS, 2016). The high population density and growth rate in the districts could pose significant challenges to conservation efforts. With approximately 246 persons per sq. km, pressure on natural resources, including forests and wildlife habitats, is likely to increase. This dense and growing population often leads to the expansion of agricultural land, settlement areas, and infrastructure development, which can result in habitat fragmentation and loss, adversely affecting biodiversity and ecosystem integrity (NEMA, 2021; UBOS, 2016).

### **3.2.4 Main economic activities**

In Hoima and Kikuube districts (Bunyoro sub-region), economic activities are primarily driven by agriculture, with 85.9% of households engaged predominantly in farming, compared to the national average of 81.2% (UBOS, 2020). The main subsistence crops

include maize, beans, and sweet potatoes, with surplus produce sold for income. While tobacco was previously a key cash crop, there has been a shift towards cultivating sugarcane and rice. About 77% of households in these districts rely on subsistence farming. Dominant household agricultural activities include food crop cultivation (84%), bean farming (71.5%), livestock rearing (70.1%), and maize production (58%). Overall, approximately 90.4% of households are involved in either crop or livestock farming (UBOS, 2016). The predominant reliance on agriculture in Hoima and Kikuube districts drives deforestation and habitat fragmentation, primarily due to the conversion of forested land for crop cultivation and livestock rearing. This land-use change threatens biodiversity by disrupting habitats and reducing ecosystem services. The shift toward cash crops, such as sugarcane, increases pressure on private forests, complicating conservation efforts. Balancing agricultural demands with sustainable land management practices is crucial to protect biodiversity and maintain ecosystem health in these regions (NEMA, 2019).

### **3.2.5 Land tenure and forest restoration**

Uganda's 1995 Constitution outlines four primary land tenure systems: leasehold, customary, mailo, and freehold. In the study area, customary land tenure system is the most prevalent (Alden Wily, 2017). Characteristics of customary land include the absence of official registration and undefined surveyed boundaries, which are instead established through mutual agreements among neighbors and marked with traditionally accepted live markers. The management of these lands is typically vested in the community and local leaders. The customary tenure system presents both opportunities and challenges for conservation efforts. While the lack of formal documentation can lead to disputes and complicate coordinated management for conservation initiatives, the community-based aspect of customary tenure enables local stakeholders to engage actively in conservation practices. This involvement

fosters a sense of ownership and responsibility towards sustainable use and forest restoration (Fischer & Riechers, 2021).

### **3.3 Research design and sample size**

The research design employed in this study was cross-sectional using mixed methods which provided a snapshot of various conservation strategies, attitudes, and perceptions of private forest owners towards conservation. This approach allows researchers to gather information from diverse groups and explore the relationships between variables that may influence the current state (Lauren, 2023). The research was exploratory, and analytical, and incorporated both quantitative and qualitative methods. It examined changes in primate species conservation with climate change adaptation strategies and assessed how these strategies have impacted the survival of primate populations in the study area.

### **3.4 Study Population**

The target population for this study was drawn from lists of Private Forest Owners (PFOs) within the BBC. These lists, provided by chairpersons of the PFOAs in the study parishes, included a total of 424 forest owners. Additionally, other respondents comprised key informants from conservation NGOs and representatives from district local governments and focused group discussions. The primate species studied were in the private forests within the BBC.

### **3.5 Sample size determination**

This study used a total sample size of 206 that was calculated using a formula advanced by Taro Yamane (1967). The formula was expressed as.

$$n(206) = \frac{N(424)}{1 + e^2}$$

Where  $n$  = sample size (206),  $N$  = population under study (424),  $e$  = margin error (5%). The selection of sample size used in the study was done as explained in Table 3.1

**Table 3.1: Number of forest owners and sample size per parish**

<b>Parish</b>	<b>Number of Forest Owners</b>	<b>Sample size</b>
Kibanjwa	86	42
Birungu	130	63
Kidoma	132	64
Munteme	76	37
<b>Total</b>	<b>424</b>	<b>206</b>

**Source:** Lists of private forest owners provided by PFOAs' chairpersons

In total, 206 households of respondents were interviewed, comprising 63 participants from Birungu parish, 64 from Kidoma, 42 from Kibanjwa, and 37 from Munteme (see Table 3.1). Gender was a significant consideration in the participant selection for the household survey, with 133 respondents (64.6%) being male and 73 respondents (35.4%) being female. Additionally, in the eight Focus Group Discussions (FGDs), at least three members were women and/or youth.

### **3.6 Sampling Techniques and Procedures**

The random sampling technique was employed to select respondents identified as Private Forest Owners (FOs). Areas with the highest concentration of FOs were prioritized. A list of private forest owners was obtained from the leadership of parish-based associations, which served as the basis for selecting the interviewed households.

Purposive sampling was used to select the two sub-counties and four study parishes. Specifically, Munteme and Kidoma were chosen from Kiziranfumbi Sub County in Kikuube District, while Kibanjwa and Birungu were selected from Kitoba Sub County in Hoima District. The criteria for purposive sampling included selecting parishes with a significant

number of Private Forest Owners and those where forest and biodiversity conservation initiatives, as well as Climate Change Adaptation (CCA) interventions, had been implemented or were actively ongoing.

### **3.7 Data collection methods**

This study utilized both primary and secondary data. Primary data encompassed both quantitative and qualitative information, while secondary data was gathered through a review of relevant documents.

#### **Objective 1: Private forest conservation and climate change adaptation strategies used by conservation NGOs in the BBC.**

The data collection tools for objective one included a household questionnaire, key informant, and focus group discussion (FGD) interview guides. A total of 206 households were surveyed while twenty (20) key informant interviews (KIIs), and 8 FGDs were conducted. Pre-coded semi-structured questionnaires—containing both open and closed-ended questions—were utilized for the household survey targeting private forest owners. The household questionnaires primarily focused on quantitative and qualitative data collection.

Key informant interviews were conducted among staff from conservation organizations, relevant district officials, and leaders of Private Forest Owners' Associations (PFOAs). The KII guides and FGDs guides facilitated the moderation of KI interviews and FGDs, respectively. Key Informant Interviews and FGD guides captured qualitative insights about the study. Eight (8) FGDs, each comprising 10 participants, were held to enrich the data collection process. Two FGDs were conducted in each parish, involving a mix of forest owners (FOs), non-FOs, women, and youth, to triangulate data from the household surveys. Additional data collection methods included field observations, and secondary data sources to achieve the study objective.

Interviews were conducted with respondents to identify and document the forest conservation and CCA strategies used by NGOs in private forests. The questionnaires included both open and closed-ended questions tailored to the specific research objectives. They were organized into sections aligned with these objectives to facilitate the collection of relevant information. The questionnaires were prepared in English and translated by the researcher during data collection to accommodate participants who were not proficient in English.

The survey specifically targeted purposively selected households of forest owners, with respondents randomly selected from lists provided by PFOAs' chairpersons. One representative from each household was chosen to participate in the survey, either the household/family head or a family member aged 18 years or older in the absence of the head. The questionnaires captured information regarding respondents' socioeconomic and demographic backgrounds, their awareness of various forest conservation or restoration initiatives, perceived benefits of forest conservation, preferences for different conservation initiatives offered by various NGOs, and the adoption of conservation practices in private forests.

**Objective 2: Species diversity of primates that are present in the privately owned forests within the BBC.**

The data collection tools included a survey form, global position system (GPS) device, and maps. The survey was conducted within the BBC to determine primate species presence, diversity, and abundance in privately owned forests across four parishes. The survey involved determining species richness, and identification of the prevailing primate threats.

Reconnaissance walks were conducted using direct observation and indirect count methods (signs of presence) to gather data on primate species' presence in the BBC private forests. The specific detection methods followed guidelines established by Wintle *et al.*, (2019),

focusing on gaining familiarity with the terrain and identifying significant features without the limitations of systematic sampling, which was impractical due to the fragmented nature of the forested areas. For recce walks, the researcher and four field assistants navigated predetermined routes, adapting to obstacles such as dense vegetation and swampy areas. Each recce allowed coverage of approximately 4 km, enabling extensive data collection across the study area. To detect the presence of chimpanzees, direct sightings, and indirect evidence, such as nest counts, were recorded. During the survey, forest cover types were recorded at every observation, and GPS points were taken, and the perpendicular distance from recces to the primate(s)' group(s) was taken by estimation. The researcher used GIS to generate a study area map for guidance in data collection (Figure 3.2).

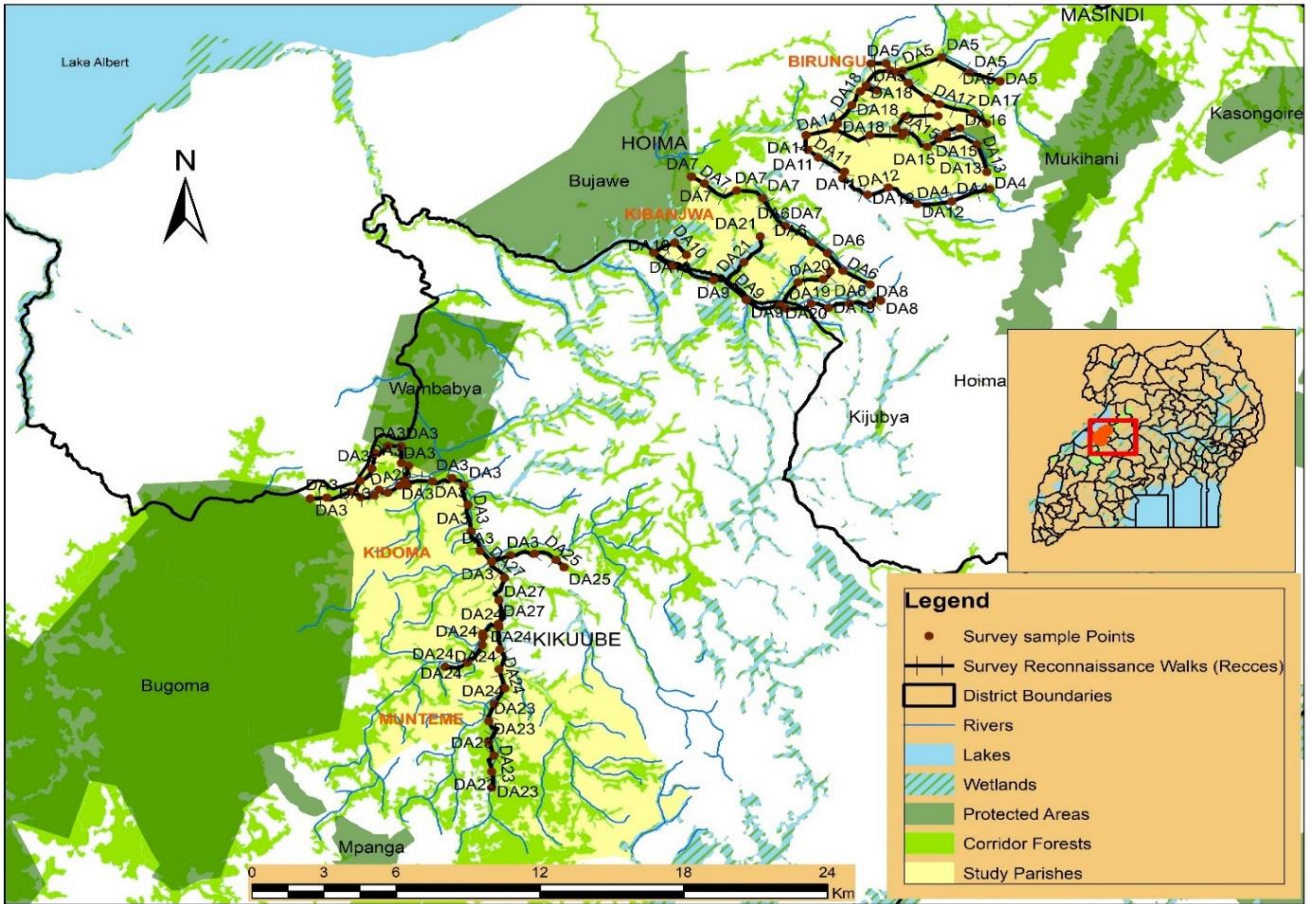
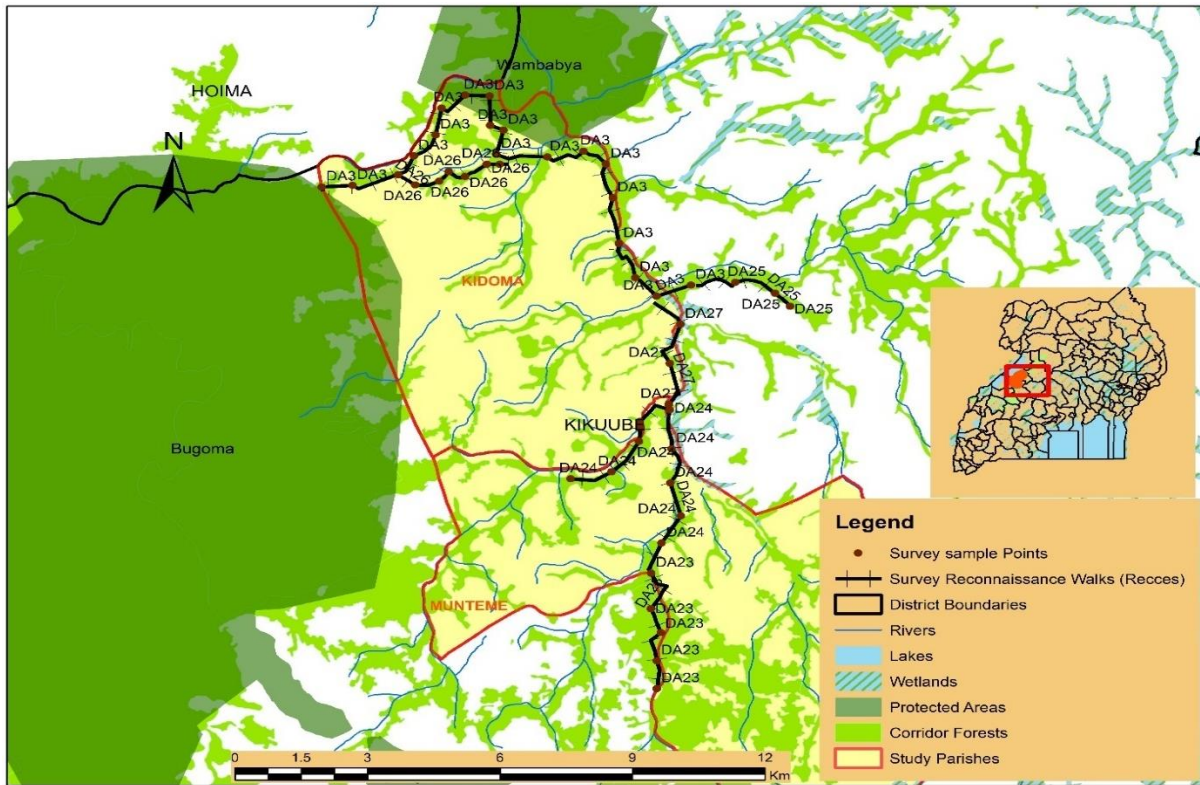


Figure 3.2: Primates survey recces in the four study parishes.



Figure 3.3: Primates survey recces in Birungu and Kibanjwa parishes.



**Figure 3.4: Primates survey recces in Kidoma and Muntele parishes.**

**Objective 3: Private forest owners’ attitudes and perceptions towards primate conservation in private forests and climate change adaptation within the BBC.**

The data collection tools for objective three included a household questionnaire, key informant, and focus group discussion (FGD) interview guides. A total of 206 households were surveyed while twenty (20) key informant interviews (KIIs) were conducted. Pre-coded semi-structured questionnaires—containing both open and closed-ended questions—were utilized for the household survey targeting private forest owners. The household questionnaires primarily focused on quantitative and qualitative data collection.

Key informant interviews were conducted among staff from conservation organizations, relevant district officials, and leaders of Private Forest Owners’ Associations (PFOAs). The Key Informant Interview guides and FGDs guides facilitated the moderation of KI interviews

and FGDs, respectively. Key Informant Interviews and FGD guides captured qualitative insights about the study.

In addition, eight (8) Focus Group Discussions (FGDs), each comprising 10 participants, were held to enrich the data collection process. Two FGDs were conducted in each parish, involving a mix of forest owners (FOs), non-FOs, women, and youth, to triangulate data from the household surveys. Additional data collection methods included field observations, photography, and secondary data sources to achieve the study objective.

To gauge attitudes and perceptions regarding primate conservation, respondents were presented with statements to which they could agree or disagree, with non-responses categorized as ‘undecided/undisclosed/no response.’

Twenty (20) key informants, including both males and females, were interviewed to assess their knowledge of the implementation of forest conservation projects in the Budongo-Bugoma Corridor, the status of private forests, the presence of primates in the area, and the challenges encountered. The KIs included seven project managers from conservation NGOs, two District Forestry Officers from Hoima and Kikuube Districts, an NFA range manager based in Hoima, a District Natural Resources Officer in Hoima, four chairpersons of selected parish-level PFOAs, and five community parish-level forest monitors.

### **3.8 Secondary data sources**

Secondary data and information were gathered from various sources, including libraries: Uganda National Council for Science and Technology (UNCST) library, Kyambogo University library, and conservation NGOs such as Wildlife Conservation Society (WCS) and Advocates Coalition for Development and Environment (ACODE). Online literature especially relevant academic articles and reports were also reviewed. These secondary

sources complemented primary field data, enriching the overall analysis and conclusions drawn from the study.

### **3.9 Data analysis**

#### **Objective 1: Private forest conservation and climate change adaptation strategies used by conservation NGOs to conserve private forests in the BBC.**

Data analysis for objective one involved a combination of quantitative and qualitative approaches to comprehensively understand the forest conservation strategies used by NGOs. The collected data underwent several processing steps, including compilation, sorting, editing, and coding, to ensure quality, accuracy, and completeness. The data was then entered into a computer for analysis using the Statistical Package for Social Sciences (SPSS) version 20. The SPSS generated both descriptive and inferential statistics which summarized primary variables and associated indicators relevant to the study objectives.

Pearson's correlation was utilized to measure the relationships between study variables while ANOVA tests were conducted to evaluate mean differences in respondents' background characteristics and conservation and CCA strategies within the BBC at a significance level of 0.05. Thematic analysis was conducted on the qualitative data using Atlas.ti, enabling a comprehensive exploration of the study objectives. The analyzed results were presented in descriptive formats, including narratives, tables, frequencies, percentages, graphs, pie charts, and direct quotations.

#### **Objective 2: Species diversity of primates that are present in the privately owned forests within the BBC.**

The primate species recorded signs of the presence of primates were spatially mapped to compute and compare relative abundance in the four parishes studied. The spatial distributions of objects were analyzed visually to identify where the main threats to the

private forests were occurring and the main concentrations of primates. Pivotal tables in Excel were used to analyze the primates survey data collected.

Encounter rates (ERs) of primate species and signs of human impact were documented using GPS devices, facilitating spatial analysis in GIS software. Primate sightings were recorded at 250 m intervals to track survey progress. Encounter rates of primates were calculated by dividing the total number of primate sightings of each species by the total distance covered during the reconnaissance walks. This method standardized the data and allowed for comparison of primate abundance across different areas and routes surveyed. The distance walked in the four parishes was used to calculate ERs - the number of species sighted per kilometer walked. Species encounter rates allowed for comparative analysis across different parishes. Mapping of sightings was performed using ArcMap 10.8, enabling visual representation of relative species abundance.

Shannon Weiner Diversity Index was used to determine the species diversity of primates in the study area and make a comparison among the four parishes (Appendix 2). The Shannon-Wiener Diversity Index ( $H'$ ) was calculated using the equation:

$$H' = -\sum P_i (\ln P_i)$$

Where  $P_i$  is the proportion of each primate species in the sampled area.

Some analyses indicating the spatial distribution of primates, interaction, habitat type, and threats encountered in the 4 parishes were done using Remote Sensing and GIS. Using Remote Sensing and GIS, georeferenced data capturing primate species' sighting location was analyzed and spatially presented in maps to visualize the spatial distribution and abundance of species.

**Objective 3: Private forest owners' attitudes and perceptions towards primate conservation in private forests and climate change adaptation within the BBC.**

Data analysis for objective three involved a combination of quantitative and qualitative approaches to comprehensively understand the attitudes and perceptions of private forest owners towards primate conservation. The collected data underwent several processing steps, including compilation, sorting, editing, and coding, to ensure quality, accuracy, and completeness. The data was then entered into a computer for analysis using the Statistical Package for Social Sciences (SPSS) version 20. Pearson correlation analysis was employed to establish relationships between background characteristics and respondents' perceptions and attitudes toward forest conservation and CCA strategies at a 0.05 significance level.

ANOVA was applied for quantitative data while qualitative data was processed using Atlas.ti software for coding and analysis. Themes and content were developed around the attitudes and perceptions of private forest owners towards primate conservation. Analyzed results were presented in descriptive formats such as narratives, tables, frequencies, percentages, graphs, pie charts, and citations.

## **CHAPTER FOUR: PRESENTATION AND INTERPRETATION OF FINDINGS**

### **4.1 Introduction**

This chapter presents the results on the background information of respondents, descriptive statistics regarding private forest conservation, and climate change adaptation (CCA) strategies used by conservation NGOs in the BBC. It also examines the species diversity of primates in private forests, as well as the attitudes and perceptions of private forest owners toward primate conservation in these privately owned forests. Lastly, it provides the results from the ANOVA and Pearson correlation analyses conducted for each objective.

### **4.2 Background Information of Respondents**

The background characteristics of respondents encompassed gender, age groups, education level, occupation, household energy source, land ownership, and forest size. Table 4.1 presents the summarized results. The majority of respondents were male, with 64.6%, while 35.4% were female. Men were generally more available for interviews, whereas women were occupied with household responsibilities and other chores. The largest age group included respondents aged 45 and above, with 59.7%. This was followed by the 36–45 age group, comprising 8.5%. Respondents aged 26–35 accounted for 13.1%, while those aged 18–25 represented 7.3%. Education levels among respondents varied, with the majority having completed primary education 51.5%, followed by those with secondary education at 35.9%. Additionally, 5.5% had no formal education. Certificate holders were 5.3%, diplomas were 2.4%, degree holders at 1%, and a postgraduate degree 0.5%. Occupational distribution showed that 8.7% were unemployed, and the same percentage were domestic workers. Additionally, 7.9% were business owners, 5.7% were casual workers, 3.1% were civil servants, and 0.9% were retired pensioners. Wood fuel was the most common source of energy used by 50.5% of households, likely due to its availability from nearby private forests, which also serve as habitats for primates. Solar energy was the next most common source,

used by 31.6%. Other energy sources included paraffin at 9.2%, candles used by 4.4%, gas at 2.9%, and electricity at 1.5%. Land ownership was primarily under customary ownership reported by 76.2%. Other types of ownership included communal land at 8.7%, Mailo tenure at 6.8%, freehold at 6.3%, and leasehold at 2.0%. Regarding land size, 56.3% owned 1–6 acres. This was followed by 21.8% who owned 7–12 acres 13.6% who owned 13–18 acres, and 8.3% who owned more than 18 acres.

**Table 4.1: Background Characteristics of the Respondents**

<b>Background characteristics</b>		<b>Frequency</b>	<b>Percent</b>
Gender	Male	133	64.6
	Female	73	35.4
	Total	206	100.0
Age groups	18-25	18	8.7
	26-35	27	13.1
	36-45	38	18.4
	46+ years	123	59.7
	Total	206	100.0
Education	No formal Education	12	5.8
	Primary	101	51.5
	Secondary	74	35.9
	Certificate	11	5.3
	Diploma	2	1.0
	Degree	1	0.5
	Total	206	100.0
Occupation	Unemployed	18	8.7
	Laborer (casual worker)	11	5.3
	Domestic worker	18	8.7
	Business owner	16	7.8
	Civil servant	7	3.1
	Farmer	135	65.5
	Retired pensioner	1	0.5
	Total	206	100.0

<b>Background characteristics</b>		<b>Frequency</b>	<b>Percent</b>
Type of energy	Electricity from public supply	3	1.5
	Paraffin	19	9.2
	Wood Fuel	104	50.5
	Candle	9	4.4
	Solar	65	31.6
	Others (Gas)	6	2.9
	Total	206	100.0
Type of land ownership	Private-titled-free hold	13	6.3
	Private without title-customary	157	76.2
	Mailo	14	6.8
	Communal	18	8.7
	Leasehold-tenancy	4	2.0
	Total	206	100.0
	Land size in acres	1-6	116
7-12		45	21.8
13-18		28	13.6
19 Plus		17	8.3
Total		206	100.0

**Source:** Field data, 2023

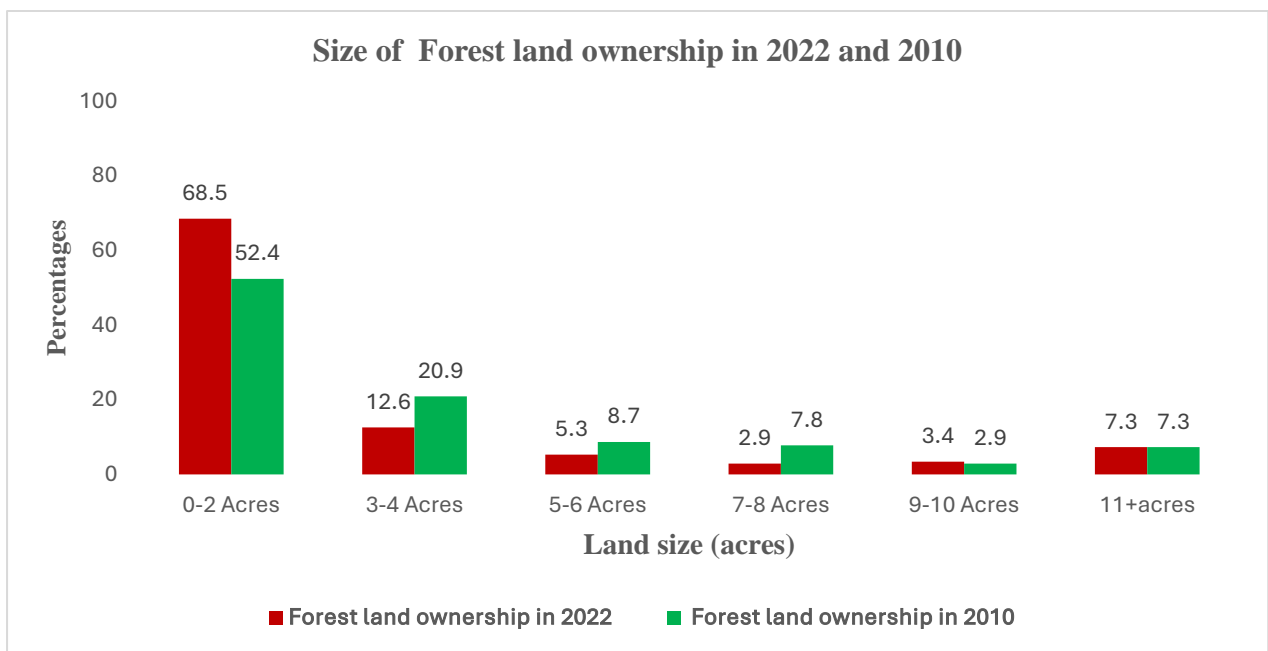
### **4.3 Private Forest conservation and climate change adaptation strategies used by conservation NGOs.**

The success of private forest conservation and climate change adaptation (CCA) strategies was assessed based on the forest size owned by forest owners who benefited from these interventions. The results are displayed as follows.

The comparison of forest land ownership among respondents in 2022 and 2010 was as follows: Forest Land Ownership in 2022 (N=206): 0–2 Acres: 141 respondents, 3–4 Acres: 26 respondents, 5–6 Acres: 11 respondents, 7–8 Acres: 6 respondents, 9–10 Acres: 7 respondents, and 11+ Acres: 15 respondents. Forest Land Ownership in 2010 (N=206): 0–2 Acres: 108 respondents, 3–4 Acres: 43 respondents, 5–6 Acres: 18 respondents, 7–8 Acres: 16 respondents, 9–10 Acres: 6 respondents, and 11+ Acres: 15 respondents. This comparison

highlights a shift in land ownership distribution over the 12 years, with an increase in the number of respondents owning smaller forest plots (0-2 acres) by 2022, while ownership of mid-sized plots (3–8 acres) generally decreased (Figure 4.1).

These results indicate a general shift towards smaller private forest land ownership over the 12 years, with an increase in the proportion of respondents holding 0–2 acres in 2022 compared to 2010. The decline in ownership of mid-sized plots (3–4 acres and 7–8 acres) from 2010 to 2022 suggests possible land fragmentation or selling-off portions, while ownership of larger plots (11+ acres) remained stable, indicating that larger holdings may be less affected by these trends. This shift highlights potential pressures on land resources and could have implications for the sustainability of private forest conservation efforts.



**Figure 4.1: The sizes of the forest land ownership distribution in 2022 and 2010 in the BBC**

**Source:** Field data, 2023

The distribution of forest land ownership in 2022 and 2010 was analyzed at the parish level to understand changes in land ownership patterns before and after the implementation of significant conservation interventions. The comparison highlights ownership trends across

parishes, with data shown in Table 4.2. The results provide insights into how conservation interventions might have influenced forest land ownership, potentially leading to variations in land size distribution across different parishes. Table 4.2 allows for a closer examination of the impact of conservation efforts on private forest land sizes within each parish, illustrating any shifts toward smaller or larger land holdings because of conservation initiatives over the 12 years.

The table revealed variations in forest land ownership across parishes from before 2010 to 2022. In Kibanjwa, forest land ownership was slightly higher in 2010 at 20.9% compared to 19.9% in 2022, indicating minimal change. Birungu parish, however, experienced an increase in forest land ownership, rising from 28.6% of households in 2010 to 31.6% in 2022. Kidoma saw a slight decline, from 33.5% households in 2010 to 30.5% in 2022, and Munteme also showed a decrease from 18.0% in 2010 to 17.0% in 2022.

These shifts reflect trends such as the reduction in forest cover on larger plots (11 acres and above), with a notable increase in smaller plots (1–2 acres), suggesting land fragmentation and increased subdivision of land among families. Conservation NGOs have responded to these trends by intensifying tree-planting efforts to offset forest loss, despite challenges such as low survival rates and limited land availability. This was supported by focus group discussions (FGDs) in Kidoma, where participants expressed concerns about the low survival rate of seedlings due to insufficient planting practices and land fragmentation from population growth. Some respondents, particularly from Kidoma, highlighted positive restoration efforts, noting the replanting of previously degraded riverine forests and the establishment of an average of 50 trees per household due to conservation interventions.

**Table 4.2 Comparison of Forest Land Ownership per Parish in 2010 and 2022**

<b>Parish</b>	<b>Forest Size (Acres)</b>	<b>2010 Ownership (Households, %)</b>	<b>2022 Ownership (Households, %)</b>
<b>Kibanjwa</b>	1-2	17 (8.3%)	18 (8.7%)
	3-4	7 (3.4%)	6 (2.9%)
	5-6	3 (1.5%)	5 (2.4%)
	7-8	5 (2.4%)	4 (1.9%)
	9-10	2 (0.97%)	3 (1.5%)
	11+	7 (3.4%)	5 (2.4%)
<b>Sub Total</b>		<b>43 (20.9%)</b>	<b>41 (19.9%)</b>
<b>Birungu</b>	1-2	19 (9.2%)	49 (23.9%)
	3-4	25 (12.1%)	11 (5.3%)
	5-6	8 (3.9%)	3 (1.5%)
	7-8	3 (1.5%)	0 (0.0%)
	9-10	2 (0.97%)	0 (0.0%)
	11+	4 (1.9%)	2 (1.0%)
<b>Sub Total</b>		<b>59 (28.6%)</b>	<b>65 (31.6%)</b>
<b>Kidoma</b>	1-2	46 (22.2%)	40 (19.4%)
	3-4	5 (2.4%)	7 (3.4%)
	5-6	5 (2.4%)	2 (0.9%)
	7-8	8 (3.9%)	2 (1.0%)
	9-10	2 (1.0%)	4 (1.9%)
	11+	3 (1.5%)	8 (3.9%)
<b>Total</b>		<b>69 (33.5%)</b>	<b>63 (30.5%)</b>
<b>Munteme</b>	1-2	26 (12.6%)	34 (16.5%)
	3-4	6 (2.9%)	2 (0.9%)
	5-6	2 (0.9%)	1 (0.5%)
	7-8	0 (0.0%)	0 (0.0%)
	9-10	0 (0.0%)	0 (0.0%)
	11+	1 (0.5%)	0 (0.0%)
<b>Sub Total</b>		<b>35 (17.0%)</b>	<b>37 (18.0%)</b>
<b>Grand Total</b>		<b>206 (100%)</b>	<b>206 (100%)</b>

Source: Field data, 2023

### **4.3.1 Climate Change Adaptation Strategies**

Respondents identified several CCA strategies implemented by conservation NGOs in the area, particularly for biodiversity conservation, including primates. The strategies and their respective frequencies are detailed in Table 4.2

Tree planting was the most frequently reported CCA strategy, accounting for 27.2% of responses. This strategy includes both local conservation and restoration initiatives, as well as the global strategy of purchasing riverine forested land for restoration. Incentivization through alternative livelihoods, such as beekeeping and livestock rearing, was reported by 23.7% of respondents. This indicates a significant recognition of the role of alternative income sources in enhancing conservation efforts. Conservation awareness creation and sensitization meetings were highlighted by 19.4% of respondents, emphasizing the importance of education in fostering engagement with CCA strategies. In addition to conservation NGOs, other stakeholders, including district natural resource departments, play a crucial role in promoting forest conservation and CCA. These departments support the PFOA model spearheaded by NGOs through various activities, such as: Sensitization campaign; Collaborative Forest Management (CFM); Restoration of buffer zones; and Landscape planning and resource mapping.

The Hoima district natural resource office provided several recommendations to enhance conservation outcomes, including Effective tree planting and management practices to improve tree survival rates; Planting unpalatable crops in buffer zones to mitigate human-wildlife conflicts (HWC), particularly for communities neighboring central forest reserves; and Support for alternative livelihood sources to bolster community involvement in conservation efforts.

**Table 4.3: Climate change adaptation strategies used by conservation NGOs among forest owners in the BBC**

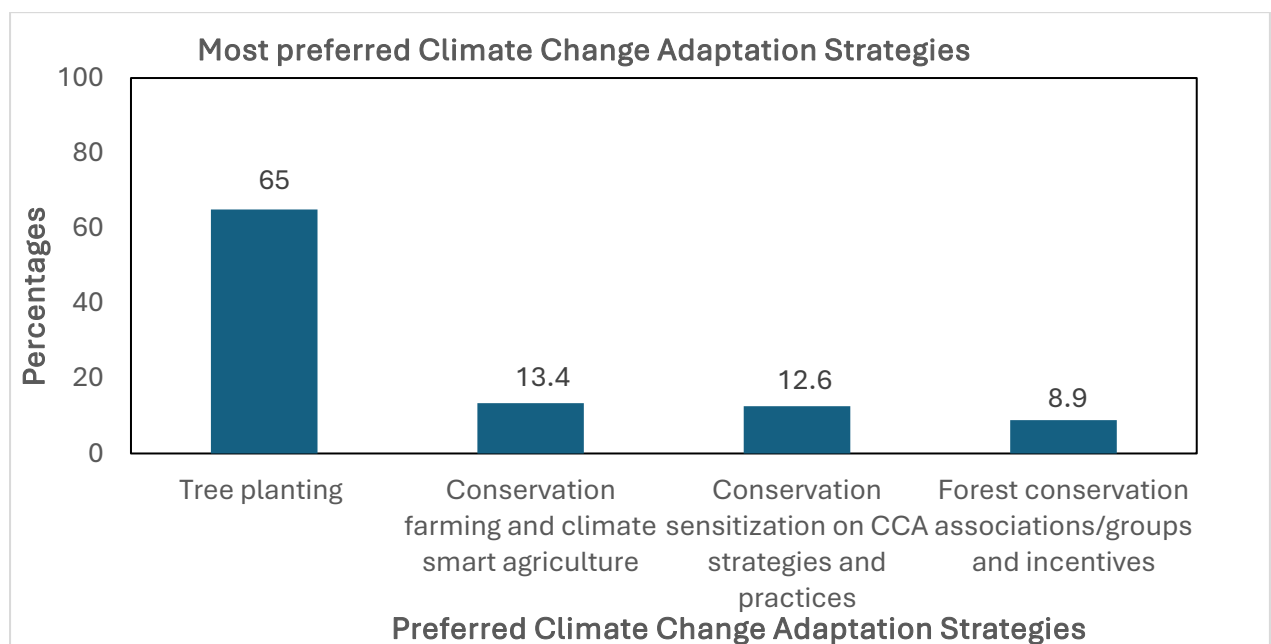
<b>Climate Change Adaptation Strategies</b>	<b>Frequency</b>	<b>Percent (%)</b>
Tree planting and forest monitoring, including T4GB	56	27.2
Incentivization - alternative livelihoods (e.g., beekeeping, livestock rearing)	49	23.7
Conservation awareness creation and sensitization meetings	40	19.4
Conservation farming and climate-smart agriculture	28	13.6
Payment for Ecosystem Services and REDD+ programs	21	10.2
Conservation research	6	2.9
Conservation association models (PFOs and BSGs)	6	2.9
<b>Total</b>	<b>206</b>	<b>100</b>

**Source:** Field data, 2023.

### **Preferred Climate Change Adaptation (CCA) Strategies**

The study on preferred Climate Change Adaptation (CCA) strategies piloted and demonstrated by conservation NGOs revealed notable preferences among respondents, highlighting key strategies in biodiversity conservation. Tree planting emerged as the most favored strategy, 65.0% selecting it as their top choice. This strong preference underscores the essential role of tree planting for local conservation and climate resilience. The second most preferred strategy was conservation farming and climate-smart agriculture, chosen by 13.4%. This reflects the community’s recognition of sustainable agricultural practices that not only contribute to food security but also support climate adaptation. Conservation sensitization, which focuses on educating communities about climate adaptation strategies, ranked third, with 12.6% acknowledging its importance for community awareness and engagement. Additionally, 8.9% indicated a preference for forest conservation associations and incentive-based models, pointing to the value of community involvement and support structures in advancing forest preservation. A consensus among respondents emphasized that

an integrated approach combining all the preferred CCA strategies would likely yield the most effective conservation outcomes. This holistic perspective reflects a growing understanding of the interconnectedness of CCA strategies and the importance of collaboration to enhance biodiversity resilience. The distribution of preferences, as illustrated in Figure 4.2, reinforces the importance of a multi-faceted approach to climate adaptation and conservation efforts in addressing the complex challenges posed by climate change.



**Figure 4.2: The most preferred climate change adaptation strategies by households**

**Source:** Field data, 2023

### **Strategies for Building Resilience and Combatting Climate Change Effects**

Respondents reported several deliberate strategies implemented to enhance resilience and mitigate the impacts of climate change, particularly concerning high temperatures and erratic rainfall. Conservation NGOs have actively engaged in sensitizing communities to shift their attitudes and perceptions about forest and primate conservation from negative to positive. To promote forest-friendly activities, conservation NGOs have provided livelihood support, encouraging practices that are beneficial to both the community and the environment. For instance, in Kibanjwa parish, a community-based organization (CBO) comprised of forest

owners (FOs) and business saving groups assists members in obtaining loans. This support helps address their needs and has been effective in reducing forest degradation, as noted by a key informant (KI), a leader of the PFOA.

Results regarding household members’ involvement with conservation NGOs or institutions revealed the following. In terms of overall engagement, a significant portion of respondents, 62.6%, indicated that they had never worked or had any household member(s) employed by conservation NGOs. Conversely, 37.4% reported having worked or having a household member(s) who had worked for conservation NGOs or institutions (Table 4.4). Among those who had engaged with conservation NGOs, the breakdown of job types was as follows: Seasonal/Short-Term Employment accounted for 25.2% of respondents who indicated that their household members were employed seasonally or on a short-term basis. Casual Employment accounted for 6.8%. Only 5.3% of respondents indicated that their household members were permanently employed by conservation NGOs or institutions (Table 4.4).

**Table 4.4: Household Members’ Engagement with Conservation NGOs/Institutions**

Category	Frequency	Percent
<b>Worked for Conservation NGO/Institution</b>		
Yes	77	37.4%
No	129	62.6%
<b>Total</b>	<b>206</b>	<b>100.0%</b>
<b>Type of Employment</b>		
No response	129	62.6%
Permanent	11	5.3%
Seasonal/Short-term	52	25.2%
Casual	14	6.8%
<b>Total</b>	<b>206</b>	<b>100.0%</b>

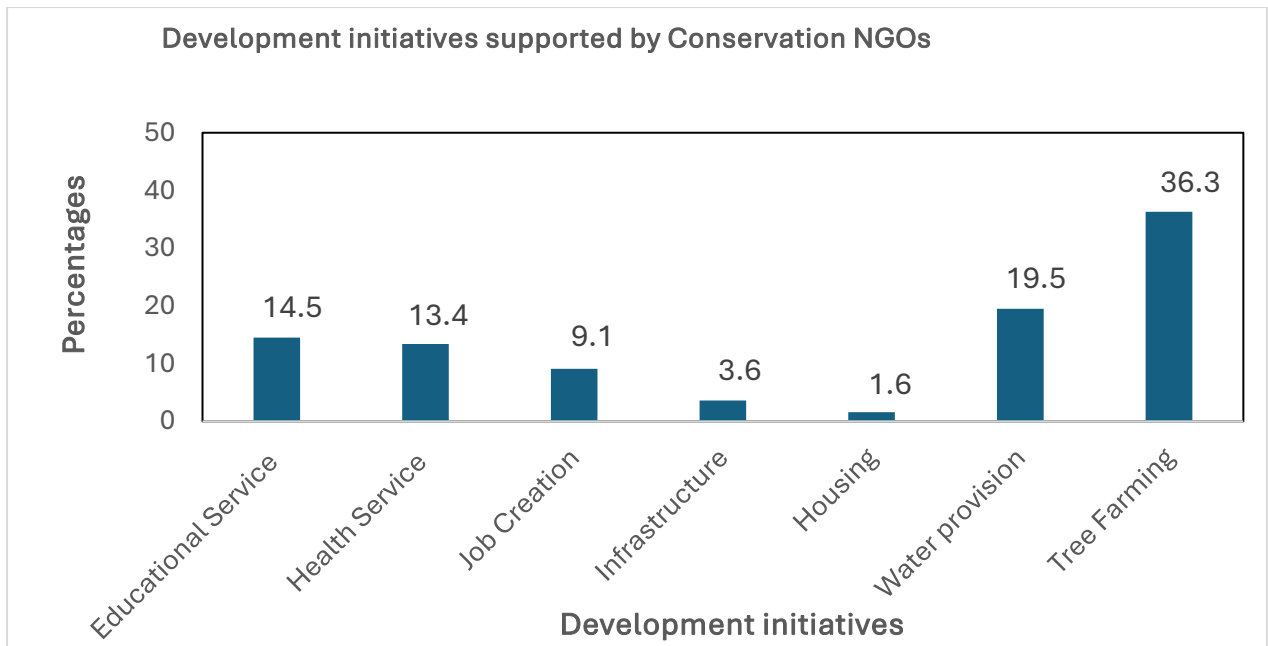
**Source:** Field data, 2023

Most respondents (69.4%) felt that conservation interventions have positively impacted forest status, citing activities like afforestation and awareness campaigns by NGOs. A smaller group

(12.6%) disagreed, likely due to ongoing challenges, while 18.0% were uncertain, possibly from limited involvement or visibility of outcomes. Overall, the perception of conservation efforts is largely positive, though some remain skeptical or unaware of their effects.

The majority of respondents, 69.4%, observed that conservation NGOs had positively impacted forest status, attributing this to various conservation interventions, including conservation farming, increased forest cover, and a rise in primate populations. Respondents highlighted improvements in rainfall and weather patterns because of enhanced forest cover. Additionally, most respondents, 82.0%, confirmed that conservation NGOs actively support development initiatives linked to conservation efforts, while 17.9% disagreed, suggesting that some areas or specific development needs may not yet be fully addressed by conservation organizations.

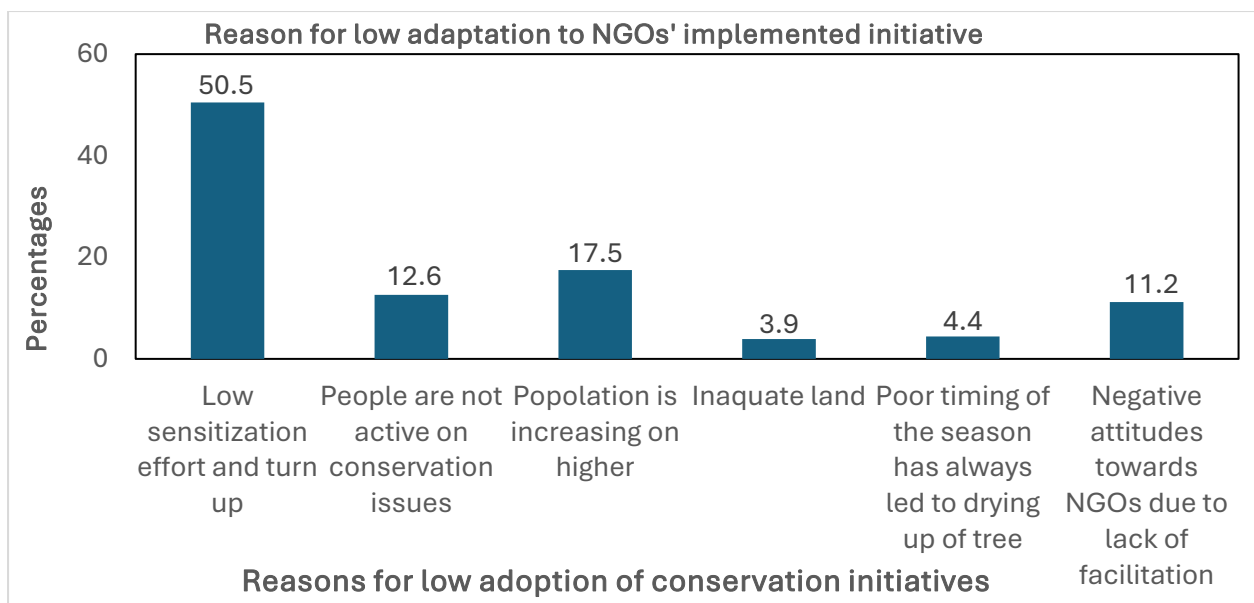
According to respondents (Figure 4.3), conservation NGOs have implemented various development initiatives to support both primate conservation and climate change adaptation strategies. Tree planting emerged as the most significant initiative, with 36.3% citing it as a key activity. Water provision was the second most frequently mentioned initiative, highlighted by 19.5% of respondents. Other development-focused conservation efforts included educational support, 14.5%, health service provision at 13.4%, and job creation 9.1%. Infrastructure development was mentioned by 3.2%, housing facilitation by 2.5%, and agricultural support by 1.6% of respondents. These initiatives reflect a broad commitment by conservation NGOs to enhance community resilience and foster support for conservation goals.



**Figure 4.3: Development initiatives supported by conservation NGOs in the BBC**

**Source:** Field data, 2023

Respondents identified several reasons for the low adoption of conservation initiatives led by NGOs (Figure 4.4). The most significant factor was limited sensitization efforts and low community turnout, as noted by 50.6%. Additionally, the high rate of population growth was highlighted by 17.5% as a barrier, followed by a lack of community engagement in conservation activities with 12.6%. Negative attitudes towards NGOs, often due to perceptions of insufficient funding for conservation projects, were cited by 11.2%. Seasonal challenges, such as drought leading to the drying of planted tree seedlings, were noted by 4.4%, while limited land available for conservation work was a factor for 3.9%. Understanding these reasons is essential for effective planning, implementation, and management of conservation initiatives in the area.



**Figure 4.4: Reason for low adaptation to NGOs' implemented initiative**

**Source:** Field data, 2023

The study revealed that respondents highly favor an integrated approach to conservation by NGOs, emphasizing comprehensive project design and implementation to meet conservation objectives. The preferred strategies ranked by respondents include the timely raising and distribution of tree seedlings (26.2%) and financial support to organized groups through revolving funds (22.6%), which respondents believe could enhance community involvement and success. Continuous sensitization on forest conservation (19.8%) and provision of alternative income sources like beekeeping (12.0%) also featured prominently as means to support sustainable engagement in conservation. Additionally, promoting conservation-smart agriculture (10.9%) and restoring degraded forests and wetlands (8.5%) were viewed as essential interventions to improve local resilience and biodiversity conservation.

As noted by a key informant from a conservation NGO on 12<sup>th</sup> January 2023 in the afternoon, "The efforts geared towards the conservation of forests have been enormous yet have not yielded the required success. The various conservation NGOs operating in the area have been focused on 'piece-meal' interventions at varying scales. For instance, riverine forest restoration, governance supports to ensure the continued presence of the forest estate, and

collaboration with government to enhance further conservation." These insights highlight the necessity for coordinated, multi-faceted efforts tailored to both private forest conservation and climate change adaptation strategies, actively involving local private forest owners in the design of impactful conservation initiatives.

#### **4.3.2 Results from ANOVA analysis**

The ANOVA analysis examined the relationship between the background characteristics of respondents, specifically their occupation, and their preferences for climate change adaptation (CCA) strategies.

The homogeneity of Variances: The Levene statistic indicated a significant difference in variances across groups, with a p-value of 0.006 (Table 4.5). This suggests that the assumption of homogeneity of variances was violated, prompting further investigation into mean differences.

Overall ANOVA Results: The ANOVA results revealed a significant mean difference between respondents' occupations and their preferred CCA strategies, with a p-value of 0.002. The total sum of squares was 43.73, with 3 degrees of freedom and a mean square of 14.56, yielding an F-statistic of 4.97 (Table 4.6).

Linear Relationships: A significant linear relationship was observed between occupation and CCA strategies, with a p-value of 0.032, the sum of squares of 13.79, and an F-statistic of 4.69. On the other hand, a stronger relationship was noted in the weighted analysis, with a p-value of 0.004, the sum of squares of 24.8, and an F-statistic of 8.47. The deviation analysis also showed a significant relationship between occupation and CCA strategies, with a p-value of 0.04, a sum of squares of 18.8, and an F-statistic of 3.2. This indicates that respondents engaged in farming were more likely to adopt CCA strategies. Post Hoc Analysis: Tukey

HSD multiple comparisons demonstrated that specific CCA strategies—tree planting, conservation farming, and participation in conservation meetings—were significantly related to environmental conservation efforts at a p-value of 0.00. This underscores that increased engagement in these practices correlates positively with environmental conservation outcomes.

The ANOVA analysis indicates that occupation significantly influences the adoption of climate change adaptation strategies among respondents, particularly highlighting the role of farmers in implementing conservation initiatives. The findings emphasize the importance of tailored interventions that engage specific occupational groups to enhance conservation efforts effectively.

**Table 4.5: Test of homogeneity of variances**

<b>Occupation</b>			
Levene Statistic	df1	df2	Sig.
4.23	3	202	0.006

**Table 4.6: Results from ANOVA analysis**

<b>Occupation</b>		<b>ANOVA</b>					
		<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>sig</b>	
Between Groups	(Combined)	43.73	3	14.56	4.97	0.002	
	Linear Term	Unweighted	13.79	1	13.79	4.69	0.032
		Weighted	24.8	1	24.8	8.47	0.004
		Deviation	18.8	2	7.45	3.2	0.04
Within Groups		590.99	201	2.94			
<b>Total</b>		<b>634.72</b>	<b>205</b>				

**Source:** Field data, 2023

#### **4.4 Species diversity of primates in the privately owned forests within the BBC.**

To assess primate species presence, 23 reconnaissance surveys (recces) were conducted, covering a combined total of 109.3 km across two districts: Hoima (Kitoba sub-county) and Kikuube (Kiziranfumbi sub-county). The average distance per recce was 4.752 km. In Kitoba

sub-county, 63.2 km were surveyed, with 36.6 km covered in Birungu parish and 26.6 km in Kibanjwa parish. In Kiziranfumbi sub-county, 46.1 km were covered, including 34.4 km in Kidoma parish and 11.5 km in Munteme parish. The longest survey route, recce DA3, spanned 15 km within Kidoma parish and was subdivided among field assistants for comprehensive coverage. Another recce, D24, extended 10 km and traversed the boundary from Kidoma into Munteme parish (Table 4.7).

**Table 4.7: Distance walked per recce by parish and sub-county in Hoima and Kikuube districts**

District	Sub-County	Parish	Recce Number(s)	Distance per Recce (km)	Total Distance per Parish (km)
Hoima	Kitoba	Birungu	DA11, DA12, DA13, DA14, DA15, DA16, DA17, DA18, DA4, DA5	3.1, 3.3, 1.8, 4.2, 5.5, 0.9, 4.5, 4.3, 3.1, 5.9	36.6
		Kibanjwa	DA10, DA19, DA20, DA21, DA6, DA7, DA9	3.8, 3.4, 2.9, 2.6, 4.5, 5.1, 4.3	26.6
Kikuube	Kiziranfumbi	Kidoma	DA25, DA26, DA27, DA3, DA24	2.5, 8.8, 3.3, 15.0, 5.0	34.4
		Munteme	DA24, DA23	5.0, 6.5	11.5
<b>Total</b>					<b>109.3</b>

**Source:** Field data

In both target sub-counties, a total of seven primate species were observed. At the parish level, sightings included six (6) Chimpanzees (*Pan troglodytes schweinfurthii*) and 38 chimpanzee nests, with encounter rates (ER) of 0.055 for chimpanzees and 0.348 for nests. Additional primate sightings included 25 Grey-cheeked Mangabeys (*Lophocebus ugandae*), 121 Olive Baboons (*Papio anubis*), 281 Black-and-white Colobus (*Colobus guereza*), 20 Blue Monkeys (*Cercopithecus mitis*), 371 Red-tailed Monkeys (*Cercopithecus ascanius*), and 100 Vervet Monkeys (*Chlorocebus tantalus*). Chimpanzee nests were documented across all four parishes in the study area, while direct observations of chimpanzees occurred in Kibanjwa (2 individuals), Kidoma (1 individual), and Munteme (3 individuals). Munteme

parish recorded the highest number of direct chimpanzee sightings despite the shortest survey distance among the four parishes (Table 4.8).

The presence of seven primate species across both target sub-counties highlights the Budongo-Bugoma Corridor’s importance as a refuge for diverse primate populations. The relatively high encounters with other primate species, such as the 371 Red-tailed Monkeys and 281 Black-and-white Colobus, further emphasize the area’s conservation and ecological significance. Such findings underscore the importance of preserving diverse forest patches within each parish to support varied primate needs.

**Table 4.8: Observed primate species’ Population**

<b>Primate Species</b>	<b>Birungu Kibanjwa Kidoma Munteme</b>				<b>Total Observed</b>
Red-tailed Monkeys	98	103	161	9	371
Black-and-white Colobus	97	57	114	13	281
Olive Baboons	0	0	104	17	121
Vervet Monkeys	26	22	49	3	100
Chimpanzee Nests	4	9	21	4	38
Grey-cheeked Mangabeys	5	0	20	0	25
Blue Monkeys	6	0	14	0	20
Chimpanzees	0	2	1	3	6
<b>Total Individuals Observed</b>	<b>236</b>	<b>193</b>	<b>484</b>	<b>49</b>	<b>962</b>

**Source:** Field data, 2023

In terms of total observations per parish, Kidoma recorded the highest number of primates, with 484 individuals observed, making up 50.3% of the total observations. Birungu and Kibanjwa followed, with 236 (24.5%) and 193 (20.1%) individuals observed, respectively. Munteme had the lowest count, with 49 individuals, representing 5.1% of the total observations. This pattern suggests that primate populations are more concentrated in Kidoma parish than in other areas.

Regarding the most abundant primate species, Red-tailed Monkeys were the most frequently observed, totaling 371 individuals, which accounted for 38.6% of all observations. Black-and-white Colobus were the second most observed species, with 281 individuals (29.2%). Olive Baboons were the third most observed, with 121 individuals (12.6%) recorded exclusively in Kidoma and Munteme. Vervet Monkeys accounted for 10.4% of observations, totaling 100 individuals. This distribution suggests that Red-tailed Monkeys and Black-and-white Colobus are the dominant species across the surveyed areas.

Among the less frequently observed species, chimpanzees and their nests were found in lower numbers, with six individual chimpanzees and 38 nests observed across the parishes. Kidoma recorded the highest concentration of chimpanzee nests. Grey-cheeked Mangabeys and Blue Monkeys also had low observation counts, with 25 and 20 individuals, respectively, seen mainly in Kidoma and Birungu.

In terms of species diversity across parishes, Kidoma had the greatest diversity, with all eight species represented and the highest counts for several species, including Olive Baboons and chimpanzee nests. Birungu and Kibanjwa had slightly lower diversity, with certain species missing (e.g., Grey-cheeked Mangabeys and Blue Monkeys were absent in Kibanjwa). Munteme had the lowest diversity, with only five species observed and lower overall counts.

The range and distribution of observations varied, with species counts ranging from zero (species not observed in a specific parish) to a maximum of 161 for Red-tailed Monkeys in Kidoma. This distribution pattern provides valuable insight for conservation planning, as it highlights both high-density areas and locations with rarer species presence, which can help guide priorities in habitat management and conservation efforts.

Primates observed along recces were recorded, and encounter rates (ERs) per kilometer walked were calculated for each parish (Table 4.8). Kitoba Sub-County (Kibanjwa and Birungu parishes) recorded 429 primate sightings, yielding an ER of 6.788 sightings per kilometer. In comparison, Kiziranfumbi Sub-County (Munteme and Kidoma parishes) demonstrated a higher ER of 11.562, based on 476 sightings.

The overall primate ER for the Budongo-Bugoma Corridor was 8.801 per kilometer, indicating a substantial primate presence in these privately owned forest patches. Kiziranfumbi's higher ER may be due to its proximity to protected areas, suggesting that local habitat conditions support increased primate activity, which highlights the need for focused conservation in these areas.

Among the parishes, Kidoma recorded the highest ER at 13.908 sightings per kilometer, pointing to a particularly dense primate population. Kibanjwa followed with an ER of 7.256, while Birungu and Munteme recorded ERs of 6.448 and 4.261, respectively (Table 4.9).

The study also revealed a combined ER of 0.403 for chimpanzee-related observations, including both live sightings and nests. Chimp nests had an ER of 0.348, while live chimpanzees were observed at an ER of 0.055 per kilometer. Live chimpanzees were sighted in Kibanjwa (2 individuals), Kidoma (1 individual), and Munteme (3 individuals), but not in Birungu parish.

These findings highlight the variability in chimpanzee distribution across the surveyed areas, potentially reflecting differences in habitat quality or levels of human disturbance among parishes.

**Table 4.9: Distance Walked, Observed Primate Species Counts, and Encounter Rates (ERs) per Kilometer per Parish**

Parish	Distance Walked (KM)	Red-tailed Monkey	Black & White Colobus	Olive Baboon	Vervet Monkey	Chimpanzee Nests	Grey-cheeked Mangabey	Blue Monkey	Chimpanzees	Total ER
Birungu	36.6	98 (2.678)	97 (2.650)	0 (0.0)	26 (0.710)	4 (0.109)	5 (0.137)	6 (0.164)	0 (0.0)	6.448
Kibanjwa	26.6	103 (3.872)	57 (2.143)	0 (0.0)	22 (0.827)	9 (0.338)	0 (0.0)	0 (0.0)	2 (0.075)	7.256
Kidoma	34.6	161 (4.626)	114 (3.276)	104 (2.989)	49 (1.408)	21 (0.603)	20 (0.575)	14 (0.402)	1 (0.029)	13.908
Munteme	11.5	9 (0.783)	13 (1.130)	17 (1.478)	3 (0.261)	4 (0.348)	0 (0.0)	0 (0.0)	3 (0.261)	4.261
<b>Total</b>	<b>109.3</b>	<b>371 (3.394)</b>	<b>281 (2.571)</b>	<b>121 (1.107)</b>	<b>100 (0.915)</b>	<b>38 (0.348)</b>	<b>25 (0.229)</b>	<b>20 (0.183)</b>	<b>6 (0.055)</b>	<b>8.801</b>

**Source:** Field data, 2023

The overall Encounter Rate (ER) across all parishes was 8.801 primates per kilometer. Kidoma had the highest total ER (13.908), followed by Kibanjwa (7.256), Birungu (6.448), and Munteme (4.261). Species with Highest ERs were: Red-tailed Monkeys had the highest ER across all parishes (3.394), with Kidoma parish recording the highest ER for this species (4.626). Black & White Colobus had the second-highest overall ER (2.571), with Kidoma again showing the highest ER (3.276). Species Distribution: Olive baboons were recorded in Kidoma and Munteme only, with an ER of 2.989 in Kidoma, indicating localized population clusters. Other species like Grey-cheeked Mangabeys and Blue Monkeys were also concentrated in certain parishes.

The overall Encounter Rate (ER) across all parishes was 8.801 primates per kilometer. Kidoma had the highest total ER (13.908), followed by Kibanjwa (7.256), Birungu (6.448), and Munteme (4.261). Species with Highest ERs were: Red-tailed Monkeys had the highest ER across all parishes (3.394), with Kidoma parish recording the highest ER for this species (4.626). Black & White Colobus had the second-highest overall ER (2.571), with Kidoma again showing the highest ER (3.276). Species Distribution: Olive baboons were recorded in Kidoma and Munteme only, with an ER of 2.989 in Kidoma, indicating localized population clusters. Other species like Grey-cheeked Mangabeys and Blue Monkeys were also concentrated in certain parishes.

In terms of conservation priority, chimpanzees (*Pan troglodytes schweinfurthii*), classified as endangered on the IUCN Red List, stand out among the seven observed primate species in the Budongo-Bugoma Corridor. Although sightings of live chimpanzees were limited observed in only three out of the four surveyed parishes—their nests were recorded across all four parishes, suggesting a broader habitat range within the area. Kidoma parish had the highest concentration of chimpanzee nests, with a total of 21, yielding an encounter rate (ER) of 0.603 nests per kilometer, indicating a potentially favorable habitat or nesting site in this parish. Kibanjwa followed with nine nests and an ER of 0.338, while Munteme and Birungu each had four nests, though Munteme exhibited a slightly higher ER (0.348) compared to Birungu's 0.109. These findings underscore the importance of Kidoma and Kibanjwa for chimpanzee conservation, as they exhibit higher nest encounter rates, which may reflect suitable environmental conditions or reduced human disturbance in these areas.

#### **4.4.1 Habitat Disturbance and Primate Threats**

Despite ongoing conservation efforts, significant habitat disturbances and threats to primates were observed across all four study parishes. During reconnaissance walks covering a total of

109.3 km, we recorded 196 threats, resulting in an encounter rate (ER) of 1.793 threats per kilometer.

The threats to habitats were categorized as follows: Shambas (Gardens) - 68 occurrences (ER of 0.622) – the most significant threat found in previously forested areas; Charcoal Burning Sites - 38 occurrences (ER of 0.348) – a considerable contributor to habitat disturbance. Human Pathways - 30 occurrences (ER of 0.274) – trails leading to forested areas, likely for the collection of forest products; Logging for Timber - 16 occurrences (ER of 0.146) – a notable threat to forest integrity. Cut Poles - 14 occurrences (ER of 0.128) – indicating exploitation of forest resources.

When examining the number of threats per parish, we found the following distribution: Birungu Parish - 98 threats (ER of 2.678) – the highest incidence of disturbance; Kibanjwa Parish - 54 threats (ER of 2.030) – the second highest; Kidoma Parish - 35 threats (ER of 1.012) – moderate levels of disturbance; and Munteme Parish - 9 threats (ER of 0.783) – the lowest recorded threats (Table 4.10). These threats are largely responsible for the degradation of private forests, as corroborated by findings from FGDs and KIIs.

**Table 4.10: Threats/indicators of disturbance recorded during the primates’ survey and Encounter Rates per Parish**

<b>Threats Encountered / Indicators of Disturbance</b>	<b>Birungu</b>	<b>Kibanjwa</b>	<b>Kidoma</b>	<b>Munteme</b>	<b>Total</b>	<b>Encounter Rates (ER)</b>
New shambas or gardens in degraded forests	20	26	12	5	63	0.576
Charcoal burning sites	25	9	4	0	38	0.347
Paths made by humans	19	3	4	1	27	0.247
Logging trees for timber	11	3	0	1	15	0.137
Cut poles	6	4	2	1	13	0.119
Charcoal kiln/burning sites	1	4	4	0	9	0.082
Firewood cutting	4	2	3	0	9	0.082
Fireplaces	5	0	1	0	6	0.055

<b>Threats Encountered / Indicators of Disturbance</b>	<b>Birungu</b>	<b>Kibanjwa</b>	<b>Kidoma</b>	<b>Munteme</b>	<b>Total</b>	<b>Encounter Rates (ER)</b>
Snares observed	1	0	2	1	4	0.037
Beehives observed	1	0	3	0	4	0.037
Pitsaw sites	2	1	0	0	3	0.027
Porters seen in forests	1	1	0	0	2	0.018
Charcoal bags/sacks	0	1	0	0	1	0.009
Rattan cane cutting	1	0	0	0	1	0.009
Pitfall traps	1	0	0	0	1	0.009
<b>Total threats</b>	<b>98</b>	<b>54</b>	<b>35</b>	<b>9</b>	<b>196</b>	<b>1.793</b>
<b>Distance walked in Km</b>	<b>36.6</b>	<b>26.6</b>	<b>34.6</b>	<b>11.5</b>	<b>109.3</b>	
<b>Overall Encounter Rate</b>						<b>1.793</b>

**Source:** Field data, 2023

### **Habitat Status Observed During Reconnaissance**

Out of a total of 588 habitat recordings, the status was classified as follows: 178 were categorized as intact, 168 as degraded, 151 as slightly degraded, 62 as heavily degraded, 18 as undergoing restoration, and 11 as destroyed. Notably, Birungu parish had the highest number of intact habitat recordings at 90, while Kibanjwa had the lowest with just 16. In terms of heavily degraded habitats, Birungu again led with 26 counts, followed by Kibanjwa with 15. Kidoma and Munteme recorded 11 and 10 heavily degraded habitats, respectively. Furthermore, Birungu and Kibanjwa reported 7 and 4 destroyed habitats, respectively (see Table 4.11).

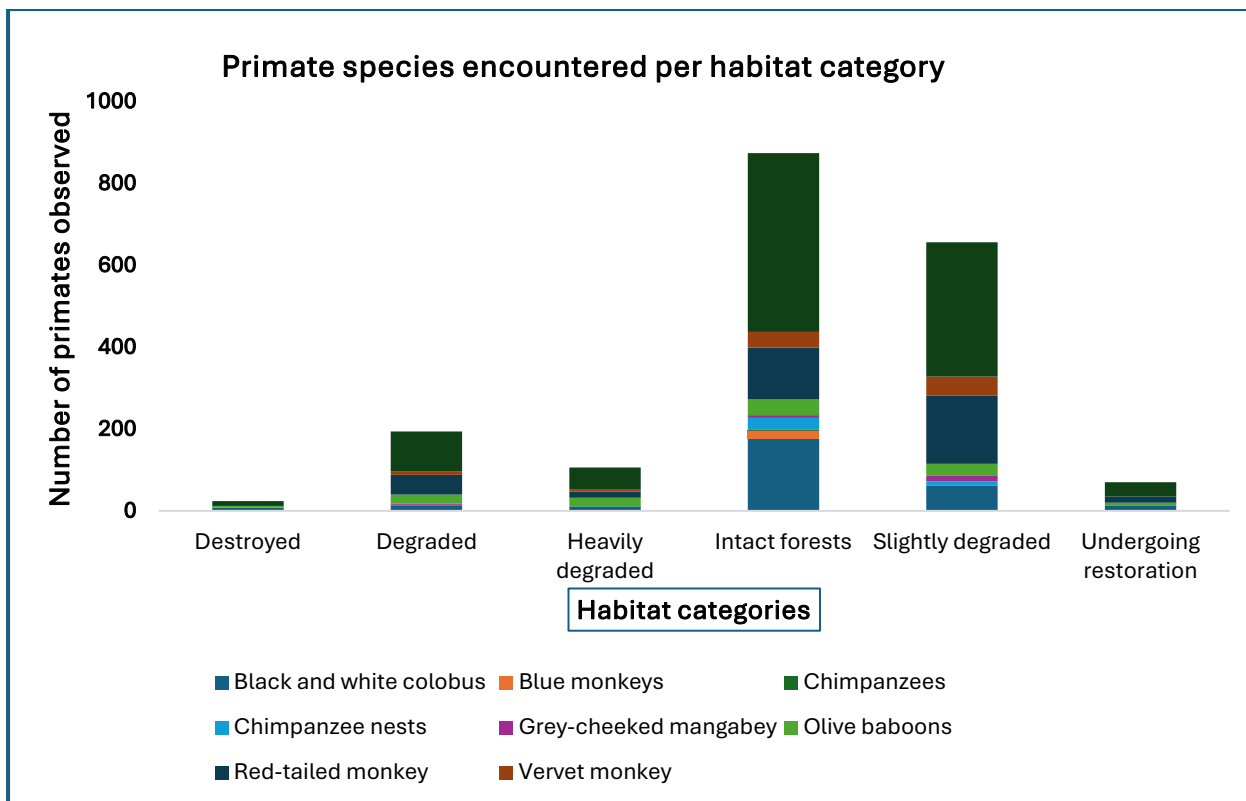
The habitat categories were ranked in order of severity, starting from intact (well-functioning habitats) to slightly degraded, degraded, heavily degraded, undergoing restoration, and destroyed habitats. Intact habitats are pristine with no signs of degradation. Slightly degraded habitats have experienced minimal tree cutting and are recovering. Degraded habitats show significant modification or loss of their structure, functions, species composition, or productivity due to anthropogenic activities. Heavily degraded habitats are in a state of

permanent loss of structure, functions, and species composition unless restoration efforts are initiated. Habitats undergoing restoration involve active tree planting and other restorative actions, while destroyed habitats have been converted to permanent land uses, such as roads, construction, or crop cultivation.

Intact Forests had the highest total of observed primates (437 sightings), followed by Slightly Degraded habitats with 328 sightings. These two categories supported the majority of primate species across all recorded areas. Destroyed and Heavily Degraded habitats had the lowest total sightings, with 12 and 53 sightings, respectively, demonstrating a significant decline in primate presence in these habitats.

In terms of primate species distribution across habitat categories, intact forests supported the largest variety of primate species, with all species represented, including high numbers of Red-Tailed Monkeys (127 individuals) and Black and White Colobus (176 individuals). Slightly Degraded habitats also had significant sightings, particularly of Red-Tailed Monkeys (166 individuals), but showed a marked decline in species richness compared to intact forests. Destroyed, Degraded, and Heavily Degraded habitats exhibited fewer species and sightings. Blue Monkeys were only encountered in Intact Forests, and Chimpanzees and Chimpanzee Nests were only found in Intact and Slightly Degraded habitats.

Species like Red-Tailed Monkeys and Olive Baboons were more widely distributed, recorded across multiple habitat categories, suggesting greater ecological resilience to habitat degradation. In contrast, Blue Monkeys and Chimpanzees had more restricted distributions, being found only in intact and slightly degraded habitats.



**Figure 4.5: Primate species encountered per habitat status category in the study parishes.**

**Source:** Field data 2023:

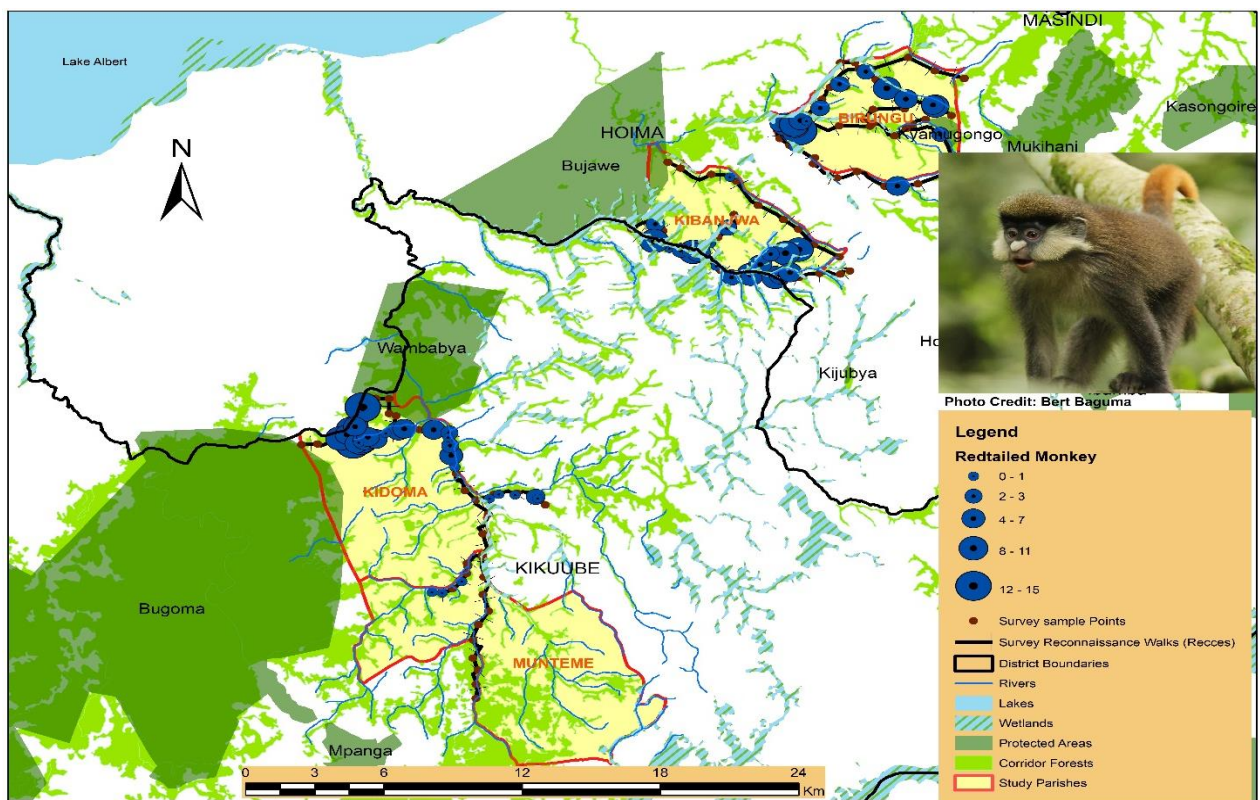
The study examined the relationship between primate species sightings (both live individuals and chimp nests) and the habitat status in the study area. The results revealed that the intact habitat status supported the highest number of primate sightings, with a total of 437 individuals observed. This was followed by the slightly degraded habitat, which accounted for 328 sightings. In contrast, 97 primates were sighted in degraded habitats. The heavily degraded habitats and those undergoing restoration ranked fourth and fifth, with 53 and 35 sightings, respectively. Only 12 primate sightings occurred in destroyed habitats, which included 8 sightings of black and white colobus monkeys and 4 sightings of olive baboons.

**Distribution of primate species observed in the study area.**

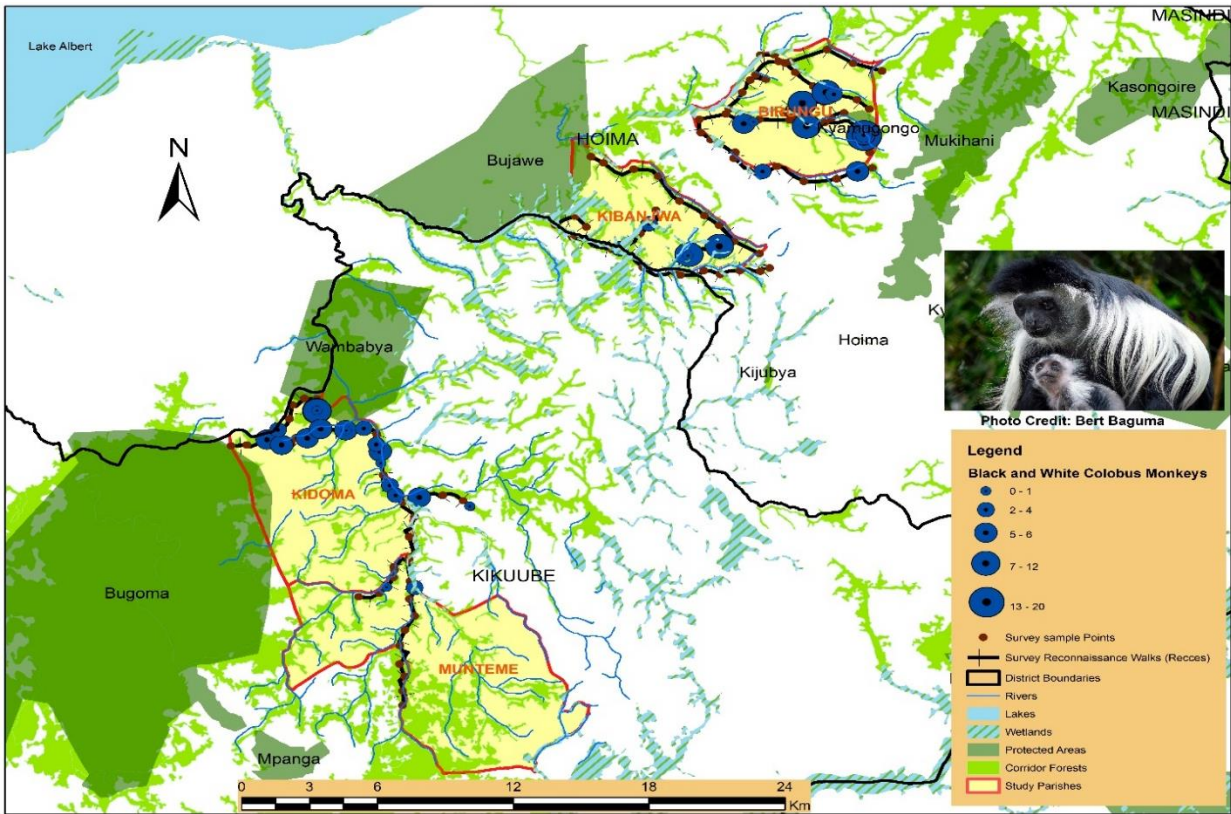
The spatial distribution of the seven sighted primate species in the study area was illustrated in figures (maps) 4.6, 4.7, 4.8, 4.9, 4.10, 4.11, and 4.12 using GIS. Chimpanzee nests were

recorded across all surveyed parishes, with Kidoma parish having the highest number of nests at 21. Kibanjwa parish followed with 9 nests. Kidoma also exhibited the highest encounter rate (ER) of chimpanzee nests at 0.636 nests per kilometer walked. Munteme parish ranked second with an ER of 0.609 nests per kilometer, while Kibanjwa came in third with an ER of 0.414 nests per kilometer. Both Birungu and Munteme parishes recorded 4 chimpanzee nests each; however, Munteme had a greater ER of 0.348 nests per kilometer, compared to Birungu’s ER of 0.109 nests per kilometer (see Table 4.9).

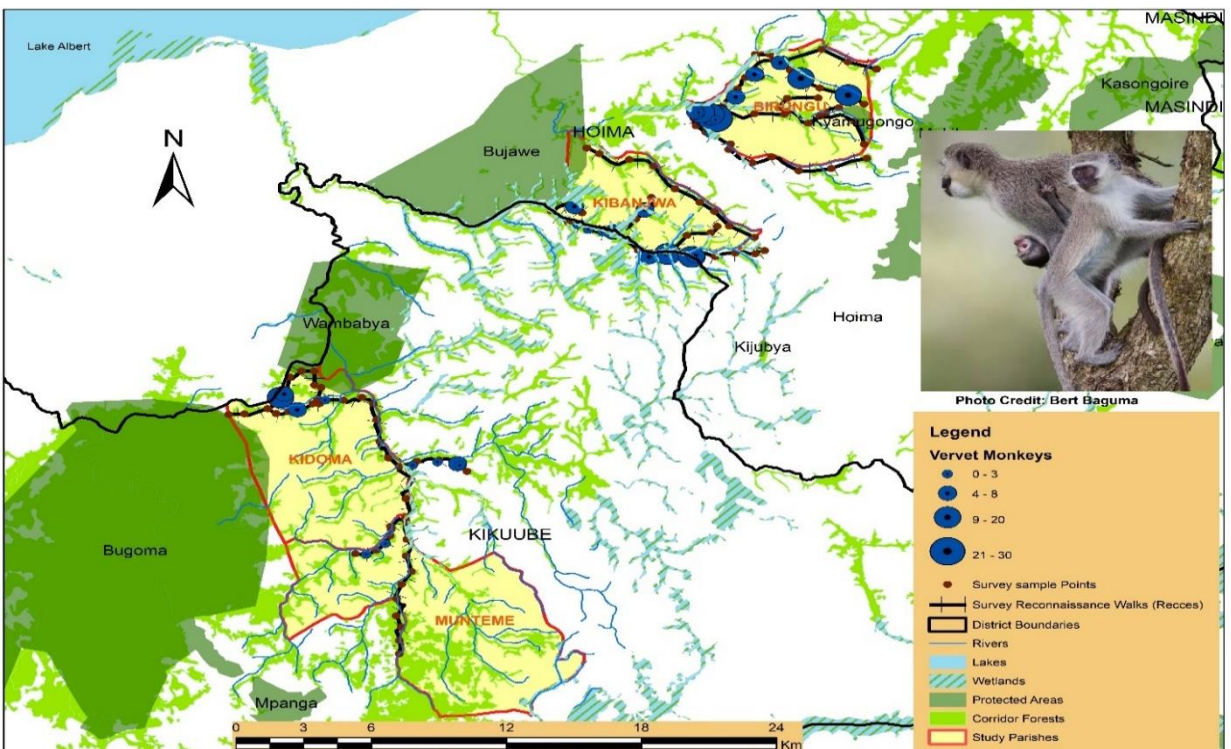
The study revealed an overall combined encounter rate (ER) of 0.403 for both live chimpanzees and chimp nests per kilometer walked. Within this combined ER, the nests accounted for 0.348, while live chimpanzees were observed 6 times, resulting in an ER of 0.055 live chimps per kilometer walked. Live chimp sightings occurred in three out of the four study parishes: 2 in Kibanjwa, 1 in Kidoma, and 3 in Munteme (see Table 4.9).



**Figure 4.6: Distribution of red-tailed monkeys observed in the study parishes.**



**Figure 4.7: Distribution of black and white colobus monkeys observed in the study parishes.**



**Figure 4.8: Distribution of vervet monkeys observed in the study parishes.**



Figure 4.9: Distribution of olive baboons observed in the study parishes.

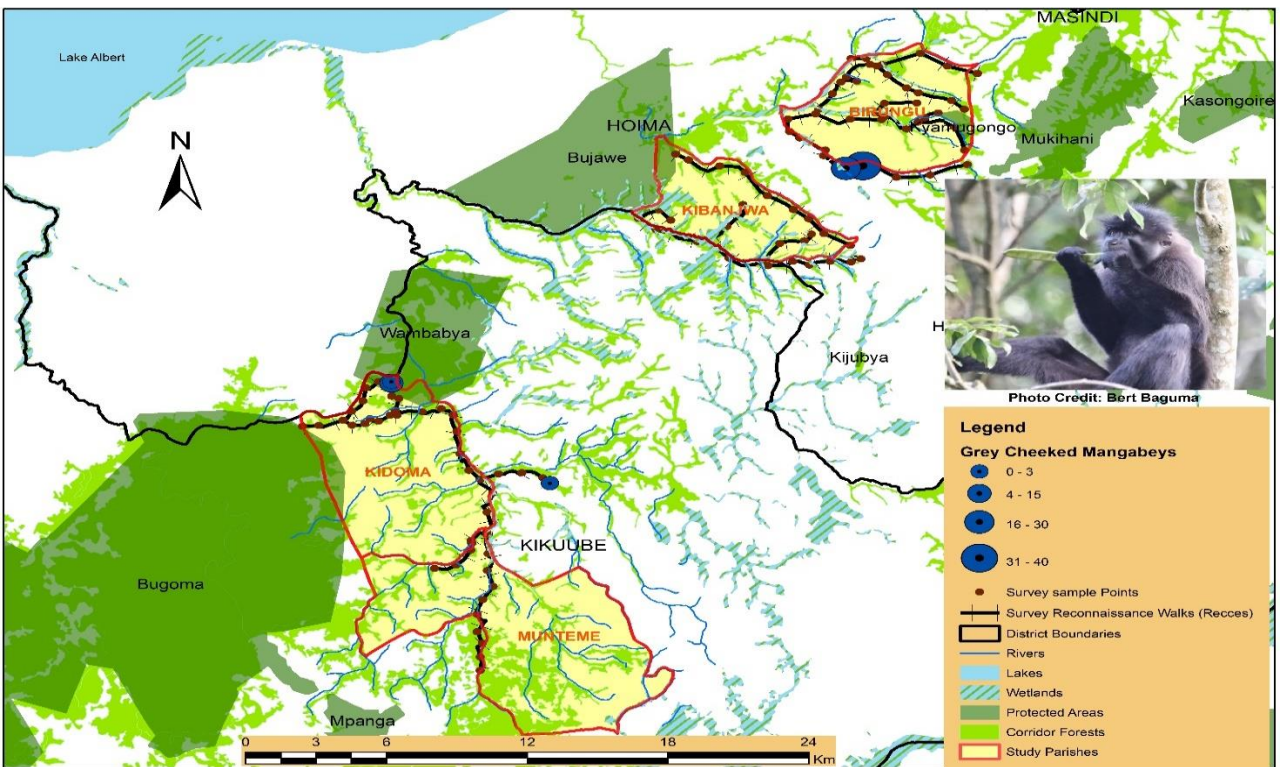


Figure 4.10: Distribution of grey-checked mangabeys observed in the study parishes.



Figure 4.11: Distribution of blue monkeys observed in the study parishes.

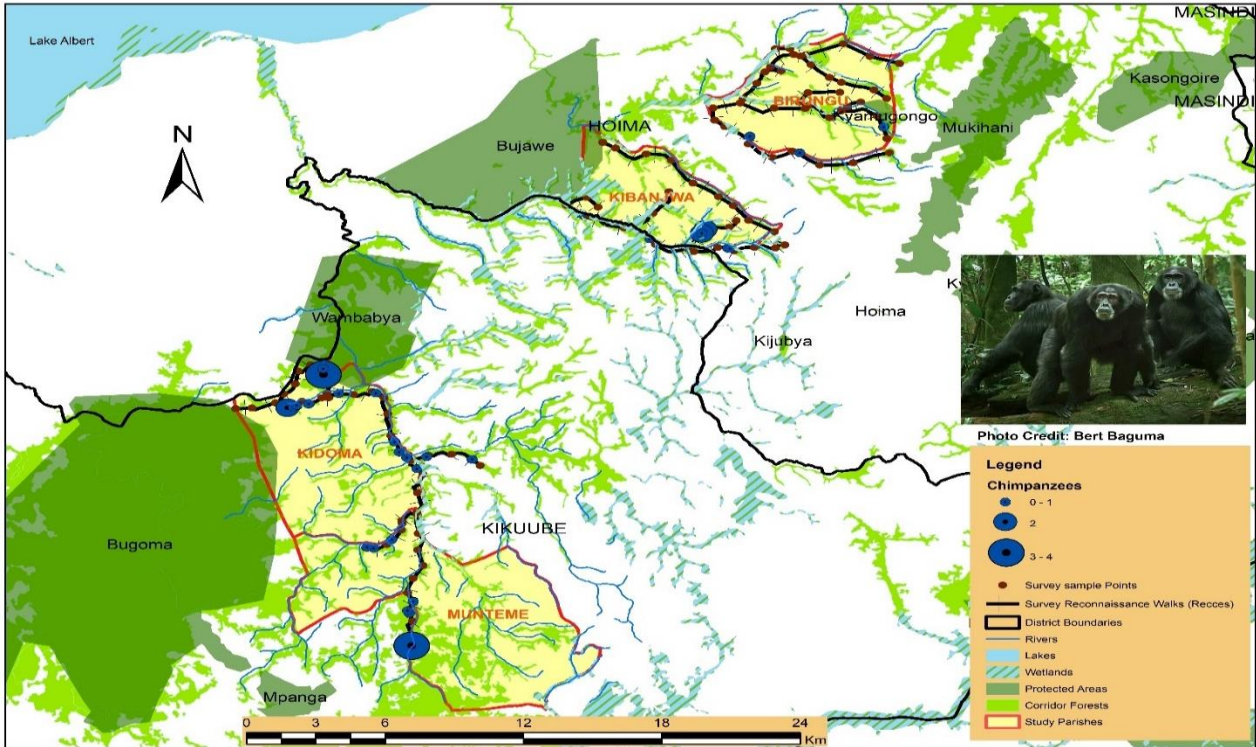


Figure 4.12: Distribution of chimpanzees observed in the study area - counts and nests.

The overall Shannon-Wiener diversity index ( $H'$ ) for the primate species in the study area is 1.540 (Table 4.12). This index reflects the diversity of primate species across the four surveyed parishes, calculated based on the number of individuals counted per species. The diversity index is derived from the formula:  $H' = -\sum P_i (\ln P_i)$  (explained in the methodology). The findings indicate that Red-tailed monkeys are the most abundant species, constituting 38.6% of the total individuals observed, while blue monkeys represent the least abundant species, with only 2.1%.

**Table 4.11: Shannon-Wiener primate species diversity index for the entire study area**

<b>Primate species</b>	<b>Number of species</b>	<b>pi</b>	<b>ln pi</b>	<b>pi lnpi</b>
Red-tailed monkeys	371	0.386	-0.953	-0.367
Black and white colobus	281	0.292	-1.231	-0.359
Olive baboons	121	0.126	-2.073	-0.261
Vervet monkeys	100	0.104	-2.264	-0.235
Chimpanzees and signs (nests)	44	0.046	-3.085	-0.141
Grey-cheeked mangabeys	25	0.026	-3.650	-0.095
Blue monkeys	20	0.021	-3.873	-0.081
<b>Sum</b>	<b>962</b>	<b>1.000</b>		<b>-1.540</b>
<b>H'</b>				<b>1.540</b>

**Source:** Field data, 2023

#### **4.5.1 Results from ANOVA Analysis**

This section presents the results from the ANOVA analysis conducted to examine differences between parishes and various primate species groups. The relevant findings are summarized in Tables 4.13 and 4.14, with additional details provided in Appendix 3.

**Table 4.12: Test of Homogeneity of Variances Between Primate Species Groups**

Primate Species Groups	Levene Statistic	df1	df2	Sig.
	3.118	3	164	0.028

**Table 4.13: ANOVA Results Between Parishes and Different Primate Species Groups**

Source	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups (Combined)	13.299	3	4.433	0.819	0.485
Unweighted Deviation	1.079	1	1.079	0.200	0.656
Weighted Deviation	1.762	1	1.762	0.326	0.569
Within Groups	887.220	164			
<b>Total</b>	<b>900.520</b>	<b>167</b>			

**Source:** Field data, 2023

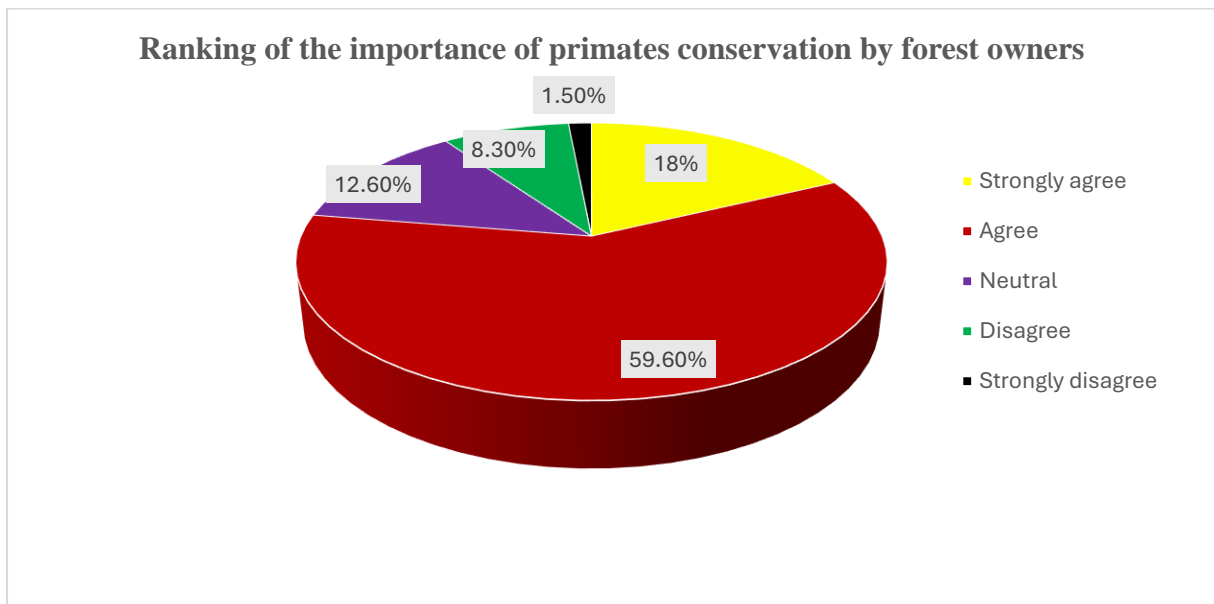
The results presented in Table 4.13 indicate that there is no significant mean difference between the parishes and the different primate species groups. The significance values (p-values) obtained from the ANOVA analysis reveal the following: Overall Comparison (Between Groups) - The F-value is 0.819 with a significance level of 0.485, indicating no significant differences among the groups. Unweighted Deviation - With an F-value of 0.200 and a significance level of 0.656, this comparison also shows no significant differences. Weighted Deviation - Similarly, the F-value of 0.326 with a significance level of 0.569 confirms the lack of significant differences.

Post Hoc analyses were performed using the Least Significant Difference (LSD) and Tamhane methods, as detailed in Appendix 3. The results of these comparisons further support the conclusion that there are no significant mean differences between parishes and primate species groups at the 5% significance level.

#### 4.5 Private FOs' Attitudes and Perceptions Towards Primate Conservation in Private Forests

The findings reveal a notable commitment among FOs towards primate conservation in their respective areas. Specifically, most respondents, 59.6%, acknowledged the importance of primate conservation by agreeing with the statement presented in the questionnaire. Additionally, 18.0% strongly agreed, indicating a robust endorsement of conservation efforts. In contrast, 12.6% remained neutral, reflecting a degree of ambivalence towards the issue. On the other hand, a smaller fraction of the respondents expressed dissent, with 8.3% disagreeing and 1.5% strongly disagreeing with the notion of primate conservation.

These results, illustrated in Figure 4.13, underscore the significant importance FOs place on primate conservation, which, in turn, influences their attitudes and perceptions toward such initiatives. The prevailing agreement among the respondents highlights a positive disposition towards conservation efforts, suggesting that further engagement and education on the benefits of primate conservation could strengthen these attitudes even more.



**Figure 4.13: Respondents' choice on the importance of primates to forest owners**

**Source: Field data, 2023**

## Interactions Between Respondents and Conservation NGOs

The survey investigated whether staff from conservation NGOs had ever visited the homesteads of the respondents. The findings indicate that a substantial majority, 75.7%, reported that representatives from conservation organizations had indeed visited their homes as part of conservation efforts. In contrast, 25.3% stated they had never received a visit from conservation NGO staff, as illustrated in Table 4.15. This frequency of engagement reflects a commitment to ongoing dialogue and relationship-building between NGOs and the communities they serve. The frequency of conservation staff visits correlated with the respondents' perception of relationship quality (Table 4.15).

**Table 4.14: Conservation NGOs' Staff Visit to Forest Owners by Relationship Quality**

NGO Staff Visit	Excellent	Very Good	Satisfactory	Good	Poor	Very Poor	Total
Yes (156)	5	29	75	22	23	2	156
No (50)	1	5	18	9	16	1	50
<b>Total (206)</b>	<b>6</b>	<b>34</b>	<b>93</b>	<b>31</b>	<b>39</b>	<b>3</b>	<b>206</b>

**Source:** Field data, 2023

The results revealed that most households (54.9%) reported receiving annual visits from conservation NGO staff, whereas a notable 45.1% experienced more frequent interactions, with monthly visits from NGO representatives. Results also revealed that the relationship with conservation NGOs was predominantly rated as Satisfactory by 45.1%. Other ratings included Poor (18.9%), Very Good (16.5%), Good (15.0%), Excellent (2.9%), and Very Poor (1.5%). The frequency of conservation staff visits correlated with the respondents' perception of relationship quality (Table 4.16).

**Table 4.15: Conservation NGOs’ Staff Visit Frequency by Relationship Quality**

Visit Frequency	Excellent	Very Good	Satisfactory	Good	Poor	Very Poor	Total
Monthly (93)	3	15	48	10	16	1	93
Annually (113)	3	19	45	21	23	2	113
<b>Total (206)</b>	<b>6</b>	<b>34</b>	<b>93</b>	<b>31</b>	<b>39</b>	<b>3</b>	<b>206</b>

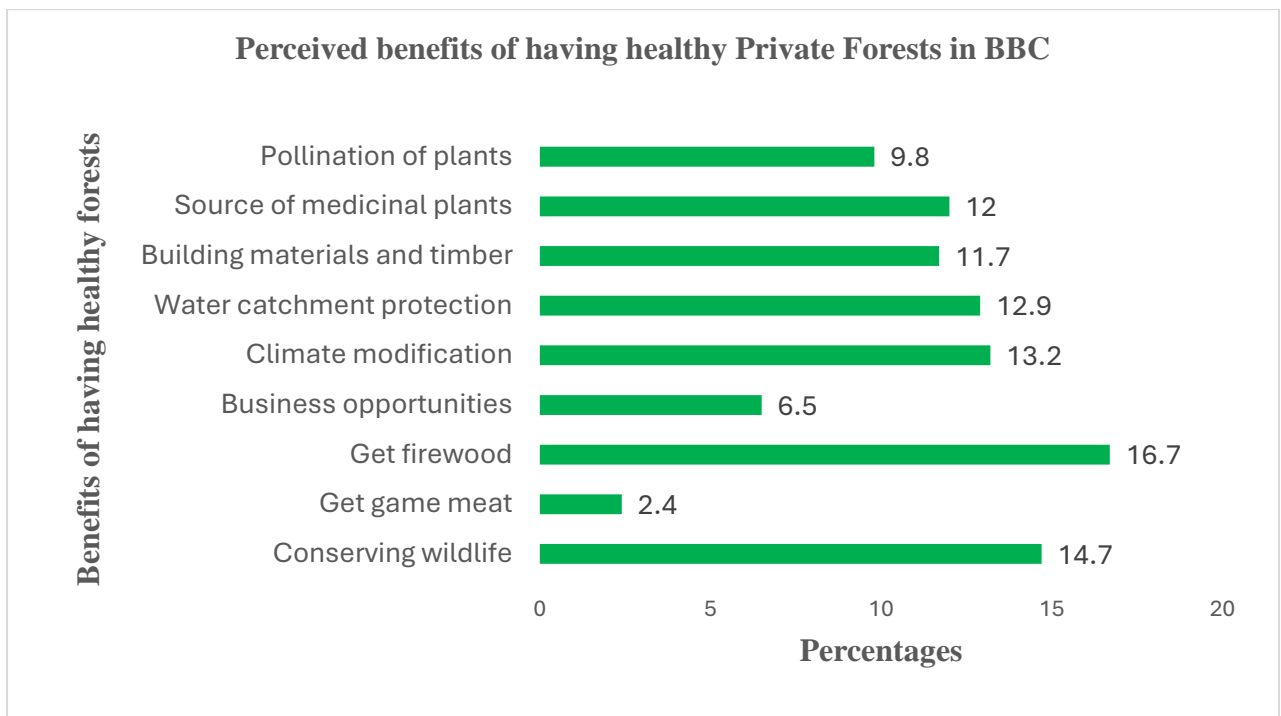
**Source:** Field data, 2023

The positive ratings (Satisfactory, Good, Very Good, and Excellent) were largely attributed to several key factors, including collaborative efforts in conserving natural resources, effective awareness creation among households, heightened awareness of primate and forest values, and community sensitization initiatives. However, those who rated the relationship as Poor or Very Poor cited issues such as unfulfilled promises from NGOs, insufficient involvement of diverse stakeholders—particularly youth—and inadequate community development initiatives. The results highlight both the strengths and challenges in the relationships between conservation NGOs and the communities, indicating areas for potential improvement in engagement strategies.

The study explored the significant benefits of maintaining healthy private forests, revealing a variety of ecological and economic advantages that underscore their importance to both the environment and local communities. Among the ten identified benefits, six stood out due to their impact (Figure 4.14): First, firewood collection was highlighted by 16.7% as a crucial benefit, providing a vital source of energy for many households. Following this, wildlife conservation emerged as another key advantage, with 14.7% acknowledging the forests' role in preserving biodiversity and protecting various species. Climate modification was also noted by 13.2%, emphasizing how healthy forests help regulate and stabilize local climates, contributing to overall environmental balance. Additionally, 13.0% recognized the

importance of forests in water catchment protection, which is essential for safeguarding water resources in the area.

The study further identified the forests as a source of medicinal plants, a benefit cited by 12.0%. These plants are crucial for health care and traditional practices, showcasing the forests' role in supporting community well-being. Lastly, the provision of building materials and timber was noted by 11.7%, highlighting the economic significance of these natural resources. Other notable benefits included business opportunities such as eco-tourism, 6.5%, which can stimulate local economies, and the vital role of forests in pollination by 5.9%, education and research by 4.0%, and the provision of game meat by 2.4%. These findings illustrate the multifaceted advantages of healthy private forests, emphasizing their essential contributions to energy needs, wildlife conservation, climate stability, water protection, medicine, and economic opportunities.

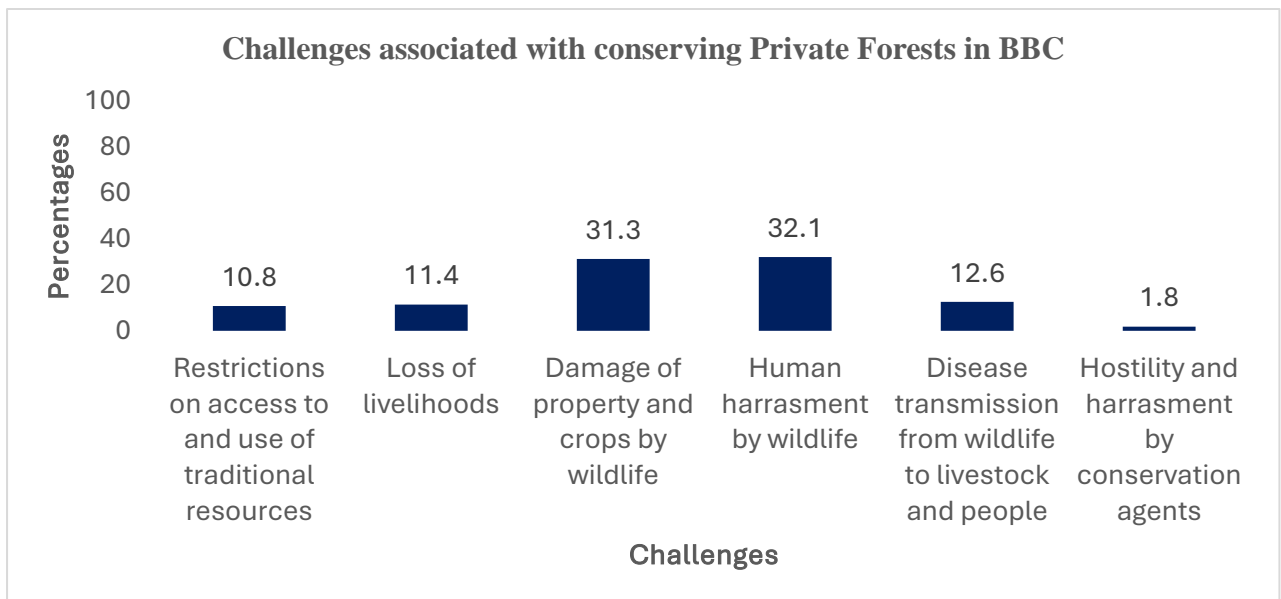


**Figure 4.14: Perceived benefits of having healthy Private Forests in BBC**

**Source:** Field data, 2023

The study identified two primary challenges in conserving private forests: human harassment by wildlife, reported by 32.1%, and damage to property and crops caused by wildlife by 31.3%.

In addition to these significant issues, other challenges were noted. Disease transmission from wildlife to livestock and humans was a concern for 12.6%, while 11.4% reported a loss of livelihoods due to conservation efforts. Restrictions on access to and use of traditional resources affected 10.8%, and 1.8% experienced hostility and harassment from conservation agents and authorities. These findings, illustrated in Figure 4.15, highlight the complex challenges faced by communities in balancing conservation with their daily lives and livelihoods.



**Figure 4.15: Challenges associated with conserving private forests in the BBC**

**Source:** Field data, 2023

### **Human-wildlife conflicts and routine of occurrence in the BBC**

Human-wildlife conflict (HWC) has become a pressing issue in the context of wildlife conservation in private forests. During a focus group discussion (FGD) held at Birongo village, Kibanjwa parish on 14<sup>th</sup> January 2023, participants expressed concern over the rising

prices of beef and other meats, stating, “Due to the high price of beef and other meat, people are now eating primates.” They also noted that the reduction of forests and the food sources for primates have driven these animals into local communities, leading to increased human-wildlife conflicts. Consequently, primates are sometimes killed through poisoning and trapping.

An interview with a government institution representative on 5<sup>th</sup> January 2023 highlighted a specific incident: “There is a man who was arrested in Bulindi for harassing and disturbing chimpanzees by cutting down their preferred nesting trees, which led to HWC.” In the BBC, several tree species are crucial to primate populations due to their provision of food, shelter, and habitat structure. Notable species include *Ficus spp.* (fig trees), *Prunus africana* (African cherry), and *Canarium schweinfurthii* (African olive) are known for their year-round fruit availability and strong canopies, which support foraging for chimpanzees and monkeys. *Albizia spp.* and *Syzygium spp.* (waterberry trees) are essential for their seeds and fruits, which attract primates, especially during the rainy season.

The study revealed that most 86.9% believe HWC incidents occur in the BBC, while only 18 respondents (8.7%) thought HWC did not exist, and 4.4% were uncertain, as shown in Table 4.17. Further discussions with FGD participants in Kidoma on 16<sup>th</sup> January 2023 indicated that monkeys and baboons were destroying cultivated crops, damaging young leaves of planted trees, and spreading diseases.

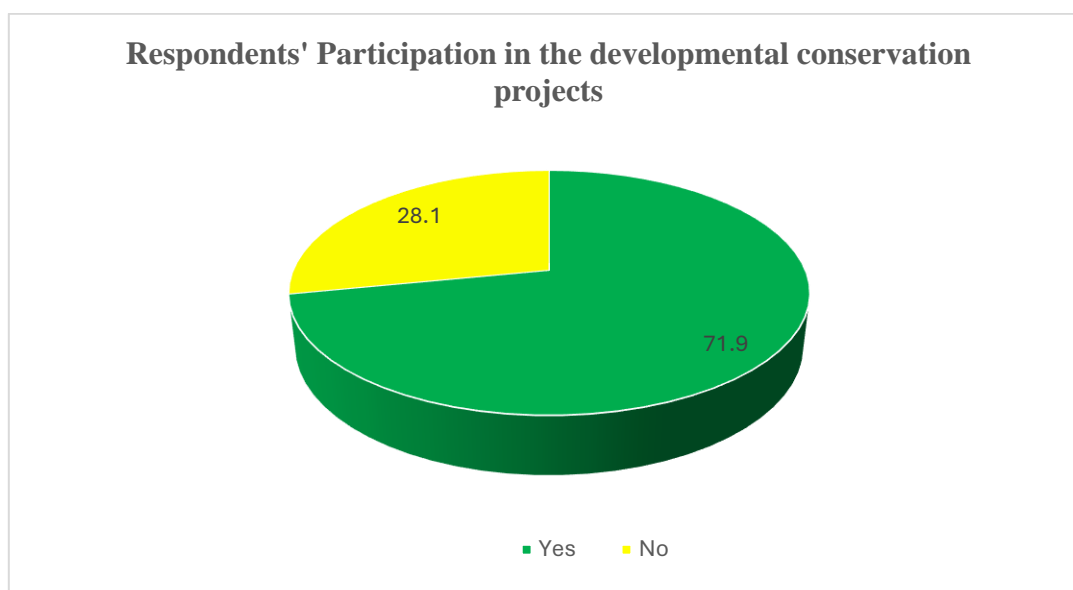
Regarding the frequency of HWC occurrences, 27.2% believed these conflicts happen bi-annually, while 26.7% thought they occur monthly. Additionally, 19.4% reported that HWC occurs weekly, and 10.7% stated that these incidents occur daily. Only 4.9% of respondents believed they happen annually, while 11.2% did not respond.

**Table 4.16: Human-wildlife conflicts and routine of occurrence in the BBC**

<b>Human-Wildlife Conflict and Routine of Occurrence</b>	<b>Frequency</b>	<b>Percent</b>
<b>Cases of Human-Wildlife Conflict</b>		
Yes	179	86.9
No	18	8.7
Don't Know	9	4.4
<b>Total</b>	<b>206</b>	<b>100.0</b>
<b>Routine of Occurrence</b>		
Daily	45	21.9
Weekly	40	19.4
Monthly	55	26.7
Bi-annually	56	27.2
Annually	10	4.9
<b>Total</b>	<b>206</b>	<b>100.0</b>

**Source:** Field data, 2023

When asked about their involvement in the development of conservation projects, a significant majority of respondents, 71.9%, reported that they had participated in such initiatives. Conversely, 28.1% indicated that they had never participated in the development of conservation projects, as illustrated in Figure 4.16.



**Figure 4.16: Respondents' participation in developmental conservation projects.**

**Source:** Field data, 2023

In assessing the impact of conservation approaches used by NGOs on respondents' attitudes and perceptions towards the conservation of primates and private forests, a substantial majority of 71.8% agreed with the positive influence of these approaches. In contrast, 28.1% disagreed with this assertion, as shown in Table 4.18.

**Table 4.17: Influence of Conservation Approaches by NGOs on Respondents' Attitudes and Perceptions and the Reasons**

<b>Reason for Attitude/Perception</b>	<b>Agree with Positive Influence</b>	<b>Disagree with Positive Influence</b>	<b>Total</b>
Conservation NGOs have emphasized the values of forests and primates	5	0	5
Sensitization on how to coexist with primates	33	6	39
Benefits from selling trees and replanting	12	2	14
Increased understanding of climate change	5	1	6
Awareness raising on conservation	11	3	14
Unfulfilled promises	0	13	13
Lack of participatory project planning	0	5	5
Projects not fully impacting the community	0	19	19
<b>Total</b>	<b>148</b>	<b>58</b>	<b>206</b>

**Source:** Field data, 2023

Respondents who affirmed the positive influence of conservation NGOs highlighted several key aspects: 39.8% noted that NGOs have emphasized the values of forests and primates, while 18.9% mentioned sensitization efforts on how to coexist with primates. Additionally, 6.8% recognized the benefits of selling trees and replanting, and another 6.8% pointed to increased awareness of conservation issues (Table 4.18). Conversely, those who provided negative responses attributed their views to several factors: 6.3% cited unfulfilled promises, 5.4% mentioned that projects have not fully impacted the community, and 2.4% criticized the lack of participatory planning in project development. Furthermore, 6.3% did not respond, while 4.4% indicated they were unsure.

Regarding the involvement of local communities in planning conservation activities, 37.4% reported being somewhat involved, while 29.1% indicated they are involved. Only 2.9% stated they are highly involved in decision-making and management processes. In contrast, 26.7% indicated that they are not involved in the planning and decision-making related to conservation projects and interventions.

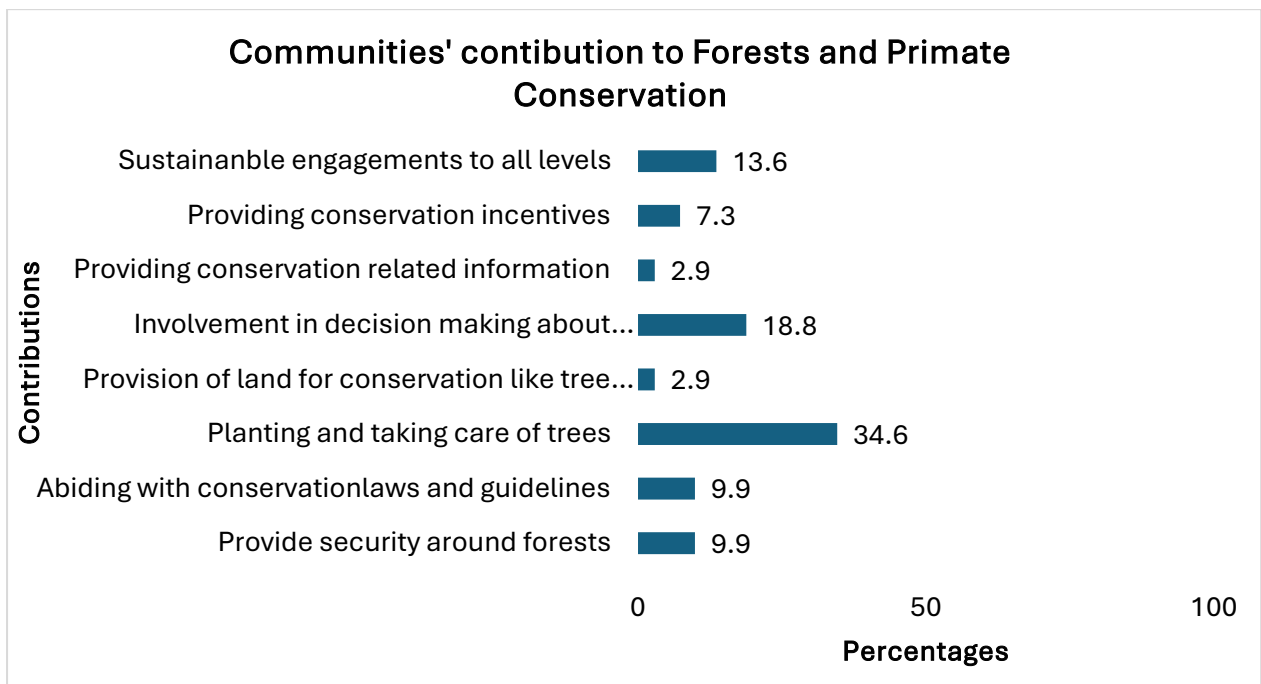
**Table 4.18: Local communities’ involvement in conservation activities, decision making and Level of Involvement**

<b>Local communities’ involvement and Level Involvement</b>		<b>Frequency</b>	<b>Percent</b>
Involvement	Not involved	63	30.6
	Somewhat involved.	77	37.4
	Involved	60	29.1
	Highly Involved	6	2.9
	<b>Total</b>	<b>206</b>	<b>100.0</b>
Reason for the choice	Involvement in tree planting	28	13.6
	Involvement in bee keeping.	16	7.8
	Participation in business saving groups.	19	9.2
	Participation in PFOAs’ activities	18	8.7
	Involved in planning activities for implementation.	14	6.8
	Not involved in high-level decision-making processes	21	10.2
	41	19.9	
	Not all community members have been involved.	20	9.7
	Involved but our contribution not respected.	1	.5
	Involved in livestock rearing for conservation.	19	9.2
	Poor attitudes toward conservation	9	4.4
	More sensitization needed.	<b>206</b>	<b>100.0</b>
<b>Total</b>			

**Source:** Field data, 2023

Respondents expressed their choices regarding involvement in conservation programs, as outlined in Table 4.19. These responses underscore the various ways individuals engage with conservation initiatives, reflecting both their participation and lack of involvement in decision-making, management, and planning processes.

In terms of community contributions to forest conservation, two primary activities were noted. Planting and caring for trees, as well as nursery beds, emerged as the most significant contribution, with 34.6% identifying it as a key action. Additionally, participation in decision-making processes related to conservation was highlighted by 18.8%. Furthermore, respondents mentioned six other methods of contribution, which are illustrated in Figure 4.17.



**Figure 4.17: Ways through which communities could contribute towards private forests and primates' conservation.**

**Source:** Field data, 2023

#### **4.5.1: Results from Pearson correlation analysis**

This section presents the findings from the Pearson correlation analysis conducted to examine the relationship between gender and community contributions towards forest and primate conservation, as detailed in Table 4.20.

The results in Table 4.20 indicate that there is no statistically significant relationship between gender and community contributions towards forest and primate conservation, with a Pearson

correlation coefficient (PV) of -0.037 ( $p = 0.601$ ). This suggests that male respondents were less likely to contribute to conservation efforts in the Bugoma Forest Corridor (BBC). Qualitative insights from an FGD in Munteme support this finding, highlighting that "men engage in activities that degrade forests, such as charcoal burning, brick making, and timber harvesting as sources of income." This was reported on 20<sup>th</sup> January 2023.

**Table 4.19: Pearson Correlations results**

		<b>Gender</b>	<b>Communities Contribution towards forests and Primates conservation</b>
Gender	Pearson Correlation	1	-0.037
	Sig. (2-tailed)		.601
	N	206	206
Communities Contribution towards forests and Primates conservation	Pearson Correlation	-0.037	1
	Sig. (2-tailed)	.601	
	N	206	206

**Source:** Field data, 2023

Table 4.20 illustrates that there is a positive correlation between occupation and the perceived importance of primate conservation in the BBC, with a Pearson correlation coefficient of 0.045 ( $p = 0.520$ ). This indicates that respondents engaged in farming were more likely to recognize the significance of primate conservation. The rationale for this relationship may be attributed to the benefits derived from conserved forests, which include improved rainfall patterns and enhanced soil fertility.

**Table 4.20: Pearson Correlations Results**

		<b>Occupation</b>	<b>Importance of primate conservation in the BBC</b>
Occupation	Pearson Correlation	1	0.045
	Sig. (2-tailed)		0.520
	N	206	206
Importance of primate conservation in BBC	Pearson Correlation	0.045	1
	Sig. (2-tailed)	.520	
	N	206	206

**Source:** Field data, 2023

Overall, the Pearson correlation analysis suggests that gender does not significantly influence community contributions to conservation efforts, while occupation appears to correlate positively with the appreciation of primate conservation. These findings underscore the complexities of human behavior with conservation initiatives and highlight the need for targeted interventions that consider socio-economic factors.

## CHAPTER FIVE: DISCUSSION OF FINDINGS

### 5.1 Introduction

This chapter discusses the study's findings, structured around background characteristics and the three objectives: (1) private forest conservation and climate change adaptation strategies, (2) primate species diversity within private forests in the Budongo-Bugoma Corridor (BBC), and (3) private forest owners' attitudes and perceptions toward primate conservation and climate change adaptation strategies. Each objective is explored with relevant studies, emphasizing the role of private forest management in supporting biodiversity and climate resilience in the BBC.

The socio-demographic profile of respondents in the BBC reveals key characteristics influencing forest ownership, management, and climate change adaptation. The predominance of male forest owners (64.6%) aligns with traditional land ownership norms in Uganda, where men typically hold land rights (Katusiime *et al.*, 2023). This male dominance may be exacerbated by women's domestic responsibilities limiting their participation in conservation discussions, highlighting the need for greater inclusion of female perspectives (Nabanyumya *et al.*, 2017).

A significant majority (59.7%) of respondents were aged 45 and above, reflecting their longer-established land rights and experience in land management. This trend suggests potential intergenerational knowledge gaps in forestry, as younger individuals may prioritize other economic opportunities over forestry (Twongyirwe *et al.*, 2018; Yahyah, 2020).

Most respondents had primary education (51.5%), with fewer attaining secondary education (35.9%). Limited access to higher education in rural Uganda affects resource access and knowledge of conservation practices (Bersacola *et al.*, 2023; Kaweesa *et al.*, 2018).

Nevertheless, even those with lower education levels engaged in climate change adaptation, underscoring the value of accessible community-based training.

Most respondents relied on agriculture, reflecting the region's resource-dependent nature. This reliance increases pressures for land conversion and deforestation, consistent with findings that agricultural expansion often leads to forest degradation (Nabanyumya *et al.*, 2017).

Wood fuel was the primary energy source (50.5%), typical in rural Uganda, although this dependence can lead to habitat degradation. Increasing use of solar energy (31.6%) reflects recent initiatives aimed at enhancing energy access, while low electricity (1.5%) and gas (2.9%) usage indicate infrastructure challenges (Fashina *et al.*, 2018; Yahyah, 2020).

Most respondents (76.2%) own land customarily, which can complicate access to formal conservation incentives (Katusiime *et al.*, 2023). The presence of diverse tenure types could influence management practices and conservation outcomes (Kaweesa *et al.*, 2018).

The majority owned small parcels (1–6 acres), reflecting population pressures and land fragmentation trends observed in Uganda (Katusiime *et al.*, 2023). However, an increase in forest cover on smaller plots suggests a growing recognition of forest conservation's importance among smallholders (Kazoora *et al.*, 2019).

## **5.2 Forest conservation and climate change adaptation strategies**

The assessment of forest land ownership between 2010 and 2022 reveals a significant shift towards smaller private forest plots (0–2 acres), with a corresponding decline in mid-sized plots (3–8 acres). This trend suggests an increase in smallholders entering forestry, possibly driven by government incentives and community programs promoting forest conservation

(Twongyirwe *et al.*, 2018). The decrease in mid-sized holdings may indicate land fragmentation due to economic pressures, such as selling portions of land or shifting to more diverse income sources (Tikkanen, 2018).

The stability of larger holdings (11+ acres) implies that these landowners may have better resilience to market fluctuations. This shift poses challenges for conservation efforts, as smaller plots may be more prone to degradation and ecological disruption, necessitating tailored policies to support smallholders in sustainable forest management (Nunan, 2017). These findings align with global trends towards smaller landholdings but highlight unique regional dynamics that require further investigation. Overall, the results underscore the importance of targeted interventions and support for diverse landowner demographics to enhance the sustainability of private forest management and climate change adaptation strategies (Kröger & Raitio, 2017).

The analysis of forest land ownership changes between 2010 and 2022 in the Budongo-Bugoma Corridor (BBC) reveals important trends influenced by conservation interventions. In Kibanjwa parish, ownership remained stable, decreasing slightly from 20.9% in 2010 to 41 households 19.9% in 2022. This stability may indicate effective conservation measures that have helped maintain land use practices (Katusiime *et al.*, 2023). In Birungu parish, an increase in forest land ownership from 28.6% in 2010 to 31.6% in 2022 suggests successful conservation outreach efforts, potentially motivating more households to engage in forest management (Bersacola *et al.*, 2023). The decline in land ownership highlights the impact of population pressures and land fragmentation, which align with findings that increasing population density leads to land subdivision, affecting larger forest holdings (Kazoora *et al.*, 2019).

Conservation NGOs have intensified tree-planting initiatives in response to these trends, aiming to mitigate forest loss caused by land fragmentation. However, challenges remain, particularly regarding the survival of seedlings, as highlighted in focus group discussions in Kidoma. Participants noted low survival rates due to inadequate planting practices and competition for limited land resources (Yahyah, 2020).

Overall, the shifts in forest land ownership from 2010 to 2022 illustrate the complex interplay between conservation initiatives and socio-economic factors. While some parishes have shown resilience, others face challenges related to fragmentation. These findings emphasize the need for tailored conservation strategies that promote sustainable land use practices and enhance community participation in forest management.

The findings regarding climate change adaptation (CCA) strategies implemented by conservation NGOs and local stakeholders in Hoima and Kikuube districts highlight a comprehensive approach to enhancing biodiverse private forest conservation, particularly for primates. Tree planting was the most reported CCA strategy, with 27.2% of respondents acknowledging its importance. This strategy includes local conservation efforts and global initiatives, such as purchasing riverine forested land for restoration. Tree planting is recognized as an effective means to improve forest cover and support biodiversity (Katswera *et al.*, 2022).

Alternative livelihood incentivization such as beekeeping and livestock rearing, were identified by 23.7% of respondents. These programs are vital for reducing dependence on forest resources and fostering community involvement in conservation. Diversifying income sources has been linked to enhanced conservation outcomes (Kimengsi *et al.*, 2019). The importance of education in engaging communities with CCA strategies was underscored by

19.4% of respondents. Conservation awareness initiatives are essential for promoting participation and support for conservation efforts (Mugeere & Opara, 2022).

Collaboration between NGOs and local natural resource departments supports various CCA strategies. The Participatory Forest Management (PFM) model is particularly noted for its role in enhancing conservation efforts through community engagement and resource management (Kazooru *et al.*, 2019). The Hoima district natural resource office recommended effective tree management practices and planting unpalatable crops in buffer zones to mitigate human-wildlife conflicts (HWC). These strategies are crucial for maintaining community support and enhancing conservation effectiveness (Tumuhe & Kiguli, 2019). The identified CCA strategies reflect an integrated approach that combines ecological restoration, community livelihoods, and education. These strategies align with recent research highlighting their importance in conservation and provide a foundation for future initiatives.

The study on preferred Climate CCA strategies revealed several key insights regarding community preferences for biodiversity conservation: The most favored strategy was tree planting, selected by 65.0% of respondents, highlighting its critical role in local conservation and climate resilience. This aligns with research indicating that tree planting enhances forest cover and contributes to carbon sequestration (Ampaire *et al.*, 2017). Conservation Farming and Climate-Smart Agriculture approach was chosen by 13.4% of respondents, reflecting a recognition of sustainable agriculture's role in food security and climate adaptation. Previous studies support this, emphasizing sustainable agriculture's importance for resilience against climate impacts (Sterling *et al.*, 2017; Thierfelder *et al.*, 2017). Conservation Sensitization was in third place, highlighted by 12.6% of respondents, this strategy focuses on community education about climate adaptation. Existing research underscores the value of awareness and education in promoting sustainable practices (Twecan *et al.*, 2022). Forest Conservation

Associations and Incentive Models were preferred by 8.9% of respondents, this indicates a desire for collaborative structures to support forest preservation. Community-based conservation models have been shown to enhance resource management (Kasmira & Hagerman, 2020). However, respondents favored an Integrated Approach - a combination of all strategies for effective conservation outcomes, reflecting an understanding of the interconnectedness of CCA strategies. This aligns with contemporary research advocating for integrated approaches to address complex environmental challenges (Gigi, 2020; Runting *et al.*, 2017). Overall, the findings indicate a strong preference for tree planting and sustainable agricultural practices, emphasizing the importance of a holistic approach in enhancing biodiversity resilience amid climate change.

The study on strategies for building resilience and mitigating climate change impacts revealed several key findings regarding community engagement and the role of conservation NGOs: Conservation NGOs have focused on changing community attitudes towards forest and primate conservation. By educating communities, these organizations aim to foster a more positive perception, which is crucial for effective conservation efforts (Obradović *et al.*, 2023). Conservation NGOs have implemented livelihood support programs to promote forest-friendly activities. For example, WCS in Kibanjwa parish provides financial assistance through loans to forest owners and business saving groups. This initiative addresses community needs while also reducing forest degradation, demonstrating a successful model of integrating conservation with local economic development (Gidebo, 2023). The study found that 62.6% of respondents had never engaged with conservation NGOs, while 37.4% reported some level of involvement. This suggests that while there is some level of engagement, it is primarily short-term and may limit the potential for long-term community investment in conservation efforts (Sterling *et al.*, 2017). These findings highlight the importance of community involvement and livelihood support in fostering resilience against

climate change. The reliance on short-term employment may indicate a need for more sustainable job creation within conservation initiatives. Overall, the strategies used by conservation NGOs emphasize a holistic approach to conservation that incorporates community needs and perceptions, which aligns with contemporary approaches to sustainable environmental management (Gigi, 2020).

Results in Table 4.4 revealed that 37.4% household members had been/were still employed by conservation NGOs/institutions. Employment of local communities neighboring PAs is known to positively improve the attitude and perceptions towards conservation strategies (Abukari & Mwalyosi, 2020). Job creation for locals by conservation NGOs/institutions on both short and medium-term contracts and casual workers' employment have been used as a conservation strategy globally. Uganda Wildlife Authority prioritizes the employment of local community members neighboring PAs to enhance their benefits and conserve wildlife (Kolinski & Milich, 2021).

The findings highlight a largely positive perception among respondents regarding the impact of conservation interventions on forest status, with 69.4% recognizing improvements linked to initiatives by conservation NGOs, such as afforestation and conservation farming. Most respondents attributed positive changes in forest conditions and biodiversity, especially for primate populations, to conservation efforts. This aligns with research indicating that community engagement and targeted strategies can lead to environmental benefits (Anwadike, 2020; Chervier *et al.*, 2019). A minority (12.6%) expressed skepticism about conservation's effectiveness, possibly due to ongoing challenges like illegal logging or insufficient visibility of outcomes. An additional 18.0% were uncertain, suggesting a need for greater awareness and involvement in local conservation efforts (Sterling *et al.*, 2017; Ugboju *et al.*, 2023). A substantial majority (82.0%) acknowledged that conservation NGOs support

development initiatives linked to conservation goals. However, 17.9% disagreed, indicating potential gaps in addressing specific community needs, a concern noted in other studies (Kemp *et al.*, 2023; Lunstrum, 2018). Tree planting was identified as the most significant initiative, with other efforts including water provision and educational support reflecting a comprehensive approach to enhancing community resilience (Ensor *et al.*, 2018; Nafeesa Esmail *et al.*, 2023). Overall, while the positive responses were expected, the skepticism and identified gaps in certain areas of support suggest that conservation NGOs should enhance their engagement with local communities to improve effectiveness.

The positive impact of conservation interventions was attributed to improvements in private forest status due to conservation interventions, such as riverine forest restoration and community sensitization efforts. These observations resonate with findings from Ayebare *et al.*, (2018), which highlight the importance of community involvement in protecting PAs and forest patches. Such involvement is crucial for effective CCA, emphasizing the necessity of collaborative approaches.

Respondents indicated a growing awareness of climate change's negative impacts, such as prolonged droughts attributed to deforestation. This aligns with IPCC (2022) which observed that deforestation exacerbates climate change effects, leading to poor agricultural productivity and food insecurity. The increased demand for tree planting reflects communities' efforts to combat these adverse impacts, illustrating a recognition of the interdependence between forest health and climate resilience.

Despite numerous interventions, adoption rates remained low, influenced by factors such as insufficient sensitization, population growth, inadequate funding, and poor timing of initiatives. These barriers echo findings from WCS (2021) and Katswera *et al.*, (2022),

highlighting the challenges of implementing effective conservation strategies in densely populated regions where land is scarce.

Respondents provided actionable suggestions for enhancing conservation outcomes, including the establishment of conservation revolving funds and increased distribution of tree seedlings. These recommendations align with successful strategies for CCA identified in the literature, suggesting that community-driven approaches can yield better conservation results (Monroe *et al.*, 2019). Continuous support for conservation activities is critical, emphasizing the need for sustained engagement from NGOs.

Preferences for conservation interventions indicated a strong inclination towards tree seedling distribution and financial support through revolving funds. However, sustainable funding remains a significant challenge, limiting the implementation of highly favored initiatives. This aligns with findings from the (Global Climate Action Pathway, 2021), which emphasizes the necessity for adequate financial resources to achieve meaningful conservation outcomes.

The statistical analyses revealed significant mean differences between occupation types and their influence on forest conservation and CCA. These findings support (Bezanson *et al.*, 2023), who argued that the occupation of forest owners plays a vital role in reducing dependency on forest resources. The reliance on alternative livelihoods can mitigate deforestation pressures, which is critical considering the (FAO, 2020) report of substantial forest loss.

The findings echo the sentiment expressed by Von Fersen *et al.*, (2024) that successful conservation must incorporate social, cultural, and economic factors influencing human populations and ecological dynamics. The complexity of these interrelations underscores the

importance of a comprehensive approach that integrates human dimensions into conservation strategies.

### **5.3 Species diversity of primates in private forests within the BBC**

The primate survey conducted in the study area documented seven species: chimpanzees (*Pan troglodytes schweinfurthii*), grey-cheeked mangabeys (*Lophocebus ugandae*), black-and-white colobus monkeys (*Colobus guereza*), red-tailed monkeys (*Cercopithecus ascanius*), blue monkeys (*Cercopithecus mitis*), vervet monkeys (*Chlorocebus tantalus*), and olive baboons (*Papio anubis*). This aligns with findings by Ayebare *et al.*, (2018), who reported the same species within the BBC. Local households, key informants, and FGDs confirmed these species' presence across the parishes. However, habitat loss and fragmentation, driven by agricultural expansion, have shifted these species' spatial distribution, with a significant decline in encounter rates (ERs) and overall abundance since 2018. For example, chimpanzee ERs dropped from 1.75 to 0.403 per km, likely due to ongoing land-use pressures and human activities. Studies (Mawa *et al.*, 2022; Reid *et al.*, 2018) confirm that habitat quality declines correlate with reduced primate densities. These results suggest that while some primates show resilience to environmental changes, sustained habitat degradation may drive population declines. The study emphasizes the urgency of adaptive conservation strategies, including habitat restoration and anti-poaching efforts, to protect primate populations in Uganda's BBC.

The survey findings across the BBC indicate a notable decline in primate populations, with species abundance and encounter rates (ERs) showing clear variations by parish. The highest number of sightings was recorded for red-tailed monkeys (371) and black-and-white colobus monkeys (281), suggesting these species are somewhat adaptable to fragmented environments. In contrast, fewer sightings were recorded for more sensitive species like

chimpanzees (6 live sightings and 38 nests) and blue monkeys (20), which may require larger, continuous forested habitats to thrive. This pattern aligns with prior findings by Abbass *et al.*, (2022), who documented these species in the BBC, though current ERs and abundances are lower due to intensified habitat fragmentation.

Kidoma parish had the highest primate ER (13.908 per km), indicating either lower disturbance levels or better habitat quality compared to other areas. Kibanjwa followed with an ER of 7.256, while Birungu and Munteme had lower ERs (6.448 and 4.261, respectively), likely reflecting higher levels of human-induced habitat loss in these areas. The overall decline in ERs and species distributions since 2010 highlights the impact of ongoing habitat fragmentation from agricultural expansion, logging, and settlement, consistent with studies by (Yahyah, 2020) and (Horwich, 2017).

This shift suggests that while some primates, such as red-tailed monkeys and colobus monkeys, may tolerate edge habitats, species like chimpanzees and blue monkeys are more vulnerable due to their specific dietary needs and range requirements. Such findings underline the urgency for conservation interventions, such as habitat restoration and the establishment of ecological corridors, to mitigate habitat loss impacts and support primate populations. These efforts are essential for maintaining biodiversity and ecological health within the BBC and addressing the pressures impacting primate populations in Uganda's forested landscapes.

The findings reveal that primate species remain in the private forests of the BBC, though their numbers and occurrences have notably declined from 428 instances in 2010 to 216 in 2022. The study confirmed the presence of blue monkeys (*Cercopithecus mitis*), though this species was not recognized by local respondents, suggesting a restricted range compared to previous findings by Abbass *et al.*, (2022).

Primary factors contributing to primate declines include deforestation for agriculture, illegal forest encroachment, poaching, and over-reliance on natural resources—a pattern seen in other studies of Ugandan forests (Bersacola *et al.*, 2023; Yahyah, 2020). Population growth and unique cultural practices add further pressure on primate habitats, intensifying habitat loss and species decline (Horwich, 2017). To counteract these impacts, conservation strategies such as habitat restoration, anti-poaching measures, and sustainable land-use practices are essential. The establishment of ecological corridors may also help sustain primate populations by maintaining connectivity across fragmented habitats (Katswera *et al.*, 2022).

The findings presented in Table 4.10 highlight critical threats to primate species and overall biodiversity, primarily driven by habitat loss due to rapid forest destruction linked to infrastructure development and increasing population pressures. This observation resonates with the work of Katswera *et al.*, (2022), who emphasized that the conservation efforts in regions with significant primate populations, such as the Kibale Conservation Area, are severely undermined by similar factors.

Another pressing issue identified is the impact of immigration, particularly from refugee populations that may possess cultural practices such as primate hunting for food. As highlighted by Kazoora *et al.*, (2019), the reduction of forest size exacerbates this threat, underscoring the urgent need for enhanced conservation measures within private forest reserves like the BBC. The challenges presented by habitat fragmentation, the bushmeat trade, and retaliatory actions from local communities further compound these issues, as documented by Horwich, (2017). Their findings suggest that conservation NGOs must prioritize community needs to effectively mitigate threats to primates.

Additionally, the study revealed an overall threat encounter rate (ER) of 1.793 threats per kilometer walked, indicating a significant prevalence of threats within the surveyed area. Notably, agricultural-related threats emerged as spatially extensive, overshadowing other types of threats (Abbass *et al.*, 2022). This aligns with the survey findings from Abbass *et al.*, (2022), which reported that 43% of the surveyed transects traversed human-modified habitats, primarily due to the conversion of forested areas for agricultural use.

Moreover, the increasing population growth and immigration driven by oil and gas infrastructure development projects are also contributing to the heightened threat levels, as articulated by McClung and Moran (2018) and Abbass *et al.*, (2022). These findings underscore the complex interplay between human activities and biodiversity conservation, indicating a pressing need for integrated conservation strategies that address both ecological and social dimensions.

The analysis of habitat statuses along the recce routes, as presented in Table 4.11, reveals significant insights into the prevailing threats to wildlife in the region. Notably, Birungu exhibited the highest number of intact habitats recorded (90), while Kibanjwa had the lowest with only 16 intact habitats. This discrepancy highlights the varied degrees of habitat preservation across different areas. Furthermore, Birungu Parish recorded the highest incidence of heavily degraded habitats (26), compared to Kibanjwa (15), Kidoma (11), and Munteme (10), emphasizing the urgent need for targeted conservation efforts in these more impacted regions.

A comparison of the status of private forests, cover, and primate abundance over the past decade indicates a troubling trend: respondents noted that primate populations were more abundant in the past than in 2022. This decline in primate numbers correlates with a significant reduction in forest cover, driven by community conversions of previously forested

lands into agricultural areas for income generation. As highlighted by Kazoora *et al.*, (2019), the conversion of forested land to agricultural practices has been fueled by rising population pressures and increased agricultural activity. This change threatens to negatively impact the nesting patterns of chimpanzees and the number and distribution of other primate species (McClung & Moran, 2018).

Findings from KIIs, FGDs, and household surveys further corroborate these trends, indicating that while primate populations and species faced threats, they remained relatively stable before 2010. Many respondents recalled a time when primates were abundant, with only a minority noting their scarcity. It was reported that seven species of primates existed in the study area before 2010, a number consistent with current observations. However, despite the corroboration of species richness within the study area, as noted by Abbass *et al.*, (2022), the abundance and spatial distribution of primates have noticeably declined.

Moreover, the fragmentation of forested areas owned by forest owners (FOs) has contributed to the reduction of viable habitats, exacerbating the challenges faced by primates. Increased threats and competing land uses have led to a decline in the number of primates that can thrive in the remaining smaller and degraded habitats, as pointed out by Horwich, (2017). This combination of factors underscores the need for urgent conservation interventions to mitigate habitat loss and promote the sustainability of primate populations in the region.

The findings presented in Table 4.11 indicate significant insights into the encounter rates (ERs) of primates relative to various habitat statuses. Notably, both black and white colobus monkeys and olive baboons were observed across all six habitat status categories, suggesting their high resilience to habitat conversion and status changes, resulting in stable populations. In contrast, red-tailed monkeys and vervet monkeys were found in five and four habitat statuses, respectively, reflecting their comparatively stable populations. Conversely, grey-

cheeked mangabeys and chimpanzees were sighted in four and three habitat status categories, respectively, indicating lower resilience and reduced population sizes (Kusiima *et al.*, 2022). Interestingly, chimpanzee nests were documented in only two habitat status categories, while blue monkeys were exclusively found in intact forests. This disparity highlights the varying degrees of habitat specificity and adaptability among different primate species.

The results further reveal that intact and slightly degraded habitats had the highest number of primate sightings, whereas destroyed and heavily degraded habitats exhibited the lowest encounter rates. This pattern underscores the importance of habitat quality and stability, as degradation and conversion to alternative land uses significantly impact primate populations. These observations align with findings from McClung and Moran (2018) and Abbass *et al.*, (2022), which stress the specific reactions of primate species to habitat changes, particularly in intact and stable environments.

In terms of overall encounter rates, the study recorded a combined ER of 0.403 live chimpanzees and chimp nests per kilometer walked (Table 4.20). Of this, chimp nests accounted for 0.348, while live chimpanzees represented 0.055 per kilometer walked. Notably, live chimpanzees were sighted in three parishes: Kibanjwa (2), Kidoma (1), and Munteme (3), with no sightings recorded in Birungu parish (Table 4.19). These findings further emphasize the spatial distribution of chimpanzees and the need for habitat conservation efforts, particularly in areas where they are less frequently encountered.

The calculations of the Shannon-Wiener diversity indices presented in Appendix 2 reveal important insights into primate diversity across various parishes, highlighting significant ecological patterns. Kidoma parish ranked highest in diversity ( $H' = 1.64$ ), likely influenced by its proximity to the Bugoma Central Forest Reserve and the Wambabya Forest Reserve, which provide essential habitat connectivity (Abbass *et al.*, 2022). The high diversity and

encounter rates (ERs) in Kidoma can also be attributed to the active conservation efforts by organizations such as the Jane Goodall Institute (JGI), Wildlife Conservation Society (WCS), Flora and Fauna International (FFI), and ECOTRUST. Notably, ECOTRUST's acquisition of riverine forest land in Kidoma contributes to the increasing diversity and the notable ER of 13.908 primates per kilometer walked (Twongyirwe *et al.*, 2018).

In terms of diversity ranking, Munteme ( $H' = 1.48$ ), Birungu ( $H' = 1.218$ ), and Kibanjwa ( $H' = 1.106$ ) follow Kidoma. Interestingly, despite its lower distance walked (11.5 km), Munteme emerged as second in diversity ranking. However, it recorded the lowest ER (4.261), likely due to its proximity to the Hoima sugar factory, where out-grower schemes threaten primate habitats by converting natural landscapes into monoculture sugarcane plantations (McClung & Moran, 2018; Sher, 2022). Despite these threats, Munteme contains the largest remaining forest habitat, which still supports a significant number of primate species.

The reduced primate diversity in Birungu and Kibanjwa, indicated by their lower Shannon-Wiener indices, can be linked to various threats encountered during the survey, quantified as 2.678 and 2.030 threat encounters per kilometer walked, respectively (Horwich, 2017). Notably, Kidoma and Munteme exhibited the lowest threat ERs, at 1.012 and 0.783, respectively, further supporting the relationship between habitat quality and biodiversity (Mwanjalolo *et al.*, 2018).

The principle that increases in species richness or evenness enhance diversity is particularly relevant here. As biologists assert, while high species richness contributes positively to biodiversity and ecosystem functions, disparities in species distribution—where a few species dominate—can diminish overall diversity (Frontiers in Plant Science, 2023). This pattern was evident in Birungu ( $H' = 1.218$ ) and Kibanjwa ( $H' = 1.106$ ), reflecting ongoing conservation challenges that necessitate targeted intervention strategies (Sher, 2022).

The distribution of primate species across the study area (Table 4.9) provides further context to these findings. For instance, the grey-cheeked mangabey population was predominantly located in Kidoma parish (75%), while black and white colobus monkeys were also most frequently observed in this area (43.8%). Other species, such as blue monkeys and olive baboons, showed varied distributions, with olive baboons being most prevalent in Kidoma (88.2%) and Muntele (11.8%). The data on chimpanzee nests indicated a significant presence in Kibanjwa (23.9%) and Kidoma (52.4%) (McClung & Moran, 2018).

Lastly, results from Tables 4.13 and 4.14 indicate no statistically significant mean differences between parishes and primate species groups at the 5% level of significance (Twongyirwe *et al.*, 2018). This finding emphasizes the need for further research to explore underlying factors influencing primate diversity and distribution in these areas, as current conservation strategies may need to adapt to the specific ecological dynamics observed.

#### **5.4 Private FOs' attitudes and perceptions towards primate conservation in private forests.**

The attitudes and perceptions of local conservation stakeholders are critical for the success of conservation interventions. Engaging community members and forest owners (FOs) in the design and implementation of conservation strategies is essential for achieving effective outcomes (Armitage *et al.*, 2020). Findings indicate that a significant majority of FOs (59.6%) value primate conservation, reflecting a positive shift in attitudes driven by enhanced conservation efforts (Zimmermann *et al.*, 2020). This change highlights the effectiveness of targeted conservation initiatives in fostering community support for wildlife preservation (Global Wildlife Program, 2023). However, further behavioral changes are necessary to promote sustainable agricultural practices and resilience against climate change. Encouraging

the cultivation of early-maturing crops and protecting private forests are critical strategies for aligning community livelihoods with conservation goals (Zimmermann *et al.*, 2020).

The findings indicate that most forest owners (FOs) have received regular visits from conservation staff, primarily aimed at monitoring conservation activities. This consistent engagement contributes to a strong recognition of the importance of primate conservation among 59.6% of respondents. These results align with Juniyanti *et al.* (2021), who emphasize the role of increased support and awareness in fostering sustainable livelihoods around PAs and local communities. Moreover, the satisfactory relationship between FOs and conservation institution staff stems from collaborative efforts in conserving natural resources and raising awareness about the value of primates and forest ecosystems (Rahman *et al.*, 2017). However, challenges persist, including unfulfilled promises, limited involvement of various stakeholders—particularly youth—and inadequate community development initiatives.

Engaging FOs in the design and implementation of conservation interventions is critical for improving these relationships and enhancing outcomes. Effective sensitization and information sharing regarding the benefits of forest conservation are also essential for fostering community understanding and support (Kolinski & Milich, 2021). By prioritizing active engagement and participation in project design, conservation initiatives can effectively address and mitigate forest stressors, ultimately leading to more successful outcomes (FAO, 2019).

The findings from Figure 4.14 highlight that the most significant benefit derived from healthy forests, as identified by local stakeholders, is firewood collection. This benefit surpasses other potential advantages such as wildlife conservation, climate modification, water catchment protection, and the provision of medicinal plants. These results underscore the necessity of enhancing these benefits, as any threats to forest ecosystems can have

detrimental effects on both human welfare and biodiversity (Brown, 2022). The benefits of forest conservation are aligned with global biodiversity frameworks, including the UN Decade on Ecosystem Restoration (2021-2030) (FAO & UNEP, 2021) and the new Global Biodiversity Framework (GBF).

This perspective is supported by (Metzger *et al.*, 2019), who emphasize the importance of conservation corridors for forest restoration based on the ecological benefits they offer. Specifically, forest conservation plays a vital role in mitigating climate change through various mechanisms: Forests absorb and store carbon, thereby reducing atmospheric carbon levels and combating global warming (WRI, 2022); Riverine forests facilitate rainfall formation and protect water sources, acting as natural filters to purify water; Forests contribute to the creation of fresh air and help in microclimate stabilization; They serve as windbreaks and reduce soil erosion caused by climate change effects, such as droughts; Forests regenerate biomass, providing sustainable wood fuel; and Forests yield herbs and medicinal plants used in research and in mitigating health issues related to climate change, including the spread of diseases and pests (Abbass *et al.*, 2022).

Conversely, the findings also illuminate challenges associated with private forest conservation, notably human-wildlife conflicts (HWCs). These conflicts often manifest as property damage and crop loss due to wildlife interactions, as depicted in Figure 4.15. Additional challenges include disease transmission from wildlife to livestock and humans, loss of livelihoods, and restrictions on accessing traditional resources. The hostility exhibited by conservation agents further complicates these dynamics (Kolinski & Milich, 2021) WCS, (2021).

The occurrence of HWCs in the BBC was noted to be frequent, with events happening bi-annually and monthly, directly impacting local communities' attitudes toward conservation

and CCA strategies (Kolinski & Milich, 2021; Lemma *et al.*, 2022). As one conservation NGO representative articulated on 20<sup>th</sup> April 2023, “As conservation NGOs, we are working with the forest-neighboring communities to improve their livelihoods and address HWCs through the projects we implement.” This proactive approach aims to shift community attitudes from negative to positive regarding forest conservation.

Figure 4.16 illustrates the significant involvement of local community members and Forest Owners (FOs) in the development of conservation projects, underscoring the importance of stakeholder participation in designing interventions that effectively address local needs. This participatory approach aligns with the findings of ECOLIFE (2023), which emphasize that engaging local stakeholders is crucial for ensuring that conservation projects are relevant and effective. As one representative from a conservation NGO stated on 19<sup>th</sup> April 2023, “The design of our interventions is consultative through ‘design workshops,’ where issues are identified and potential pathways to desired scenarios discussed, proposed and adopted for utilization.” This consultative process enhances community ownership and fosters a sense of responsibility towards conservation initiatives.

Members of the Private Forest Owners Association (PFOA) actively participate in various conservation activities, including attending meetings and engaging in community initiatives such as nursery bed management and tree planting. The active involvement of FOs demonstrates a collaborative approach to conservation, which is critical for building trust and ensuring that local perspectives are incorporated into project planning. This multifaceted engagement strategy resonates with the observations made by ECOLIFE (2023) and highlights the positive impact of community involvement on conservation outcomes.

Table 4.14 indicates that the conservation approaches employed by NGOs have positively influenced respondents’ attitudes and perceptions towards the conservation of primates and

private forests, as well as CCA. Key factors contributing to this shift include an enhanced understanding of the values associated with forests and primates, strategies for coexistence with wildlife, and economic benefits from sustainable practices. However, some respondents pointed to unfulfilled promises as a significant barrier to maintaining positive attitudes towards conservation. These findings are consistent with those of Guibinga Mickala *et al.*, (2021), who noted that conservation efforts often concentrate in resource-rich areas, neglecting adjacent regions that pose challenges to conservation success.

Guibinga Mickala *et al.*, (2021) further assert that conservation NGOs typically focus their initiatives on areas with existing forest cover rather than those without. As a result, FOs in forested regions receive more support through conservation-related projects compared to nearby farmers without forest resources. This disparity leads to a higher level of participation and engagement in areas with private forests, where community members benefit from initiatives such as free tree seedlings, conservation farming training, livelihood enhancement programs, and beekeeping projects (Zimmermann *et al.*, 2020). Such targeted support is likely to cultivate a more favorable attitude toward conservation among these communities.

Interviews with key informants highlighted the active participation of community members in various research initiatives. These studies addressed governance of natural resources, market potential for forest products, human-wildlife conflict (HWC), the impacts of crop raiding near the Bugoma forest boundary, and the adaptive behavior and ecology of chimpanzees within fragmented habitats, as emphasized by Zimmermann *et al.*, (2020). The integration of research findings into conservation practices enhances the effectiveness of interventions and promotes community buy-in, ultimately supporting sustainable forest management.

Table 4.15 presents a rating of local community involvement in conservation activities, revealing that while communities are somewhat engaged in decision-making processes, they

are not yet highly involved. The activities contributing to this rating include tree planting, beekeeping, forming business savings groups, livestock rearing, and participating in Private Forest Owners Associations (PFOAs). This level of involvement aligns with the findings of Kazoora *et al.*, (2019) and Juniyanti *et al.*, (2021), who highlighted that local community engagement in conservation activities is crucial for addressing challenges such as deforestation, habitat fragmentation, and unsustainable resource use, all of which contribute to biodiversity loss.

Communities play a vital role in the conservation of private forests, as evidenced by their contributions to security for conservation initiatives, adherence to conservation laws and guidelines, and their active participation in the planning and implementation of conservation strategies. They provide land for conservation efforts, care for tree seedlings and nursery beds, and contribute valuable information related to conservation practices. The sustainable engagement of all stakeholders, alongside attendance at conservation meetings, further strengthens these initiatives. These findings echo the work of Rahman *et al.*, (2017), who emphasize that the co-management and community involvement are critical components for effective conservation, particularly in developing countries. Moreover, the involvement of local communities enhances their attitudes and perceptions towards the conservation of corridors and modified habitats, as supported by Dhliwayo *et al.*, (2023). This indicates that when communities feel empowered and engaged in conservation efforts, it fosters a positive relationship with the environment, ultimately aiding in the preservation of biodiversity.

In terms of prioritization, the implementation of conservation initiatives predominantly targets areas where forests can deliver rapid impacts in forest cover restoration and biodiversity conservation. As noted by Abbass *et al.*, (2022), communities possessing forests typically experience favorable climatic conditions, such as increased rainfall and the

availability of medicinal herbs, which are essential for both human and animal health (Mensah *et al.*, 2019; Navia *et al.*, 2022). A key informant from a Private Forest Owners Association (PFOA) emphasized the need for conservation organizations and district authorities to prioritize the connectivity of corridor forests and manage the ecosystems surrounding wildlife habitats, riverine forests, and associated wetlands through comprehensive restoration and environmental management planning.

The major drivers of biodiversity loss in private forests are multifaceted, with the lack of coherence among land-use policies being a significant concern, as echoed by the FAO and UNEP, (2021). The competing interests and poor governance of resources exacerbate this issue (Kazoora *et al.*, 2019). Agricultural expansion and commercial projects are replacing forested areas, as all respondent categories confirmed. Furthermore, activities such as charcoal production, timber extraction, and the conversion of forests to agricultural land contribute to the degradation of these ecosystems (Juniyanti *et al.*, 2021). Deforestation, habitat fragmentation due to infrastructure development, irresponsible consumption, and the pervasive issue of poverty are critical factors undermining biodiversity (Kusiima *et al.*, 2022). However, despite these threats, key informants, household surveys, and focus group discussions underscore the immense value of private forests, corroborating findings by Metzger *et al.*, (2019).

To effectively address private forest conservation amid climate stressors, conservation NGOs and institutions must provide adequate tree seedlings to interested farmers on time each planting season. This initiative should be complemented by awareness-raising campaigns focusing on climate change stressors, their effects, and mitigation strategies, including the promotion of climate-smart agriculture (FAO, 2019). Additionally, implementing Payment

for Ecosystem Services (PES) through carbon financing could incentivize sustainable practices.

Statistical analysis revealed a significant negative relationship between gender and community contributions to forest and primate conservation, indicating that males are less inclined to participate, likely due to economic motivations related to harvesting forest products like charcoal and timber. These findings align with FSC (2023), which highlight that cultural values and economic needs significantly influence forest harvesting practices. Conversely, there was a statistically significant positive correlation between occupation and the perceived importance of primate conservation, suggesting that farming occupations are more supportive of conservation efforts than other professions. This observation is consistent with Setchell *et al's* (2017) research on people-primate interactions, which identified socio-ecological factors shaping the coexistence between humans and primates, indicating that certain primate species can effectively share habitats with agricultural communities.

## **CHAPTER SIX: SUMMARY OF THE FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

### **6.1 Introduction**

This chapter provides a comprehensive summary of the study's findings, conclusions, and recommendations. The findings detailed in Chapter Four are synthesized and explicitly linked to the study's objectives. The conclusions drawn reflect the overall insights gained from the research, while the recommendations are formulated based on these findings.

### **6.2 Summary of the Findings**

The study profiles forest owners (FOs) in the BBC and examines the socio-economic factors influencing conservation and CCA strategies. Most FOs interviewed were male, aged 46 and above, married, and primarily engaged in farming, with a majority having lived in the area for over 25 years. Descriptive statistics reveal a trend of increasing smaller forest patches (1-2 acres) while larger plots (11 acres or more) declined, indicating pressure on larger forest areas due to land use changes and population growth. Tree planting emerged as the primary CCA strategy, supported by conservation NGOs through initiatives like the Trees for Global Benefit program. FOs ranked primate conservation as important, influenced by socio-economic factors. ANOVA tests showed significant differences between background characteristics and preferred conservation interventions. Pearson correlation analysis revealed a negative relationship between male gender and community contributions to primate conservation, while farming occupation positively correlated with conservation importance. Despite a relatively even distribution of primate sightings across parishes, the findings underscore the significance of socio-demographic factors in shaping attitudes toward conservation.

### 6.3 Conclusions

The study employed both quantitative and qualitative methods to explore the conservation of primates and the CCA strategies utilized by forest owners (FOs) in the BBC. The findings provide valuable insights into the dynamics of forest conservation, species diversity, and the socio-economic factors influencing conservation attitudes among private forest owners.

- Tree planting is the most favored CCA strategy among FOs in the BBC. There are benefits of tree planting in promoting rainfall formation and enhancing soil fertility, which in turn supports agricultural productivity. Such insights underscore the importance of engaging FOs and adjacent communities in the planning and implementation of conservation interventions. Collaborative approaches that facilitate the exchange of ideas are essential for the successful integration of conservation efforts into local practices.
- Despite the various habitat threats faced by the BBC private forests, including degradation and loss of forest cover, seven primate species continue to inhabit private forest areas. This resilience amid significant challenges underscores the need for intensified conservation efforts to protect these vital habitats.
- While FOs generally exhibit positive attitudes towards primate conservation, the study identified a concerning trend of declining forest size and cover. This decline is largely driven by population growth and competing land uses that hinder forest regeneration, despite ongoing conservation efforts from NGOs. Encouragingly, increased tree planting can enhance the status and size of private forests, improving habitats for primate species and facilitating the BBC's vital biodiversity conservation functions.

## 6.5 Recommendations from the study

Based on the findings and discussions, actionable recommendations are proposed per objective to enhance the conservation of primates in private forests and improve CCA strategies in the BBC.

- **Enhance forest conservation and climate change adaptation strategies:** To enhance forest conservation and climate change adaptation strategies, it is essential to implement community-based programs that promote collaboration and knowledge sharing among forest owners (FOs) and adjacent communities. Regular training sessions should be organized to educate participants on the ecological benefits of tree planting, sustainable land management, and the importance of maintaining forest cover for climate resilience. Additionally, establishing community-led tree nurseries will ensure a sustainable supply of native tree seedlings and foster a sense of ownership among community members, ultimately enhancing the effectiveness of CCA strategies and promoting long-term conservation practices.
- **Strengthen primate species monitoring and conservation efforts:** To strengthen primate conservation in the BBC, it is essential to establish comprehensive monitoring programs that regularly assess primate populations and their habitats. Additionally, conservation NGOs must prioritize educational initiatives that emphasize the ecological importance of primate biodiversity, encouraging private forest owners to adopt practices that preserve habitats and enhance species diversity. By integrating local knowledge and fostering community involvement, targeted conservation interventions can effectively address specific threats, such as habitat degradation and human-wildlife conflict, ensuring adaptive and responsive conservation strategies.

- **Improve awareness and attitudes towards primate conservation:** To enhance awareness and improve attitudes towards primate conservation among forest owners (FOs), it is essential to implement targeted awareness campaigns. These campaigns should emphasize the long-term ecological and economic benefits of primate conservation, illustrating how healthy forests support sustainable farming practices and enhance livelihoods through ecosystem services. Additionally, promoting gender-inclusive approaches will engage both men and women, acknowledging their distinct roles in resource management. To further incentivize positive attitudes, encouraging FOs to actively participate in conservation efforts that protect primate habitats should be done.
- **Facilitate sustainable livelihood alternatives:** To reduce pressure on forest resources and enhance conservation efforts, it is vital to provide training and resources for alternative livelihoods that are less reliant on forest exploitation. Programs that promote climate-smart agriculture, eco-tourism, and sustainable harvesting of non-timber forest products can diversify income sources for FOs. Additionally, access to microfinance and support for small-scale enterprises can empower communities to adopt sustainable practices while maintaining their economic stability.

## **6.6 Problems encountered during the study**

One significant challenge faced during this study was the lack of adequate funding, which impacted the budget (see Appendix 9) and resulted in delays to the original timeline (see Appendix 8). Additionally, the private forest owners (PFOs) within the BBC have had numerous interactions with various researchers but have often seen little follow-through on the full-scale implementation of piloted conservation initiatives. As a result, some respondents were hesitant to provide information regarding forest size and status, perceiving researchers as representatives of the same conservation NGOs with whom they had previous

interactions. To address this issue, the researcher reassured the respondents that the study was purely academic and read and interpreted introductory letters to them, clarifying the study's objectives and intentions.

### **6.7 Recommendations for further research**

Based on the findings and challenges encountered in this study, several areas for further research in the BBC are recommended. First, investigate how climate change is altering species distribution within the BBC, focusing on the implications for biodiversity and ecosystem balance. Second, study primate behavior in response to environmental changes and identify effective management strategies to mitigate potential negative effects. Third, analyze food tree species that support primate populations, exploring their abundance and distribution. Additionally, examines the socio-economic implications of chimpanzee conservation for local communities, particularly in aligning conservation efforts with community development goals. Evaluate the ecological health of private forests, assessing biodiversity and habitat integrity. Finally, explores conservation and private forest management through a gender lens, analyzing how gender roles influence conservation outcomes.

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## APPENDICES

### APPENDIX 1: POST HOC SHOWING MULTIPLE COMPARISONS BETWEEN OCCUPATION OF RESPONDENTS AND CCA STRATEGIES USING TUKEY HSD

Multiple Comparisons						
Occupation LSD						
(I) Most preferred Climate change adaptation strategies by FO	(J) Most preferred climate change adaptation strategies	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Tree planting	Conservation farming and climate Smart Agriculture	-0.3	0.41	0.50	-1.1	0.54
	Conservation meetings and workshops	-1.1	0.87	0.20	-2.8	0.65
	Environmental conservation association	1.6	0.5	0.00	0.7	2.5
Conservation farming & climate Smart Agriculture	Tree planting	0.25	0.4	0.50	-0.5	1.1
	Conservation meetings and workshops	-0.8	0.9	0.40	-2.7	1.1
	Environmental conservation association	1.87	0.6	0.00	0.7	3
Conservation meetings and workshops	Tree planting	1.05	0.9	0.20	-0.7	2.8
	Conservation farming and climate Smart Agriculture	0.8	0.9	0.4	-1.1	2.7
	Environmental conservation association	2.67	0.96	0.00	0.8	4.7
Environmental conservation association	Tree planting	-1.6	0.5	0.00	-2.5	-0.7
	Conservation farming and climate Smart Agriculture	-1.87	0.6	0.00	-3	-0.7
	Conservation meetings and workshops	-2.67	0.9	0.00	-4.6	-0.8

\*. The mean difference is significant at the 0.05 level.

**APPENDIX 2: SHANNON-WIENER DIVERSITY INDICES OF PRIMATE SPECIES**

**ENCOUNTERED PER PARISH**

<b>Parish</b>	<b>Primates Species</b>	<b># Found</b>	<b>Pi</b>	<b>Ln pi</b>	<b>Pi lnpi</b>
Birungu	Red-tailed monkeys	98	0.415	-0.879	-0.365
	Black & white colobus	97	0.411	-0.889	-0.365
	Olive baboons	0	0	0	0
	Vervet monkeys	26	0.11	-2.206	-0.243
	Chimpanzees & signs (nests)	4	0.017	-4.078	-0.069
	Grey cheeked mangabeys	5	0.021	-3.854	-0.082
	Blue monkeys	6	0.025	-3.672	-0.093
	Sum	236	1		-1.218
	H'				1.218
Kibanjwa	Red-tailed monkeys	103	0.534	-0.628	-0.335
	Black & white colobus	57	0.295	-1.22	-0.36
	Olive baboons	0	0	0	0
	Vervet monkeys	22	0.114	-2.172	-0.248
	Chimpanzees & signs	11	0.057	-2.865	-0.163
	Grey cheeked mangabeys	0	0	0	0
	Blue monkeys	0	0	0	0
	Sum	193	1		-1.106
	H'				1.106
Kidoma	Red-tailed monkeys	161	0.333	-1.101	-0.366
	Black & white colobus	114	0.236	-1.446	-0.341
	Olive baboons	104	0.215	-1.538	-0.33
	Vervet monkeys	49	0.101	-2.29	-0.232
	Chimpanzees & signs (nests)	22	0.045	-3.091	-0.141
	Grey cheeked mangabeys	20	0.041	-3.186	-0.132
	Blue monkeys	14	0.029	-3.543	-0.102
	Sum	484	1		-1.644
	H'				1.644
Munteme	Red-tailed monkeys	9	0.184	-1.695	-0.311
	Black & white colobus	13	0.265	-1.327	-0.352
	Olive baboons	17	0.347	-1.059	-0.367
	Vervet monkeys	3	0.061	-2.793	-0.171
	Chimpanzees & signs (nests)	7	0.143	-1.946	-0.278
	Grey cheeked mangabeys	0	0	0	0
	Blue monkeys	0	0	0	0
	Sum	49	1		-1.48
	H'				1.48

**Source:** Field data, 2023

**APPENDIX 3: POST HOC OF MULTIPLE COMPARISONS BETWEEN PARISHES  
AND PRIMATE SPECIES USING LSD AND TAMHANE**

	(I) Parish_A	(J) Parish_A	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
LSD	Birungu	Kibanjwe	-.833	.538	0.123	-1.89	.23
		Kidoma	-.357	.452	0.430	-1.25	.53
		Munteme	-.533	.824	0.519	-2.16	1.09
	Kibanjwe	Birungu	.833	.538	0.123	-.23	1.89
		Kidoma	.476	.464	0.307	-.44	1.39
		Munteme	.300	.831	0.719	-1.34	1.94
	Kidoma	Birungu	.357	.452	0.430	-.53	1.25
		Kibanjwe	-.476	.464	0.307	-1.39	.44
		Munteme	-.176	.779	.822	-1.71	1.36
	Munteme	Birungu	.533	.824	.519	-1.09	2.16
		Kibanjwe	-.300	.831	.719	-1.94	1.34
		Kidoma	.176	.779	.822	-1.36	1.71
Tamhane	Birungu	Kibanjwe	-.833	.560	.599	-2.25	.68
		Kidoma	-.357	.484	.976	-1.67	.96
		Munteme	-.533	.769	.984	-2.81	1.75
	Kibanjwe	Birungu	.833	.560	.599	-.68	2.25
		Kidoma	.476	.449	.875	-.74	1.69
		Munteme	.300	.747	.999	-1.95	2.55
	Kidoma	Birungu	.357	.484	.976	-.96	1.67
		Kibanjwe	-.476	.449	.875	-1.69	.74
		Munteme	-.176	.692	1.000	-2.26	2.00
	Munteme	Birungu	.533	.769	.984	-1.75	2.81
		Kibanjwe	-.300	.747	.999	-2.55	1.95
		Kidoma	.176	.692	1.000	-2.00	2.26

Source: Field data, 2023

## APPENDIX 4: FOREST OWNERS' SURVEY QUESTIONNAIRE

I am Abowe Daniel, an MSc student of Kyambogo University. I am carrying out research as a partial fulfilment of a Master of Conservation and Natural Resources Management of Kyambogo University. This questionnaire has been developed to collect data for a research study aimed at assessing strategies used by NGOs in the Budongo-Bugoma Corridor (BBC) that contribute to primates' conservation and climate change adaptation. The research is purely academic and is being carried out in 4 parishes which are part of the BBC. The four parishes are Kibanjwa and Birungu located in Kitoba Sub County in Hoima district and Kidoma and Munteme parishes located in Kiziranfumbi Sub County, Kikuube district. The research is aimed at ascertaining private forest conservation approaches preferred by FOs in the area. The research will also determine primate species presence and diversity in the four parishes. You are kindly asked to participate in the study. The information you provide is strictly confidential and your details will remain anonymous and protected.

Thank you for your participation.

Name of your Private Forest Owners'

Association \_\_\_\_\_

### 1. Background Information

#### 1.1. Gender

1. Male		2. Female	
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#### 1.2. Age of respondent.

1. 18-25 years	2. 26-35 years	3. 36-45 years	4. 46-55 years	5. 56-65 years	6. >65 years
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#### 1.3. Highest level of education attained.

1. No formal education		5. A' Level (Form 5-6)	
2. Lower Primary (Std 1-4)		6. Certificate	
3. Upper Primary (Std 5-7)		7. Diploma	
4. O' Level (Form 1-4)		8. Degree	

#### 1.4. Marital status.

1. Single	2. Married	3. Separated	4. Divorced	5. Widowed
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#### 1.5. Occupation.

1. Unemployed		5. Civil servant	
2. Labourer (casual worker)		6. Farmer	
3. Domestic		7. Retired/Pensioner	
4. Business owner		8. Other (specify)	

#### 1.6. Number of people living in your household.

1-2		3-4		5-6		7-8		9-10		>10	
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1.7. Sources of monthly income.

1. Pensions		4. Farm-harvest	
2. Remittances		5. Grants	
3. Wages/Salary		6. Other (specify)	

1.8. For how long have you been living in this area?

1. > 5 year		4. 16-20 years	
2. 6-10 years		5. 21-25 years	
3. 11-15 years		6. >25 years	

1.9. Type of house owned.

1. Own formal house		4. Formal farmhouse	
2. Own traditional hut		5. Employer provided house	
3. Shack/informal residence		Any other (Specify	

1.10. Main sources of domestic water.

1. Piped tap water on site		4. Flowing stream/river	
2. Bore-hole communal on site		5. Well/Spring communal on site	
3. Rainwater tank on site		6. Dam/pool on site	

1.11. Distance to the nearest water source. \_\_\_\_\_ km/m

1.12. Main sources of energy/fuel for your household.

1. Electricity from public supply		5. Lantern	
2. Gas		6. Candles	
3. Paraffin		7. Solar	
4. Wood fuel		8. Other (specify)	

**2. Land Ownership, Forest Size and Use**

2.1. What is the size of the land currently occupied by your household?

\_\_\_\_\_ Acres

2.2 Size of your forest currently

\_\_\_\_\_ Acres

2.2.1 Size of your forest before 2010 \_\_\_\_\_ Acres

2.2. Type of land ownership

1. Private (with a title - freehold)		3. Communal	
2. Private (without a title – customary)		4. Leasehold – tenancy	
5. Mailo		5. Other (Specify)	

2.4. Select and tick yes or no for resources you get from your private forest

Resource use	Yes	No	Resource use	Yes	No
Grazing	1	2	Wood collection	1	2
Recreation	1	2	Watering/Irrigation	1	2
Food gathering	1	2	Cultural/Social activities	1	2

Hunting	1	2	Other (Specify)	1	2
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### 3. Forest conservation and climate change adaptation strategies

3.1. Tick against all forest conservation and CCA strategies used by conservation NGOs which you or a member of your household has participated in.

1. Conservation Farming		8. Tree planting	
2. Bee Keeping		9. Business Saving Groups	
3. PES		10. Livestock rearing	
4. Trees for Global Benefit (T4GB) – Purchase of riverine forested lands		11. TIST - International Tree Planting Program	
5. Forest Monitoring		12. Conservation Meetings	
6. Conservation research		13. Conservation pledging	
7. Conservation awareness		14. Sensitization	
15. Incentivizing Conservation (REDD+)		Others (specify)	

3.2. What traditional natural resource management practices existed in the BBC before the intervention of conservation NGOs?

\_\_\_\_\_

3.3. Mention any specific CCA strategies that you or a member of your household has participated in

\_\_\_\_\_

3.4. Do you or any of your household members work for any Conservation NGO or has any member of your household ever worked for a conservation organization or institution?

1. Yes		2. No	
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3.4.1. If yes, select the type of job he/she was employed

1. Permanent		2. Seasonal		3. Casual	
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3.5. Do you think the introduction of conservation interventions has positively changed the state of private forests and primate species in the BBC?

1. Yes		2. No		3. Don't know	
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3.5.1. Please explain your choice above

\_\_\_\_\_

3.6. Do the conservation NGOs support any conservation related development initiatives?

1. Yes		2. No		3. Don't know	
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3.6.1. If yes, what type/s of development initiatives?

1. Educational		5. Housing	
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2. Health		6. Water provision	
3. Job creation		7. Tree farming	
4. Infrastructure		8. Other (specify)	

3.6.2. If no, what developments would you like to see initiated by conservation NGOs in your area?

3.7. Why do you think adaptation to proposed forest conservation and CCA initiatives has remained low in the BBC? \_\_\_\_\_

3.8. What do you think should be done to ensure that the conservation of private forests and wildlife within yields the required results?

3.9. Suggest any four interventions which you think once implemented will be adopted and yield conservation objectives in the area

#### 4. Private FOs' attitudes and perceptions towards forests and primate conservation

4.1. Is primates' conservation important to your area?

Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
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4.2. Has anyone from conservation NGOs visited your household?

1. Yes		2. No	
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4.2.1 If yes, how often?

Daily		Weekly		Monthly		Bi-annually		Annually	
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4.2.2 From above, what was the purpose of the visit?

1. To create awareness		5. To implement conservation projects	
2. To help with village projects		6. To monitor project activities	
3. To carry out research		To guide conservation programs	
4. To assess forest status		8. Other (specify)	

4.3. How would you describe your relationship between FOs and conservation NGOs?

1. Excellent		4. Satisfactory		5. Poor	
2. Very good		3. Good		6. Very poor	

4.3.1. Give a reason for your choice of the answer above?

4.4. What are the benefits of having healthy private forests within your land?

1. Conserving wildlife		6. Water catchment protection	
2. Get game meat		7. Building materials – timber	
3. Get firewood		8. Source of medicinal plants	
4. Business opportunities		9. Pollination of plants	
5. Climate modification		10. Other (specify)	

4.5. What are the likely problems/challenges of conserving private forests in the BBC?

1. Restrictions on access to and use of traditional resources	
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2. Loss of land and livelihoods	
3. Damage of property and crops by wildlife	
4. Human harassment by wildlife	
5. Disease transmission from wildlife to livestock and people	
6. Hostility and harassment by conservation agents	
7. Other (specify)	

4.6. Are there some cases of HWC originating from wildlife in private forests?

1. Yes		2. No		3. Don't know	
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4.6.1. If yes, how often?

Daily		Weekly		Monthly		Bi-annually		Annually	
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4.7. Have you or anyone you know ever participated in the development of a conservation project that was later implemented in your area by NGOs?

1. Yes		2. No		3. Don't know	
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4.8. Do you think the conservation approaches used by NGOs have changed your attitude towards the conservation of primates and forests?

1. Yes		2. No		3. Don't know	
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4.8.1. Please explain your answer above \_\_\_\_\_

**5. Species diversity of primates that are present in the privately owned forests**

5.1 What was the state of primate species in the area before the initiation of conservation interventions by conservation NGOs?

Extinct	Threatened	Scarce	Rare	Abundant
1	2	3	4	5

5.1.1. Name any primate species that existed in this area before 2010

\_\_\_\_\_

5.1.2. Which of the above-mentioned primate species are still existing in this area

\_\_\_\_\_

5.1.3 Do you think there is a decline in primate species number and abundance in the BBC?

1. Yes		2. No		3. Don't know	
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5.2. Do you think the decline in primate species is because of threats by people?

1. Yes		2. No		3. Don't know	
--------	--	-------	--	---------------	--

5.2.1. If yes, what in your opinion are the characteristics of people responsible for the decline of primate species?

1. None		5. Over-reliance on natural resources	
2. Illegal encroachments		6. Unique cultural activities	
3. People increasing population		7. Reliance on agriculture	
4. Poaching of wildlife		8. Other (specify)	

5.2.2. If no, what do you think were the circumstances that led to the decline of primate species visible in this area?

\_\_\_\_\_

5.3. How effective are the conservation measures of private forests and primates in the BBC?

1. Excellent		2. Very good		3. Good		4. Bad		5. Very bad	
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5.4. To what extent are the local communities involved in the activities, decision-making and management of private forests in the BBC?

1. Not Involved		1. Involved	
2. Somewhat involved		3. Highly involved	

5.4.1. Please explain the reasons for the choice of your answer above.

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5.5. List ways in which you think the community can contribute towards promoting forest conservation

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## **APPENDIX 5: FOCUS GROUP DISCUSSIONS GUIDE**

1. What forest conservation activities have NGOs implemented in your area?
2. How would you describe your understanding of climate change?
3. Have you observed any effects of climate change in your area? If so, what are they?
4. What specific interventions or initiatives have conservation NGOs implemented to address climate change effects?
5. Are community members, particularly forest owners (FOs), involved in designing the interventions that conservation NGOs implement in your area? If yes, how?
6. In what ways does forest conservation help mitigate the effects of climate change?
7. How are conservation NGOs addressing forest stressors in the design of their interventions?
8. Were there any primate species inhabiting private forests in this area 20 years ago? If so, please mention the species you remember.
9. Are there any primate species currently inhabiting private forests in this area? If so, please name the species you know.
10. How does the level of forest conservation initiative implementation differ between areas with forests and those without forests?
11. What do you think are the main causes of forest loss in the Budongo-Bugoma Corridor (BBC)?
12. Which forest conservation approaches do you believe should be promoted in the BBC to achieve the best results?
13. Of the conservation approaches mentioned, which do you think are the most effective?
14. What are your thoughts on the status and changes in private forest cover over the past decade?

## **APPENDIX 6: KEY INFORMANT INTERVIEW GUIDE**

1. Could you name the forest conservation approaches that your organization has implemented in the Budongo-Bugoma Corridor (BBC)?
2. Among the forest conservation approaches you mentioned, which have been the most successful?
3. Can you share your experience with climate change mitigation on the BBC?
4. What steps is your organization taking to address climate change stressors in the design and implementation of its interventions?
5. Has your organization implemented specific strategies to combat the effects of climate change? If so, what are these strategies? Please identify the top two strategies in order of effectiveness.
6. What other CCA strategies are being implemented by conservation partners in the BBC?
7. How are community members, particularly forest owners (FOs), involved in the design of your organization's interventions in the BBC?
8. In your view, what are the primary causes of biodiversity loss in the BBC?
9. Could you mention any specific efforts aimed at conserving forests in the BBC?
10. Based on your observations over the past decade, how has forest cover changed in your areas of intervention? Has it been increasing or decreasing?
11. How have your organization's efforts helped prepare communities to adapt to climate change?
12. Could you identify any primate species that still inhabit the BBC?
13. What are the main threats to primate species and biodiversity in the BBC?
14. What factors inform the level of conservation effort your organization applies in the BBC? Are there specific areas you prioritize, and what determines this prioritization?
15. Have you been involved in any conservation research within the BBC? If so, what was the focus of the research?
16. Do you recommend any areas for further research on forest and primate conservation on private lands within the BBC? If so, please outline these areas.
17. How do your conservation interventions contribute to biodiversity conservation and climate change adaptation (CCA) in the BBC?

**APPENDIX 7: PRIMATES SPECIES SURVEY FORM**

Observer's name:

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District:

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Sub County:

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Parish:

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Date	Recce number	Recce length	Forest type	Recce movement	Primates Species	Location	Group size	Perpendicular distance (m)	Nest height	Threats encountered	Age	Habitat type	Habitat status	Village