Re-assessment of the Terrestrial Biodiversity (Flora and Avi-Fauna) in Bujagali, Kalagala and Isimba Hydropower Dams and Offsets, Uganda

Prepared for the Darwin Initiative project: No Net Loss for Biodiversity and Communities in Uganda

NatureUganda
Plot 1, Katalima Crescent, Lower Naguru, Kampala. P.O. Box, 27034, Phone +256 414 540719
Email: nature@natureuganda.org, Website: www.natureuganda.org

May 2017

Production Team

Compiled by:	Dr. Dianah Nalwanga, NatureUganda
Contributors:	Michael Opige, Judith Mirembe, Prof. Muchunguzi
Edited by:	Prof. EJ Milner-Gulland, Oxford University, Joseph W. Bull, Wild Business Ltd

Acknowledgements

This assessment was conducted with funding from the Darwin initiative under the NoNet loss project, for with we aregrateful. The partners on the project have alo been so instrumental in the success of this assessment. The experts who supported the data collection, anaylsis and writeup headed by Deo Muhumuza and Prof. Muchunguzi are highly appreciated. The technical team in the project did tremendous work in guiding the surveys, which made this project a success. The editors and advisors on this project are highly appreciated especially the advisoty committee headed by Proj. Derek E. Pomeroy and the team at Oxford University especially E.J. Milner-Gulland, Joseph Bull and Julia Baker. The staff of NU, especiallyMichael Opige and Judith Mirembe, who participated in this assessment as well as Achilles Byaruhanga, the chief advisor from NU are also appreciated. This study would not have been possible without the cooperation of the communities in the study sites who granted the study team access to their land for data collection, they are highly appreciated.

Table of Contents

EXECUTIVE SUMMARY 4
CHAPTER I 7
INTRODUCTION 7
1.1. Background 7
1.2. Study Site Selection 7
1.2.1. THE EAST BANK OF THE HYDRO POWER AREA 8
1.2.2. THE WEST BANK OF THE HYDRO AREA 9
1.2.3. THE FOREST RESERVES and Kalagala-Itanda offset. 11
1.3. General Methods 14
CHAPTER II 15
FLORAL DIVERSITY 15
2.1 INTRODUCTION 15
2.2 METHODS AND SITE DESCRIPTION 15
2.2.1 Survey Methods 15
2.2.2. Data analysis 16
2.2.3. Site vegetation descriptions 17
2.3 RESULTS AND DISCUSSION 39
2.3.1 Floristics 39
2.3.2 Species richness at the various sites 40
2.3.3 Site similarity 44
3.4. Management options for the invasive exotic species 46
2.3.5. A comparative overview with the previous vegetation survey done in 2006 47
2.4 CONCLUSIONS 51
CHAPTER III 52
FAUNA DIVERSITY-BIRDS 52
3.1 INTRODUCTION 52
3.2. BIRD SURVEY METHODS 52
3.2.1. Land Bird survey Methods 52
3.2.2. Water Bird Surveys 53

3.2.3. Species identification....53
3.2.4. Bird classifications....53
3.2.5. Data Analysis....54
3.3. RESULTS AND DISCUSSION....54
3.3.1. Land Birds....54
3.3.2. Waterbirds....59
3.3.3. Other Records....60
3.3.4. General Discussion....61
3.3.5. Conclusions and Recommendations....61
CHAPTER IV....62
4.0 FINAL CONCLUSIONS....62
5.0 REFERENCES....64
CHAPTER VI....66
6.0 APPENDICES....66
Appendix 1: Re-assessments of Terrestrial Ecology/Biodiversity in Bujagali and Kalagala; Records for the different species in the sutes surveyed in 2017....66
Appendix 2a: Observed species, Families and Genera of the plant at various sites, 2017....86
Appendix 2b: Summary of observed species, Families, Genera and other classifications of the plant at various sites, 2017....87
Appendix 2c: Observed Invasive plant species at various sites, 2017....89
Appendix 3.1: Relative Abundance for the Land Bird Species Recorded in different sites during the three different years....90
Appendix 3.2: Relative abundances of water birds recorded in the sites in the surveys conducted in the three years....107
Appendix 3.3: Summary of all the Bird Surveys....110

EXECUTIVE SUMMARY

This report presents a re-assessment of the floristic and bird diversity of ten sites within the Bujagali Dam and Kalagala offset project area. The re-assessment follows as far as possible the methods of the 2006 pre-dam ESIA report, in order to enable a comparative overview. The key questions are; first, how has biodiversity in Bujagali and Kalagala changed between 2006 and 2016? Second, how much of this change is owing to the dam and offset? The study was a descriptive and quantitative ecological survey, carried out by Nature Uganda in April-May 2017 as part of the Darwin Initiative project "No Net Loss for Biodiversity and Communities in Uganda".

For plants, stratified random sampling was employed in the different study sites to take care of unique microenvironments per site. Data on woody and herbaceous plants was obtained using nested quadrat sampling. Standardised plots or quadrats of 10m x 10m for woody plants and 2m x 2m for herbaceous plants were laid alternately on each transect at an interval of 100m in each of the sampled habitats. GPS points were recorded for all sampling plots in all study sitesfor future reference. Cluster analysis was used to group sites according to their respective species assemblage compositions to determine the degree of similarity among them. The dendrogram and accompanying analysis were done with ANOSIM (analysis of similarity) and SIMPER (Similarity percentage). The sites surveyed for birds covered both the East and West banks of the Bujagali Hydropower Area. Isimba Dam Project area was also surveyed to obtain a baseline.

The biodiversity survey methods applied in 2017 were kept as much as possible the same as those used in 2006. For the plants surveys; in 2006, the quadrat sampling method was applied, where randomly located quadrats of 10 x 10 m were placed in representative habitat types at the ten study sites to record trees and nested plots of 2 x 2m were used to assess the herbaceous vegetation. This was expected to give a good measure of the relative abundance of each species in a given study site. Inventory sampling was also done so as to produce a near complete species list for every site. To understand the story about the birds in the area, two kinds of bird surveys were conducted; these were the Land Bird surveys, which employed the Timed Species Count (TSC) method where birds are counted for an hour at ten-minute intervals, and repeats done at each site. This produced the relative abundance of the species and recorded in all sites. To complete the species list and give a better indication of the bird diversity in the area, Water bird surveys were also conducted, where all the observations of open water birds seen at various points along the river in all the sites were recorded.

A total of 452 plant species belonging to 292 genera and 77 plant families was observed overall. The most dominant plant family was Fabaceae with 57 species followed by Poaceae, Euphorbiaceae, Asteraceae, Malvaceae and Moraceae and with 39, 30, 26, 26 and 17 species respectively. The most abundant growth form was herbaceous, with 50.9% (262 species), followed by trees with 24.8% (127 species), Shrubs had 14.6% (75 species) and Lianas with 9.7% (50 species). The most common tree species recorded included *Markhamia lutea*, *Broussonetia papyrifera*, and *Milicia excelsa*, while for shrubs; they were *Vernonia amygadalina*, *Hibiscus diversifolia*, *Lantana camara* and *Melananthera scandens*. The most common herbaceous plant species were *Asystasia gangetica* and *Dichroste radicans*. There were 20 exotic (non-native) species recorded of which *Broussonetia papyrifera* (Paper mulberry) and *Lantana camara* were the most common. The main species of conservation concern remains *Milicia excelsa* (Mvule), whichis categorised as Near threatened on the IUCN Red List. It still maintains a fairly good population though regeneration is poor.

In comparison with the 2006 plant survey, there was an increase in the species richness in the areas re-surveyed in 2017. The tendency of increased species richness in all areas reassessed is mainly due to disturbance in most of the sites, but does not necessarily imply effective recovery of the original natural plant community. Most of the new species, especially the woody plants, encountered in 2017 were indigenous such as *Cordia milleni, Pseudospondias microcarpa, Spathodea campanulata,*and hence contributing to the natural plant diversity in the areas surveyed. The increased agricultural activity on the eastern and western sides of the river and on islands, together with the dam construction activity, contribute to the change in plant composition especially in the immediate impact zones as opposed to the offset areas. It is most likely that dam construction activities could have led to increased agricultural activities in the riverbanks as they opened up the original bushy habitat to allow access to these areas.

The dam construction activities most likely led to the disappearance of two islands with all their plant species. The area of natural vegetation lost wasvery important for the conservation of biodiversity, given that there isn't much natural vegetation left in the area after the dam construction.The Biodiversity offset areas retained 54% of the plant species of 2006 with Kalagala and Isimba sites having the most retention, thus playing a moderate role in safeguarding plant diversity, although it is not known how much plant diversity would have been retained in the absence of the offset. The mitigation measuresenvisaged in the Kalagala Management Plan were very minimal, especially replanting with trees on the riverbanks, with most riverbanks still having human activities common on them. Human activities are not yet fully controlled on riverbanks as was suggested as an offset measure in 2006. Attempted tree planting was observed at Kikubamutwe, Kalagala, Itanda and to small extent at Naminya South and North. This suggests that more tree planting efforts are required,especially with indigenous species along riverbanks. Sites with no 2006 comparison wereMalindi, Naminya North site, Isimba and Mabira Forest Reserve.This is despite Mabira being a key location where offset activities were envisaged.

A total of 259 bird species was recorded, with Kalagala, Naminya, Namizi and Isimba Dam sites recording the highest bird species richness and relative abundance. Generally, the surveys in 2017 recorded a much higher number of species compared to the 140 species from the combined 1998 and 2006 surveys. In the same way, the trend shows an increasing number of species recorded over the years for Kikubamutwe, Namizi and Bujagali, the only sites which have been consistently included in the three surveys in 1998, 2006 and 2017.

The results generally indicate that the sites surveyed still host a wide range of species and these have increased over the years, mainly as a result of the disturbance by human activities, which brings in new species especially generalists, although the more sensitive specialist species are lost in the process. More detailed analysis will be conducted to assess the increase or decrease in numbers of generalist (disturbance-tolerant species) or specialist species in the sites. In summary, the key findings are that local species richess has increased, but still the dam and offset have probably led to a net loss of diversity as some specialist species were lost as well as the submerged islands.
In our study, we observe a net loss of natural habitat due to the submerged bujagali Islands. This may have led to loss of land area, as well as some species, but overall, there has been an increase in the number of flora and Fauna species. The loss of natural habitat was the biggest failure for the offset although this did not show direct effects on the species surveyed.

In the general conclusion, we found that the overall impact on plants and birds of the development and the offset were not particularly severe. In particular, the ongoing development of the area for agriculture and plantation forestry, both of which led to loss of areas of semi-natural land, including a Forest Reserve and riparian areas which are important for soil retention, are likely to have happened anyway, regardless of the dam and the offset. Overall, the number of species recorded has increased and the status of species of concern seems not to have worsened.

Our survey was not a full census of all the biodiversity impacts of the development. We did not cover key taxa that local people felt had been severely impacted by the dam, particularly fish species. We did not look at erosion, pollution or overall loss of land area, all of which are likely to have been damaged. Therefore, it is likely that there was a biodiversity impact, and that this was not satisfactorily compensated, given the lack of offsetting activities.

The offsets would have performed better if designated areas of better habitat in this case, Kalagala CFR, were identified as offsets and something proactive done to ensure their integrity is maintained. It would be important to ensure that these areas are similar to the areas lost during the initial stages of dam construction, and that the most affected taxa (e.g. fish) were given improved habitat or reductions in other human pressure (e.g. fishing) to compensate for the impacts of the hydropower project.

Given the evidence of cultivation happening around the survey sites, there is need to try and avert any possible risk of ecosystem damage from future events resulting from habitat change through cultivation and related effects following the completion of the Isimba Dam. This can be through introduction of wise-use and sustainable-use programmes and encouraging improved farming and fishing practices, among other avenues.

The findings from this assessment should be shared with the legislators in the government of Uganda, business developers, donors or development partners and local communities in the area especially those affected by the existing dam and those or likely to be affected by the impacts of the new dam.

CHAPTER I

INTRODUCTION

1.1. Background

The convention on Biological Diversity highlighted how offsets can help its member states to achieve conservation goals. This comes in hand as governments, financial institutions and businesses world over adopt the target of No Net Loss (NNL) of biodiversity resulting from developments by using biodiversity to achieve this.With the completion of the Bujjagali Hydropower Project in 2012, the Kalagala Offset was designed to address biodiversity and human impacts. However, with the construction of Isimba Hydropower plant downstream of Bujjagali (to be completed in 2018), National Environment Management Authority (NEMA) and ***Nature***Uganda, a leading conservation NGO, identified the need to understand how the Isimba hydropower project may affect the Kalagala offset and advise both the government of Uganda and the hydropower companies on how to mitigate the negative impacts. Based on this, a consortium was put together to carry out a study, led by the University of Oxford in partnership with NatureUganda, NEMA, WCS-Uganda and IIED, with funding support from Darwin Initiative.The project aim is to support the government of Uganda, project developers, conservation organizations and rural developers to integrate poverty alleviation, equity and cultural heritage in biodiversity and social offsets strategy and ensure No Net Loss for both biodiversity and communities affected by the developments and share lessons learned with the global community through publication of the research project results. In addition, the results of this project will be used by the government of Uganda to develop or improve national policy, and guidelines on the application of mitigation hierarchy, specifically biodiversity and social offsets.

In order to obtain the baseline information to enable us understand the scale and magnitude of the negative impacts and risks to biodiversity, NatureUganda conducted a Re-assessment of Terrestrial Ecology/Biodiversity in Bujagali and Kalagala for the birds and plants, following a survey protocol used in the initial Environmental & Social Impact Assessment (ESIA), which guided the commissioning of the Bujagali hydropower project. The assessment was aimed at answering a) how biodiversity in Bujagali and Kalagala has changed between 2006 and the present (2016/2017), b) how it is likely to change with the addition of the Isimba dam and c) how much of this change is attributed to the hydropower dams and implementation of the Kalagala offset plan.

The findings from this assessment will be shared with the government of Uganda, business developers, development partners and local communities affected or likely to be affected by the impacts of the dams. This process will help to identify and map key players that could contribute resources and participate in the implementation of recommended mitigation or remedial measures aimed at restoring the biodiversity and ecosystems, and compensate for lost socio-economic benefits to communities.

1.2. Study Site Selection

The sites surveyed were those included in the study diring the ESIA studies of 1996 and 2006. New sites were added to these based on their potential to support the functions ofthe offset sites for the Dams. The survey area included sites on both on the East bank and West bank of the dam as well as four Forest reserves. Both floral and bird surveys were carried out at each study site.

1.2.1. THE EAST BANK OF THE HYDRO POWER AREA

Reassessment of the flora on the east bank of the Hydro power area was done in three sites namely; Bujagali camp site with surrounding islands, Namizi site, and Itanda sites of both the riverbank forested area and the islands. Two of the sites, namely Bujagali village site and Namizi, were first surveyed in 1996 with an addition of another site at Itanda/Nile Bank Forest Reserve in 2006 (ESIA Report , 2006; Figure 1).

Bujagali/Kyabiirwa village – the tourist area. This site is within 3.7km radius of the Bujagali power station. While the 2006 survey mainly surveyed the area outside the the campsites, the current survey did the same, and in addition surveyed the shore line while directly observing the common trees and birds on the riverbank side. This was done due to three reasons; first, the area outside campsites was heavily cultivated with crops, although with some trees either planted or left within the gardens. Secondly, the only natural or seminatural habitat which remained was along the shoreline and within 100 m of riverbank. Thirdly, we expected the shoreline biodiversity to be more affected by the changing water levels due to the dam than the community land.

The Bujagali area in addition to being heavily built with lodges and people's homes, it is also heavily cultivated with crops like maize and cassava. This particular area attracted a lot of farmland birds. Surveys were also made on the Bujagali Islands, which are also claimed to be inclusive of the Naminya Islands. The vegetation on the Island was mainly woodland composed of shrubs mixed with spaced canopies and scattered agricultural plots with evidence of soil erosion. The Bujagali Islands surveyed included; Buwenda 1, Buwenda 2 and Bujagali Speke Islands. These Islands were mainly covered by natural thickets, cultivation and shoreline habitats. Two of the Bujagali islands initially present during the earlier surveys were reported to have been submerged and so where not surveyed in this current study.

Namizi – This site is within 1km radius of Bujagali power station. By the time of the survey in 2006, this area was already dominated by the smallholder/subsistence farming with crops like bananas, maize, cassava, passion fruits and others and is relatively flat but slopes gently towards the river. The 2017 survey was done in the same dominant habitat of cultivation, a small area of fallow near the riverbank, and in addition we surveyed the shoreline plant community as it was expected to be affected by the changing water levels of the river. Introduced and native tree species were observed in the study site and common in the cultivated lands, as observed in the 2006 survey. Cultivation is done up to the shores leading to the increased eutrophication of the waters at the shores with reeds providing protection for the water in some areas. These reeds are however a habitat to the Black Crake and Squacco Heron as seen during the surveys and an interesting record of the Basra Reed Warbler *Acrocephalus griseldis*, a globally Endangered bird species according to the IUCN Red List, with only three previous records for Uganda, with the last record being taken in Serere in 1983 (Carswell et al. 2005).

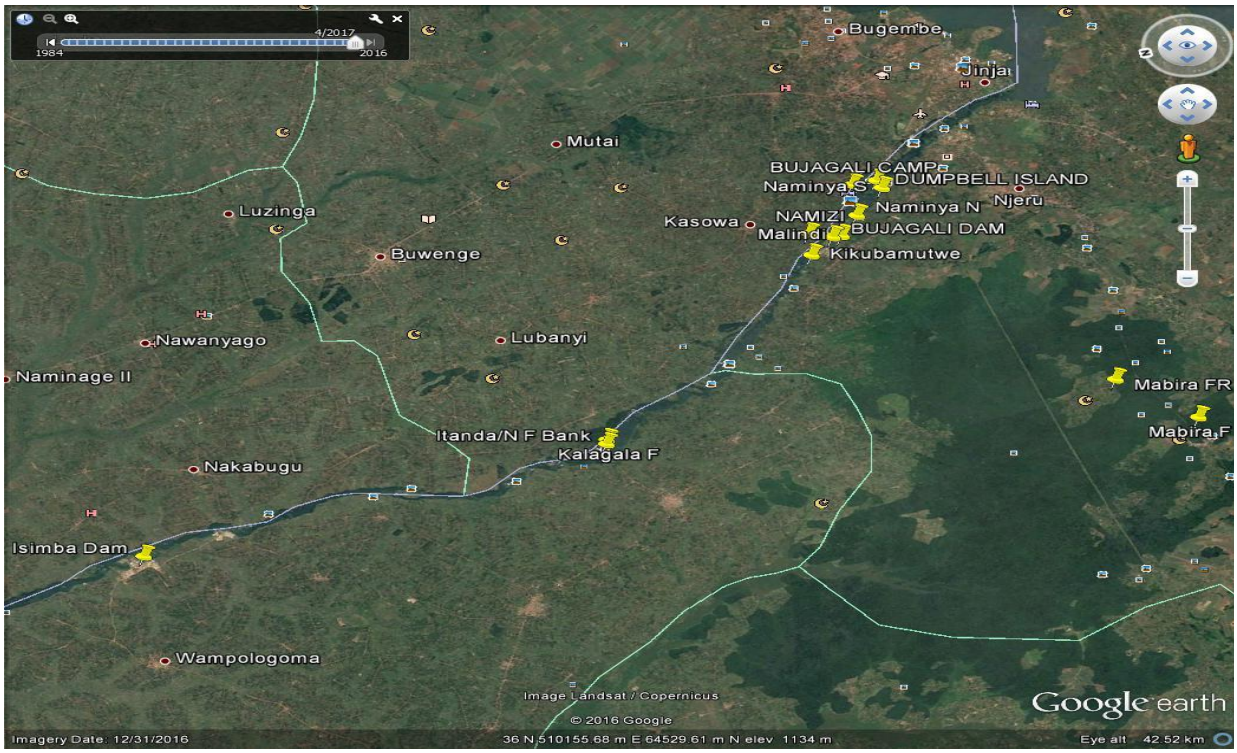

Figure 1: Bujagali Dam & Re- sampled Sites April 2017

1.2.2. THE WEST BANK OF THE HYDRO AREA

This survey was done in the sites surveyed in 1998 and 2006 at Naminya, Malindi, Kikubamutwe and Kalagala; in addition, we surveyed another site where theIsimba Dam was under construction (Figure 1 & 2).

Naminya South. This site is within 3.7km radius of Bujagali power station. This area is characterized by first; fenced tourism related developments mainly of Holland Pub and Bird Investments (Figure 3), where the within fence plant community is regulary slashed with few trees, both introduced and native. Secondly, there are marginal areas that are sandwiched between fences and the cultivation. They had tree species mainly dominated by *Broussonetia papyrifera*, an introduced and invasive woody species. This habitat includes the area under electricity transmission line that is constantly slashed and grazed. The third habitat is that of cultivation mainly of food crops with few native and introduced tree species. In adition, a fourth habitat was surveyed and that was of shorelines dominated by natural vegetation of shrubs and partly by tourist lodges and homes belonging.

Naminya North. This site is within 2.3km radius ofBujagali power station. This area, known by the LC1 Chair as Buloba, is dominated by cultivation mainly of maize, beans, cassava, coffee and banana plantations in the community land. The transmission line area and that between transmission line and the river had huge mounds of heaped soil by earlier dam construction which was never leveled. There were also few areas of fallow after earlier cultivation. Scattered introduced and a few native tree species were

observed within the site. Young trees of mainly Grevillia were seen planted in the zone between transmission line and the river.

Figure 2: Naminya South, Naminya North, Malindi and Kikubamutwe sites on the west bank of the river Nile.

Malindi– This site is within 1 km radius ofBujagali power station. It is characterized by flat land towards the river covered by two different habitats, namely riverbank dominated by secondary natural vegetation between the access road and the water, and the cultivation mainly of *Zea mays* (maize) and *Phaseolus vulgaris* (beans) on both transmission line land and the community land, on the west side of the access road.

Kikubamutwe – This site is within 1 km radius from Bujagali power station. It is characterized by a gentle slope towards the river thus suffering great flooding as told by the local guide when water is released from the upstream in the night hours. The shoreline is covered by the different habitats namely; shoreline, riverbank partly planted with Helea sp, *Markhamia lutea* and *Milicia excelsa* tree species by NEMA to replace the lost natural tree community within 100m ofthe river water; the Bujagali HydroPower Project site enclosed within the fence, with slashed area dominated by herbaceous vegetation with few scattered trees mainly of *Broussonetia papyrifera* and few *Ricinus communis* towards the riverbank; and cultivation dominated by crops such as bananas, beans, coffee with scattered trees of both introduced and few native ones. A few big trees that were reported in the ESIA 2012 to have remained during excavations provide a appropriate haven important for birds. Two pairs of the Giant Kingfisher Megaceryle maxima were seen patched in these trees. This bird is a rare sighting in Uganda and its presence in this site emphasizes the importance of these big trees which are its main habitat and thus should be protected.There is an area adjacent to the East side of the Bujagali HydroPower Project fence that has been bought by an investor who has planted some trees in his area. A

large section between the Bujagali HydroPower Project lower fence and the river is covered by *Broussonetia papyrifera*, an introduced and invasive woody species. All the described habitats above were sampled with the addition of shoreline not done in 2006 (Figure 3).

Figure 3: Kikubamutwe Site around the Bell dam area

1.2.3. THE FOREST RESERVES and Kalagala-Itanda offset.

Three forest reserves found at Itanda on the east bank, Kalagala and Mabira sites on the west bank of river Nile were sampled in 2006 and were re-sampled in this study (Figure 1).

Itanda site, on the east bank, is within 1 km radius of Bujagali power station. We identified four habitats that were sampled namely; Itanda Island with forested and cultivated areas; the shoreline; the proximate riverbank with natural vegetation below the tourist station, and the Nile Bank Forest Reserve which is fairly flat, sloping gently towards the river until within about 60 metres of the riverbank, when it falls steeply. The rocky outcrops on Itanda provide patching grounds for birds like the Rock Pratincole and cormorants. Records of Great Cormorant, African Darter, Little Egret and weavers were got with

birds nesting in trees on one of the islands at Itanda where the river breaks into rapids. Some parts of the slope had extensive cultivation of banana, cassava and maize within the scattered Pine trees. A significant feature different from 2006 assessment was the extensive Pine (Pinus sp) with few Tectonia sp in the former forest reserve with natural woody plants (Figure 4). There are few native trees observed around the picnic site that is not planted with Pines. The Nile Bank Forest Reserve is situated on the east bank. The area is predominantly flat, sloping gently towards the river until within about 30-40 metres of the riverbank, where it falls steeply. The small patch of remaining natural vegetation is a composed of shrubs as you head to the picnic site, used especially by rafters at the downstream end of their journey.

Figure 4: Itanda-Nile Bank Forest Reserve, the river water and its falls, and the Island

Kalagala Forest Reserve is within 8km radius of the Bujagali power station site, opposite Itanda on the west bank. Four habitat types were identified within the forest reserve, namely the degraded natural forest dominated by small tree species with occasional big trees, along the area between the road and the river; the fallow land between the road and the western boundary of the reserve along the local electricity transmission line; the tree plantation dominated by Terminalia sp.; and to a small extent the cultivation dominated by maize and beans (Figure 5). The area is suitable for tourism activities as evidenced by tourism structures being constructed near the Terminalia plantation, the waterfalls and the park yard at the riverbank. This reserve extends inland for approximately 200 m, with cultivation of annual crops as the main local people's activity. The area is quite attractive and is well-used by local people for washing clothes, traditional worship, eco-tourism, swimming for children and study trips by schools. In addition to the natural vegetation, Kalagala has also had some tree planting interventions

supported by National Forestry Authority (NFA). The local guide on one of the occasions mentioned that the birds were few because "the trees planted by NFA (Pinus sp) were not indigenous" and thus, do not fully provide the required habitat for most birds. We observed evidence of natural tree regeneration under the Terminalia plantation. The Kalagala Island FR was re-sampled as well as the Itanda islands.

Figure 5: Kalagala Forest Reserve, the waterfalls and the Island forest end

Isimba Dam site is within 32 km radius of the Bujagali power station site on the west bank and was the furthest site sampled. Three habitat types were identified within the forest reserve namely; the area within the fence with Dam construction activities going on at Nampaanyi village, within both natural vegetation and that regenerating on heaped soils due to construction; natural vegetation on Kuva Island currently with dumped heaps of stones and gravel from dam construction site, and cultivation by local people both on Isimba Dam land outside the fence and on community land, dominated by maize and beans with scattered trees of both introduced and natives ones. Bird surveys were done at either side of the river in Kamuli and Kayunga districs. A distance of 20-40m from the river is dominated by the natural wetland/shoreline vegetation which is slowly being cleared for agriculture. The Kamuli side is dominated by crops such as maize, coffee and large scale mango plantations, whereas the Kayunga side is dominated by maize plantations. A roost of over 70 Cattle Egret patched on the trees within the fenced area for the dam was recorded.

Mabira Forest Reserve is within 6 km radius of the Bujagali power station site, relatively far from the west bank of the river Nile. This is the biggest remaining central forest reserve closest to Kampala. It is characterised by tall trees, closed canopy and a lot of undergrowth making it a habitat for varied wildlife like birds, primates and other mammals. Mabira Forest is reserved as an offset for the Bujagali Hydropower Project. Two habitat types were identified within forest reserve, namely the natural mature forest on the west side of the Kampala-Jinja road and the degraded natural forest dominated by small tree species with occasional big trees of dbh $\geq$ 50cm, on the east side of the road. This was taken to be our control site, especially for the tree species that characterize the forests.

1.3. General Methods

Fieldwork at the sites in the Bujagali took place between 10th and 26th April 2017, two weeks later than the 2006 assessment period. The methods applied were kept as much as possible the same as those used in 2006, with minimal modifications. However, it is important to note that there might have been potential differences in the results, due to the fact that different people conducted the surveys. These might have occurred through better identification of species in this current survey compared to the past surveys, or through more species being missed in the past surveys than in this current survey. But also the reverse could be true. So since the surveys were conducted by professional researchers in all cases, we will assume that the differences caused in the results are insignificant as they could affect both past and present surveys similarly.

CHAPTER II

FLORAL DIVERSITY

2.1 INTRODUCTION

The vegetation along the river Nile before intense human activities set in was mainly a natural forest characterized by species in the genera of *Celtis* and *Chrysophyllum* as the climax (Primary forest) tree species (Langdale-Brown *et al*. (1964). The early successional stages are usually dominated by *Albizia* spp with *Vepris nobilis* (*Teclea nobilis*), *Celtis africana* and *Antiaris toxicaria* while the mid-successional stage is predominantly *Trilepisium* (*Bosqueia), Funtumia, Celtis*, with *Vepris nobilis* (*Teclea nobilis*),as the dominant understorey species.

The ESIA Report, 2006, indicated that most of the re-assessed area including the Islands contained considerably higher species richness in the respective areas surveyed compared to the 1998 botanical survey. The species assemblages varied with the level of access to and the intensity of land use activities in the main different habitats, namely the agricultural sites, forest reserves and the islands. The major tree species of conservation concern was*Milicia excelsa* (Mvule) that was categorised as Low Risk/Near Threatened by the IUCN (2000), but with stable populations in all sites.

The report foresaw the potential of natural regeneration with indigenous trees in the assessed areas when effective control or exclusion of land use activities is done, such as fenced areas. The report further recommended two management aspects; first, the controlof the populations of *Lantana camara* and *Broussonetia papyrifera* (Paper mulberry)to enhance the natural regeneration process; secondly, enrichment planting with *Albizia*, *Milicia excelsa* and *Ficus* spp. to protect the riverbanks from erosion and enhancethe aesthetic value of the forests and contribute to tourism.

In this section, we have integrated information on site descriptions, the vegetationstructure and human use as observed in 2017. These are followed by detailed accounts of the flora of the ten assessed areas and a comparison with that of 2006. Here we consider the mainfeatures of the ten surveyed areas, as a background to their flora.The area as a whole has a high human population, especially on both the east and west banks of the river, so that thelandscapes are predominantly determined by human activity, past and present.The once extensively forested banks (Langdale-Brown, 1964) have been reduced mainly to cultivation lands which in some cases goes up to the shoreline. There is evidence of earlier forest cover from the presence of typical forest treespecies in some areas both on the mainland and the Islands.

2.2 METHODS AND SITE DESCRIPTION

2.2.1 Survey Methods

In 2006, quadrat sampling method was applied, where randomly located quadrats of 10 x 10 m were placed in representative habitat types at ten study sites (the six ‘riverbank’ sites discussed in Section 1.1,

plus four 'island' sites: Itanda/Kalagala island, Namizi Island, Bujagali Islands and Dumbbell Island). The habitat types included gardens for the sites with intense agricultural activities, bushes, fallow land and forested areas especially along the riverbanks and islands. These were used to record trees over 10 cm diameter at breast height (dbh). Nested plots of 2 x 2m were also used to assess the herbaceous vegetation (i.e. forbs and grasses). This was expected to give a good measure of the relative abundance of each species in a given study site. Inventory sampling was also done so as to produce a near complete species list for every site. Voucher specimens were collected for those species that could not be identified in the field and were brought to Makerere University Herbarium (MHU) for identification.

Information on vegetation structure was obtained as follows. Ten points were selected at random within the overall area; usually these were along paths, but offset to one side to exclude the path and its edges. Vegetation was recorded as the estimated percentage cover (i.e. the amount of ground covered, as seen from above) in four height zones: 0-1, 1-3, 3-8 and more than 8 metres in height. Vegetation was classified as native or non-native (crops and other introduced plants), and woody (trees and shrubs) or non-woody, (such as beans or grasses). The estimates were made by looking at the area within ten metres of the point where the observer stood, and dividing it into four nominal quadrants; the maximum cover in any one layer is therefore 25%, in any one quadrant.

In 2017, few modifications were done with minimal effects on the acquired results and their usefulness in comparison with the 2006 data. They include the following; first, in some reassessed sites, we introduced the shoreline as a habitat, due to our inability to access certain parts due to fencing and the difficult terrain. We also expected plants at the shoreline to be more affected by the changing water levels of the river after dam construction. Secondly, alternating plots along the transect were kept at estimated distances by pacing 100m from each other. Thirdly, the vegetation was recorded as the estimated percentage cover (i.e. the amount of ground covered, as seen from above) of each species within the 10m x 10m plot without placing them into height zones. Fourthly, assessment along shorelines while in a boat and in active gardens was done by locating a point and observing and recording all the plant species around the point, but with an estimated limit of 10m (i.e. 20m x 20m) from the point in all directions. The great inquisitiveness of the garden owners could not allow use of the measuring tape to define the boundary of the plot. Fifth, nested quadrat sampling in Mabira forest reserve was modified by using 20m x 30m for trees ≥ 50cm diameter at breast (dbh)-1.3m high, 10m x 15m for trees ranging from 10cm to 49cm dbh, and 2m x2m for herbaceous plants. GPS points were recorded for all sampling plot in all study sites for future reference.

2.2.2. Data analysis

A compilation of the species at site level was done indicating the individual frequency (indicative of abundances) at different sites using their estimated percentage cover for data obtained from nested quadrat samples for both woody and herbaceous plants. The number of times a species appeared in the point based sampling units was computed to give an indication of its abundance in a particular study area. A total of 84 quadrats of 10 x 10 m, and a total 64 point based sampling units both totaling to 148 sampling units, were used in the entire assessment.

Overall, 452 species were recorded in binary (presence or absence) format for the 10 sites investigated. Cluster analysis was used to group sites according to their respective species assemblage compositions to determine the degree of similarity among them. This was based on the frequency of occurrence of a species data.The dendrogram and accompanying analysis were done with ANOSIM (analysis of similarity) and SIMPER (Similarity percentage) (Clarke, 1993).Clusters were determined from the cluster analysis method based on the underlying 'ecological knowledge of the data'.

2.2.3. Site vegetation descriptions

i) Bujagali area

This study site had three habitat types namely Bujagali island, shoreline and cultivation at Kyabirwa village. The Bujagali Islands had *Broussonetia papyrifera, Albizia grandbracteata*and *Acalypha neptunica* as dominant woody species, with *Asystasia gangetica* as dominant herb in the forest. The cultivated part of the island had mainly *Zea mays* (maize), *Phaseolus vulgaris*(beans) and *Manhot esculentus*(cassava) as common crops grown.

The shoreline habitat was dominated by *Broussonetia papyrifera*, *Markhamia lutea,* and *Albizia grandbracteata* tree species; *Vernonia amygadalina* and *Lantana camara* as shrub species; and *Eichhornia crassipes* and *Asystasia gangetica* as herbaceous species. The shorelines of the Bujagali Islands were dominated by *Vossia cuspidata* and *Eichhornia crassipes*.

ii) Bujagali Camp site (Kyabirwa village)

The cultivated land at Kyabirwa village had mainly *Coffea robusta* (Coffee), *Markhamia lutea*, *Artocarpus heterophyla*(Jack fruit tree), and *Jatropha curcus* as the woody species, while the herbaceous plants were dominated by crops mainly *Manhot esculentus* (Cassava), *Zea mays* (Maize) and *Musa sapientum* (Banana).In some locations cultivation goes right up the shoreline ashown in the pictures taken.

When the current results are compared with those of 2006 reassessment, the cultivation remains similar in terms of human activity and the crops grown, with scattered trees of mainly *Artocarpus heterophyllus* (Jack fruit tree), *Broussonetia payrifera* (Paper mulberry) and *Markhamia lutea*. Theriverbanks/shorelines are still being dominated by *Lantana camara* and *Broussonetia papyrifera, although Markhamia lutea, Albizia grandbracteata* tree species, and *Vernonia amygadalina and Hibiscus diversifolia* as shrubspecies have increased therein.Theherbaceous vegetation is dominated by *Eichhornia crassipes* and *Asystasia gangetica* as herbaceous species as opposed to *Commelina africana, Bidens pilosa,* and*Ageratum conyzoides*observed in 2006.

Another observed feature was the presence of tree stumps emerging out of the water surface suggesting submergence of Small Island and extension of water line into the riverbank. This observation is likely to be caused by the dam installation.

Plate 1a: Buwenda island 1-natural vegetation
Plate 1b: Buwenda island 1-cultivation 2

Plate 1c: Buwenda island 2- crop protection
Plate 1d: Buwenda island 2- *Maesopsis eminii* & *Persia americana* in cultivation

Plate 1e: Buwenda island 2- beans+ maize cultivation

iii) Bujagali Islands

The Bujagali Islands have changed both in the cover of natural vegetation due to increased cultivation of mainly*Zea mays* (maize), *Phaseoulus vulgaris* (beans) and *Manhot esculentus* (cassava); and in the dominant plant species. The dominant tree species are *Broussonetia papyrifera, Albizia grandbracteata*

and *Acalyphaneptunica* while in 2006 reported *Capparis erythrocarpos, Maytenus heterophylla, Tapura fischeri, Alchornea cordifolia, Argomuellera macrophylla, Drypetes gerrardii, Albizia coriaria, Albizia grandibracteata, Artocarpus heterophyllus, Broussonetia papyrifera and Lantana camara.*

Plate 1f: Natural grassland on Bujagali Island

Plate 1g: Aloe spp on Bujagali Island

Plate 1h: Gloriosa sp in flower on Bujagali Island

Plate 1i: Fallowland on Bujagali island near Kyakabaale garden

Plate 1j: Bujagali island shoreline vegetation

Plate 1k: Bujagali cultivation up to shoreline, west of Speke camp

Plate 1l: Dead tree stumps due to flooding near Speke camp Bujagali
Plate 1m: Tree community at Speke camp Bujagali

Plate 1n: Tree stumps of Submerged Island near Speke camp
Plate 1p: Bujagali shoreline veg/cultivation PLOT 3

Plate 1q: Bujagali shoreline veg + tree stump dead due to flooding
Plate 1r: Bujagali shoreline vegetation

Plate 1s: Bujagali riverbank c15m away tree community
Plate 1t: Kabindi resort camp compound up to shoreline near Bujagali camp

iv) Dumbbell Island

The 2006 assessment reported the dominance of *Broussonetia papyrifera* and *Lantana camara.* Other characteristic species were *Tapura fischeri*, *Alchornea cordifolia*, *Argomuellera macrophylla*, *Drypetes gerrardii*, *Albizia coriaria*, *Albizia grandibracteata*, *Artocarpus heterophyllus*, *Manilkara obovata*, *Cola gigantea*, *Sterculia dawei*, *Chaetacme aristata*, and *Urera trinervis.*

The 2017 reassessment did not encounter the Dumpbell Island, suggesting that it might have been submerged by water after dam construction. According to the IUCN Red Lists, none of the plant species lost qualifies as a threatened species.

v) Namizi area

This area had three habitat types, namely shoreline, fallow land and cultivation, with the latter most dominant. The shoreline plant community was dominated by *Vossia cuspidata*, *Eichhornia crassipes*and *Cynodon dactylon*, with no trees observed therein. The common plant species in the cultivation habitat were *Zea mays* (Maize) and *Phaseolus vulgaris* (Beans), with scattered trees of *Artocapus heterophylla*, *Maesopsis eminii*, *Milicia excelsa*, *Mangifera indica* (Mango) and *Persia americana* (Ovacado). In some locations cultivation was up to the shoreline. The observed presence of tree stumps emerging out of water surface suggests expansion of the water line further into the riverbank thus casing death of the tree species. This is due to the dam construction effect.

In comparison with the 2006 assessment, there was no significant change in the cultivation habitat except for its expansion.The second difference is the dominance of introduced planted tree species at the expense of native ones with the exception of *Milica excelsa* within cultivated areas.The third one is that, the riverbanks aredominated by *Zea mays* (Maize) and *Phaseolus vulgaris* (Beans), cultivation, with few Eucalyptus trees planted in one locality.

Plate 2a: Namizi cultivation in community all through big trees of *Artocarpus heterophylla*
Plate 2b: *Vossia cuspidata* and *Eichhornia crassipes* plant community- Namizi shoreline part of excavated area

Plate 2c: Namizi shoreline vegetation PLOT 1
Plate 2d: Namizzi shoreline vegetation PLOT 2

Plate 2e: Tree stumps of flooded area-Namizi
Plate 2f: Cultivation near constructed Dam- Namizi side

vi) Namizi Island

The Namizi Island was not observed, suggesting that it had been fully submerged and did not exist any more due to the dam construction. This was confirmed by our local resident. The list of plant species recorded in 2006 does not indicate loss of any threatened plant species.

Plate 2g: Fish caging at Namizi near Namizi OR Dumpbell Island now submerged fully

Vii) **Itanda/Kalagala Islands**

The Itanda site had four habitat types assessed namely the Itanda Island with both forest and cultivation habitats, the shoreline and the riverbank habitats.The Island forest part was dominated by *Acalypha neputunica, Broussonetia papyrifera, Celtis mildbraedii, Acmella* sp, *Rytiginia* sp, *Cissus rotundifolia*, *Mucuna poggei, Secamone africana*and *Tetrorchidium didymostemon*. Other uncommon species were *Blighia unijugata*, *Pseudospondias microcarpa, Margartaria* sp, *Vepris nobilis, Myranthus* sp and *Triumpheta macrophylla.*The Island cultivation part had *Grevillea* sp., *Ficus exasperata*, *Markhamia lutea*, *Cordia millenii* and *Pseudospondias microcarpa* tree species. Other woody species were *Coffea robusta*, *Ficus sur* and *Milicia excelsa*. The herbaceous plants were mainly *Zea mays* (Maize), *Phaseoulus vulgaris* (Beans), *Eleusine corocana* (Millet) and *Musa acuminata* and *Eleusine indica.*The shore line plant community was dominated by *Broussonetia papyrifera*, *Brillantasia* sp., *Eichhornia crassipes*, *Melananthera scandens*,*Phragmites mauritianus*, *Vossia cuspidata* and *Triumpheta macrophylla.*The riverbank had a mixed plant community with several species such as *Albizia zygia*, *Markhamia lutea, Vernonia amygadalina, Urena lobata, Lantana camara*. Other less common species were *Dombeya burgessiae,* Lamiaceae (blue flowers), *Fluggea virosa*, *Ocimum suave, Sida ovata*, *Cyperous cyperoides* and *Justicia fulva.*

In comparison with the 2006 assessment, no significant change in terms of plant community has occurredon Itanda Island, with *Milicia excelsa,* aspecies of conservation concern, still existing thereon. The 2017 reassessment attempted to sample the the island periphery which is less accessible or is dominated by rock, covered by the degraded forest.


Plate 3a: Itanda falls as observed from the tourism site
Plate 3b: Itanda Island as observed from the Tourism site across river Nile after the Falls


Plate 3c: Degraded forest at Itanda Island dominated by *Broussonetia papyrifera*
Plate 3d: Part of the cultivated land on Itanda Island that has many rocks

vii) Nile Bank Forest Reserve

This habitat had significant changes compared to the 2006 assessment. Much of the Nile Bank Forest Reserve was under a Pine (*Pinus* sp) plantation established in 2008, with few parts with *Tectonia grandis*, both introduced tree species. A large section of the bank had *Zea mays* (Maize) cultivation up to the shoreline. This part was not sampled as it had few understorey weeds due to the plantation. Instead we sampled the shore line plant community with the help of a boat, and the part of the bank that had natural plant community.Native mature trees were only observed scattered between the Pine plantation and the shoreline, and at the tourism site with few individuals e.g. *Maesopsis eminii*, *Albizia zygia*, *Milicia excelsa*, *Albizia glaberimma* and *Senna spectabilis*, an introduced tree species.


Plate 3e: Former Nile natural Forest Bank replaced by Pines planted in 2008, now with maize cultivation up to shoreline at Itanda site

Plate 3f: Sloping bank with seminatural vegetation between Pine plantation and Nile shoreline at Itanda site


Plate 3g: Sloping bank with natural woody vegetation between *Tectonia grandis* plantation and Nile shoreline at Itanda site

Plate 3 h: *Tectonia grandis* plantation informerly Nile Bank natural forest at Itanda site

Plate 3i: Access road between Tectonia and Pine plantations planted in 2008 that replaced the natural Nile Bank Forest

ix) **Naminya South site**

Three habitat types were assessed at this site namely; shoreline, land vegetation (seminatural and within fence) and cultivation on community land.

The shoreline plant community was dominated by *Vernonia amygadalina*, *Broussonetia papyrifera*, *Justiciafulva*, Cissus *rotundifolia* and *Ipomea whitei.* Other specieswere *Ricinus communis, Albizia grandbrateata, Asystasia gangetica, Eichhornia crassipes, Flugea virosa, Lantana camara and Melananthera scandens.*The land vegetation (seminatural and within fence) was dominated by *Amaranthus hybridus* var *cruentus*, *Desmodium ripandum*, *Imperata cylindrica* and *Ricinus communis*. Other species on the basis of cover were *Cynodon dactylon*, *Digitaria abyssinica*, *Digitaria tanata* and *Imperata cylindrica*. Within the fenced area by Bird Investor and the Holland pub, few trees were observed namely; *Sapium ellipticum*, *Markhamia lutea*, *Artocarpus heterophylla*, *Delonix* sp, *Maesopsis eminii*, *Milicia excelsa*, *Albizia zygia*, *Ficus exasperata*, *Mangifera indica* and *Broussonetia papyrifera*. Cultivation habitat had *Coffea rubusta*, *Milicia excelsa*, *Artocarpus heterophylla*, *Psidium guajava*, *Spathodea campanulata*, *Markhamia lutea*, *Persia americana*, *Mangifera indica* and *Desmodium ripandum*.The area between lands fenced by investors was dominated by *Broussonetia papyrifera*mainly composed of seedlings, *Senna spectabilis*, M*arkhamia lutea*, *Lantana camara* and B*ougainvillea* sp.

The 2006 assessment found out that a large section was dominated bythe invasive exotics*Broussonetia papyrifera* and *Lantana camara*. Other trees recorded in this area included *Markhamia lutea, Spathodea campanulata, Albizia grandibracteata, Albizia coriaria* and *Artocarpus heterophyllus*. The dominant shrubs included *Flueggea virosa* and *Vernonia amygdalina*. The herbaceous vegetation was dominated by *Bidens pilosa, Digitaria abyssinica, Conyza floribunda, Dyschoriste radicans* and *Imperata cylindrica*. The cultivated area mainly consisted of scattered trees of Ficus, *Maesopsis eminii*, *Cassia spectabilis*, and *Coffea robusta*.

Therefore, in comparison, there were no significant changes in the plant species between the 2006 and 2017 reassessments at Naminya South site.

Plate 4a: Tectonia plantation up to shoreline on the western side of river Nile at Naminya South site
Plate 4b: Holland pub on Naminya South site Buganda side observed from the island 2

Plate 4c: Maize, Banana and Coffee crops grown on community land (Milicia tree in the background) adjacent to the transmission line land

x) Naminya North/Buloba

This site had three habitat types, namely cultivation, riparian and fallow, but mainly dominated by cultivation. The cultivation habitat was dominated by *Zea mays* (maize) cultivation with few weeds of *Bidens pilosa* and *Asystasia gangetica*. Few trees of *Artocarpus heterophylla*, *Mangifera indica*, *Markhamia lutea* and Sesbania sp were observed scattered in the cultivation area. The riparian zone was mainly composed of *Cyperous dives*. The fallow habitat was dominated by *Senna hirsuta*, *Sida acuta*, *Asystasia gangetica* and *Micrococca mercurialis*. Other species were *Digitaria abyssinica*, *Melananthera scandens*, *Sporobolus pyrimidalis* and *Alysicarpus glumaceus*.

Zea mays (maize) cultivation was also observed on the heaps of soils dumped in the area during the dam construction which had not been levelled. Young seedlings of trees planted by the local people were also observed on the land towards the riverbank.

This site was not specifically assessed in 2006 as done in 2017. However, when compared with the nearest 2006 assessed area of Naminya South, Naminya North is significantly different due to the intense cultivation that has taken place over the years.


Plate 5a: Cultivation of maize at around the transmission line at Naminya North/Buloba
Plate 5b: Cultivation of maize on the dumped soil by Dam construction activities that was not cleared at Naminya North/Buloba


Plate 5c: Cultivation of maize and recent tree planting up to shoreline on the leveled dumped soil by Dam construction activities at Naminya North/Buloba
Plate 5d: Fallow land 2 on the leveled dumped soil by Dam construction activities at Naminya North/Buloba

xi) **Kalagala Site**

This site had four habitat types assessed, namely Kalagala Forest Reserve along the riverbank, Kalagala Island mainly covered by natural forest, cultivation and the fallow of afairly small section.

Common tree species in Kalagala Forest Reservewere *Antiaris toxicaria*, *Albizia zygia*, *Maesopsis eminii*, *Terminalia* sp and *Broussonetia papyrifera*, with the last two being introduced species. Other less common ones were Acalyphavillicaulis, *Fluggea virosa*, *Markhamia lutea*, *Albizia grandbrateata*, *Vernonia amygadalina*, *Lantana camara*, *Argomuellera macrophylla*, *Centella asiatica* and *Cissus rotundifolia*. We observed natural regeneration of native tree species under the Terminalia plantation such as *Albizia zygia*, *Maesopsis eminii*, *Markhamia lutea*, *Celtis durandii*, *Bridelia micrantha*, *Maesa lanceolata* and *Vepris nobilis*. Thickets of *Mimosa pigra* were beginning to grow within the reserve.

Kalagala Island is mainly covered by natural forest and was dominated by *Broussonetia papyrifera*, *Acalypha* sp, *Dracaena fragrans*, *Ipomea whitei* and *Triumpheta macrophylla*. Other less common species were *Antiaris toxicaria, Pseudospondias microcarpa*, *Macaranga* sp, *Melananthera scandens*, *Mucuna* (climber) sp, *Alchornia cordata, Cissus rotundifolia*, *Asplenium* sp and *Basella alba.*

The cultivation habitat occupied a small section and was dominated by crops grown by local people e.g. *Zea mays*(Maize), *Phaseolus vulgaris* (Beans), with scattered trees of *Maesopsis eminii*, *Albizia zygia*, *Ficus exasperata*, *Markhamia lutea* and *Jatropha curcus*. The fallow habitat wasdominated by weeds, mainly by *Ageratum conyzoides*, *Desmodium ripandum*, *Euphorbia heterophylla, Bidens pilosa, Urena lobata* and *Paspalm conjugatum*.

In comparison with the 2006 report, this study observes differences in the dominant species mainly due to human activities rather than the dam construction. The dominant woody plants in the forest reserve in 2006 were *Albizia coriaria, Ficus ovata, Maesopsis eminii, Antiaris toxicaria, Vernonia amygdalina, Ficus vallis-chaudae, Holoptelea grandis,* and lianas such as *Urera trinervis* and *Loeseneriella africana*. The herbaceous vegetation is typical of forest species including *Desmodium velutinum*, *Hibiscus* sp. and *Pycreus polystachyos.*

Plate 6a: Degraded natural Forest Reserve on the western bank of river Nile at Kalagala land site
Plate 6b: Fallow land on the Forest reserve periphery at Kalagala land site

Plate 6c: Natural Forest reserve on the western bank of river Nile at Kalagala site
Plate 6d: Some of the big trees in the natural Forest reserve on the western bank of river Nile at Kalagala


Plate 6e: Tectonia plantation at Kalagala Forest reserve on the western bank of river Nile with indigenous trees growing underneath

Plate 6f: Cultivation of maize in the Kalagala forest reserve


Plate 6g: Cultivation of maize and beans in the Kalagala forest reserve

Plate 6h: Kalagala Island natural forest cover as observed from Kalagala land site

Plate 6i: Thickets of *Mimosa pudica* an invasive species in the Kalagala forest reserve

Xii) **Kikubamutwe area**

This area had three habitats assessed, namely the shoreline, riverbank and community land. The shoreline was dominated by *Broussonetia papyrifera*, *Hallea rubrostipulata* tree species, *Eichhornia crassipes*, *Triumpheta macrophylla* and *Vossia cuspidate*. Other less common ones were *Cissus rotundifolia*, *Hibiscus cannabis*, *Ipomea cairica*, *Ipomea rubens*, *Leersia hexandra*, *Maesa welwitschii*, *Markhamia lutea*, *Phoenix reclinata* and *Melananthera scandens.*

The riverbank habitat was dominated by *Broussonetia papyrifera*, *Fluggea virosa*, *Lantana camara*, *Markhamia lutea* and *Vernonia amygadalina*. Along stretch of NEMA-planted trees mainly of *Hallea rubrostipulata*and *Grevillia* sp was observed along the riverbank away from the Dam site. A few areas of cultivation, mainly of *Zea mays* (Maize) and *Phaseoulus vulgaris* (Beans), were observed.

Community land was all cultivated, mainly of *Musa* sp, *Coffea robusta*, *Phaseoulus vulgaris* (beans) with scattered trees of *Maesopsis eminii*, *Markhamia lutea*, *Broussonetia papyrifera*, *Sapium ellipticum*, *Milicia excelsa*, *Grevilia* spand*Dracaena fragrans*. Others were mainly weed plants such as *Achyranthes aspera*, *Bidens pilosa*, *Cynodon dactylon*, *Digitaria abyssinica* and *Oxalis latifolia.*

There were no significant differences between the results of 2006 and 2017 in Kikubamutwe area. In 2006, the dominant species were *Broussonetia papyrifera*and *Lantana camara. Albizia* spp, *Artocarpus heterophyllus* and a typical pioneer tree species, *Trema orientalis,*were fairly common. The herbaceous vegetation was dominated by *Bidens pilosa, Digitaria abyssinica, Conyza floribunda,* and *Dyschoriste radicans*. Seedlings and saplings of Ficus, Albizia and *Maesopsis eminii* were also observed in this area.

Plate 7a: Shoreline vegetation with planted trees on the riverbank of Kikubamutwe side
Plate 7b: Kikubamutwe shoreline vegetation near point 1


Plate 7c: Shoreline vegetation with planted trees on the riverbank of Kikubamutwe side-fig tree
Plate 7d: Shoreline vegetation with planted trees on the riverbank of Kikubamutwe side-*Phoenix sp* with NEMA planted trees in the background


Plate 7e: Riverbank with planted trees by NEMA and Maize at Kikubamutwe side
Plate 7f: Riverbank with planted trees by NEMA at Kikubamutwe side-*Halea* & *Grevilia* spp

Plate 7g: Kapaata Island about 500m from the damsite down stream at Kikubamutwe

xiii) **Malindi *area***

The study site had three habitat types, namelyseminatural secondary vegetation between the access road and the riverbank, cultivation habitat on the left side of the access road towards community land though the transmissionline land, and a few marginal areas with natural vegetation.

The seminatural vegetation was dominated by *Aeschynome abyssinica*, *Cynodon dactylon*, *Lantana camara* and *Senna hirsuta*. Other species were *Desmodium trifolium*, *Indigofera spicata*, *Justicia exigua*, *Markhamia lutea*, *Mimosa pigra* and *Sporobolus pyrimidalis*. Malindi was the site of stone crushing during Dam construction, with slow vegetation recovery observed, as shown in Plate 8e. The cultivated land was dominated by *Zea mays* (maize) with few *Manihot esculenta* (Cassava). Marginal areas were dominated by *Vernonia amygadalina* and *Mimosa pigra*. Others were *Asystasia gangetica*, *Desmodium vermicissum*, *Lantana camara* and *Panicum maximum*. Malindi access road vegetation recovery was observed and shown in Plate 8f. A remnant planted woodlot was also observed on the left side of the access road about 50m away.

This site was not assessed in 2006, hence no comparison is done. However, plant regeneration is observed after levelling the soil that had been dumped there and the refilled valleys that used to lead water to the river.

Plate 8a: Malindi secondary vegetation after dumped soil leveling with Dam site in the background
Plate 8b: Malindi secondary vegetation dominated by *Cynodon dactylon* and *Sporobolus pyramidalis* after leveling the damped soil from Dam construction (near point 1)


Plate 8c: Malindi secondary vegetation dominated by *Vernonia amygadalina* and *Melinis repens* after leveling the damped soil from Dam construction (near point 1)

Plate 8d: Malindi secondary vegetation up to the river, showing trees, shrubs and herbaceous plants after leveling the damped soil from Dam construction


Plate 8e: Malindi site of stone crushing during Dam construction with slow vegetation recovery

Plate 8f: Malindi access road vegetation recovery in the foreground; marginal vegetation and cultivation in the background


Plate 8g: Access road side in foreground, Cultivation mainly of Maize and traditional agroforestry trees in the background

Plate 8h: Maize cultivation with woodlot on land bought by Project in the background

xiv) Isimba Dam site

This area had three sites sampled, namely Isimba Dam site-Nampaayi inside the fence, Isimba Dam site-Nampaayi outside the fence, Kuva Island and community land.

Isimba Dam site-Nampaayi inside Fence area was dominated by *Acacia kirki*, *Markhamia lutea*, *Pluchea ovalis*, *Sida acuta*, *Hypoestes aristata*and *Cynodon dactylon*. The wetland section had specialized plant species of *Leersia hexandra* and *Typha latifolia* common. Other less common species were *Abutilon mauritianum, Albizia coriaria*, *Lantana camara*, *Fluggea virosa*, *Sporobolus pyrimidalis*, *Digitaria abyssinica* and *Digitaria tanata*.

Isimba Dam site-Nampaayi outside Fence was dominated by *Markhamia lutea*, *Coffea robusta*, *Digitaria abyssinica*, *Desmodium ripandum* and *Zea mays* (Maize).*Claredendron* sp was only dominant in disturbed site with deposits of small stones near the stone crushing site. Other species include the *Albizia coriaria*, *Jatropha curcus*, *Lantana camara*, *Asystasia gangetica*, *Hypetes* sp and *Euphorbia heterophylla*. Common crops grown were *Zea mays* (maize) and *Phaseolus vulgaris* (Beans).

Kuva Island is within the fenced land but has many heaps of stones and gravel, with the natural vegetation mainly at the periphery extending about 60m to the water. The island was dominated by *Broussonetia papyrifera*, *Vernonia amygadalina*, *Cyperous papyrus*, *Cyperous dives*, *Ipomea rubens*, *Cynodon dactylon*. Other less common species were *Acacia* (in water), *Aeschynomene* sp, *Markhamia lutea*, *Milicia excelsa*, *Croton* sp, *Panicum maximum*, *Phoenix reclinata*, *Mimosa pigra*, *Oryza* sp, *Sorghum arundinaceum* and *Vossia cuspidata.* This island had the highest species richness during the 2006 EIA report (Pers comm., Environment Officer).

The community land was all cultivated, dominated by *Artocarpus heterophylla*, *Coffea robusta*, *Maesopsis eminii*, *Markhamia lutea*. Other less common species include *Albizia coriaria*, *Ficus brachypoda*, *Ficus natalensis*, *Jatropha curcus*, *Milica excelsa*, *Mangifera indica*, *Spathodea campanulata*, *Senna spectabilis* and *Calliandra calothyrsus.*

Plate 9a: Isimba dam land with cultivation of maize, beans and sweet potatoes and no trees
Plate 9b: Cultivation mixed with fallow land on the western side of the stone crushing equipment


Plate 9c: Seminatural vegetation near western side of the stone crushing equipment
Plate 9d: Heaps of crushed stones near the stone with Claredendron plant


Plate 9e: Bareground near the litter collecting center and stone crushing site western side of the Dam
Plate 9f: KUVA Island with heaped soil and stones near Dam site within Isimba Dam fence (Island with highest plant spp during EIA)


Plate 9g: Seminatural vegetation on marginal land on KUVA Island
Plate 9h: Maize cultivation up to shoreline Kasaana village


Plate 9i: Seminatural vegetation on marginal land near Dam site within Isimba Dam fence
Plate 9j: Maize cultivation on the land between water and accecss road for stones collection (continuation from the inside fence sampling site)


Plate 9k: Seminatural vegetation on heaped soil near stone crushing equipment within Isimba Dam fence
Plate 9l: Wetland vegetation between heaped soil and the water within Isimba Dam fence


Plate 9m: Seminatural vegetation with heavy grazing by cattle between heaped soil and the water within Isimba Dam fence
Plate 9n: Maize Cultivation on Isimba land side (foreground) and woody plant community on local people's land in the background

xv) **Mabira Forest Reserve *area***

Mabira forest reaserve had two main habitat types, namely the near-primary undisturbed forest and the secondary forest after human disturbance. The site was among the reserves included within the Kalagala Falls Site meant to be conserved through a sustainable management programme to ensure the effectiveness of the Kalagala offset ecosystem together with Kalagala CFR and Nile Bank CFR on the banks of Kalagala Falls.
The primary forest was dominated by one tree species,*Celtis mildbraedii.* Other tree species were *Rothmania* sp, *Albizia grandbracteata*, *Trilepisium madascariensis*, *Broussonetia papyrifera*, *Markhamia lutea*and *Celtis durandii.* The herbaceous plants were dominated by *Leptaspis cocheleata*, *Olyra latifolia* and *Geophilia repens.*

The secondary forest habitat was dominated by two tree species of *Funtumia Africana and Markhamia lutea*. Other tree species were *Trichilia* sp, *Trilepisium madascariensis*, *Celtis mildbraediiAcalypha tanata*, *Albizia grandbracteata* and *Broussonetia papyrifera*. The herbaceous plants were dominated by *Leptaspis cocheleata*, *Pallisota schweinfurthii*, *Acalypha ornata* and Acanthaceae.

Mabira Forest reserve is a Protected Area with fairly adequate protection; hence the current 2017 species list of Mabira is not expected to be significantly different from that of 2006.

Plate 10a: Mabira forest Reserve, part of the disturbed secondary forest with more open canopy and small trees than the undisturbed one
Plate 10b: Mabira forest Reserve, the road used as transect in the disturbed secondary forest part


Plate 10c: Mabira forest Reserve, the undisturbed part near reference point dominated by *Celtis* sp
Plate 10d: Mabira forest canopy dominated by *Albizia* sp and *Celtis mildbraedii*

2.3 RESULTS AND DISCUSSION

2.3.1 Floristics

There were 452 species (as compared to 298 species in 2006), belonging to 292 genera (as compared to 215 in 2006) and 77 plant families (as compared to 75 plant families in 2006) (Figures 1a – 1e; appendices 1 & 2). The most dominant plant family was Fabaceae with 57 species followed by Poaceae, Euphorbiaceae, Asteraceae, Malvaceae and Moraceae and with 39, 30, 26, 26 and 17 species respectively (Appendix 1). The most dominant plant family in 2006 was Fabaceae with 40 species followed by Euphorbiaceae, Poaceae, Moraceae and Asteraceae with 27, 24, 21 and 15 species respectively. The most abundant genus was Ficus with 12 species followed by Desmodium and Cyperous each with 11 species and Ipomea with 9 species. The 2006 sampling showed that the most abundant genus was Ficus with 16 species followed by Phyllanthus with five species only. The most abundant growth form was that of Herb with 50.9% (262 species), followed by the Trees species with 24.8% (127 species) of the total, followed by Shrubs, 14.6% (75 species) and Lianas with 9.7% (50 species). These results were slightly different from those in 2006, where trees species constituted 30.5% (91 species) of the total, followed by forbs with 30.2% (90 species) and shrubs, 18.5% (55 species).

The commonest tree species recorded included *Markhamia lutea, Broussonetia papyrifera,* and *Milicia excelsa,* while for shrubs; they were *Vernonia amygadalina, Hibiscus diversifolia, Lantana camara* and *Melananthera scandens.* The most common herbaceous plant species were *Asystasia gangetica* and *Dichroste radicans.* These occurred in at least 8 of the sites surveyed (Appendix 1). Some of the common tree species recorded in 2006 of *Albizia grandibracteata* and *Maesopsis eminii* were not in 2017 although they were frequently encountered in the sites.

There were 20 exotic (non-native) species recorded of which *Broussonetia papyrifera* (Paper mulberry) and *Lantana camara* were the most common.

As observed in 2006, presence of the invasive *Broussonetia papyrifera* and *Lantana camara* in high abundances reflects the absence of tree cover, as they demand sunlight and can only proliferate under an

open canopysuch as were present in most sites surveyed. Langdale-Brown *et al*. (1964) argued that *Albizia* species represent early successional stages, which are eventually followed by *Celtis* and *Chrysophyllum* as the late successional species. Therefore, if succession is allowed to occur, *Lantana camara* and *Broussonetia papyrifera* (Paper mulberry) could eventually be eliminated as the indigenous tree species grow and provide tree cover, particularly in the fenced areas.

2.3.2 Species richness at the various sites

The Kalagala area registered the highest observed species richness of 159 species as observed in 2006, followed by Kikubamutwe and the Isimba Dam site each with 112 and Bujagali Islands with 109(Figure 1a & b). Isimba dam site was not assessed in 2006 since it was not under consideration for either development or offsetting at that time.The species richness at the Kalagala site, which is the most species-rich, is about 35% of the total plant species recorded. Differences in floristic compositions at different sites are due to varying habitat type conditions caused mainly by human activities of cultivation, construction and dumping of soil.

The high species richness at the Kalagala, Kikubamutwe, Isimba and Bujagali sites is partly due to the presence of semi-natural plant communities, while for Bujagali it may be due mainly to the presence of islands that had some parts of natural vegetation. The riverbanks at Kalagala, Kikubamutwe and Bujagali had diverse woody and herbaceous plants that increased their richness.

Namizi and Malindi sites registered the least numbers of species with 42 and 67 respectively. This is due to the intense agricultural activities and dam construction effects at Namizzi, while for Malindi, was due to effects of the dam construction and dumping of soil and levelling off the once small channels for water flow to the river. The main crops grown were *Zea mays* (maize) and*Phaseolus vulgaris* (beans). Most of the gardens had just been weeded hence there was no need tosample the herbaceous weeds. Naminya area and Namizi Island had the least numbers of species in the 2006 survey, with 56 and 46 respectively, due to the intense agricultural activities.

Kalagala and Naminya sites had the highest number of woody and herbaceous species, while Itanda site joined the two for liana species (Figure 1d). This was mainly due to minimal human activities and presence of different microhabitats. Bujagali, Naminya and Kalagala sites had each three invasive plant species mainly of *Broussonetia papyrifera, Eichhornia crassipes* and *Lantana camara* with Kalagala having *Senna spectabilis* instead of *Eichhornia crassipes* (Appendix 3; Figure 1e).

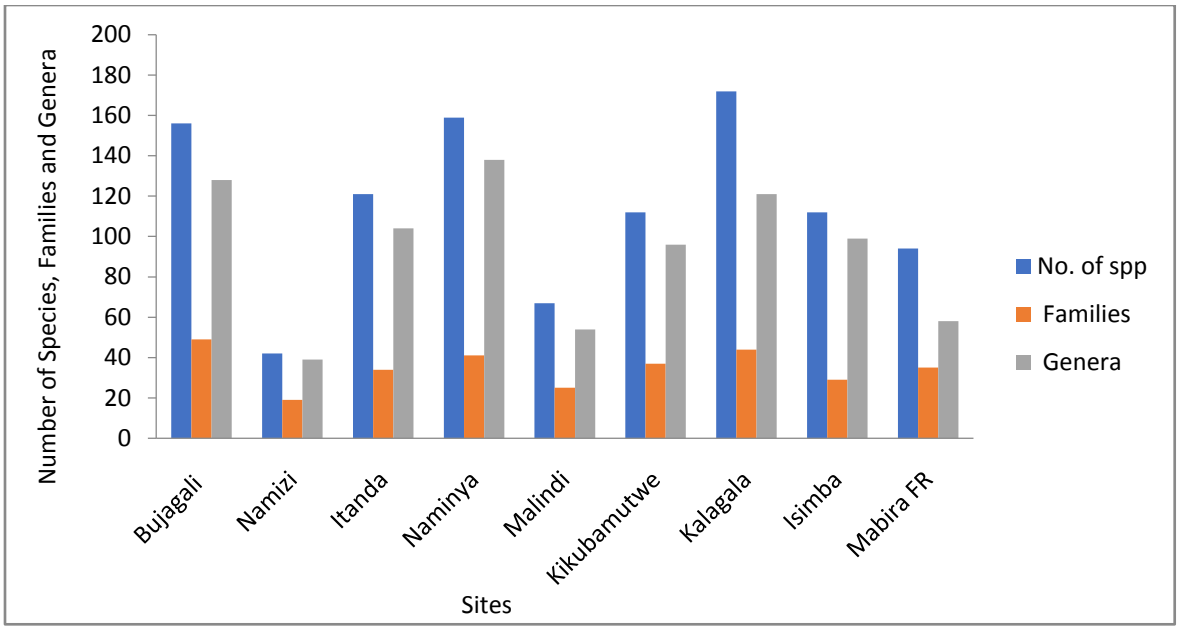

Figure 1a: Observed species, Families and Genera of the plant at various sites, 2017

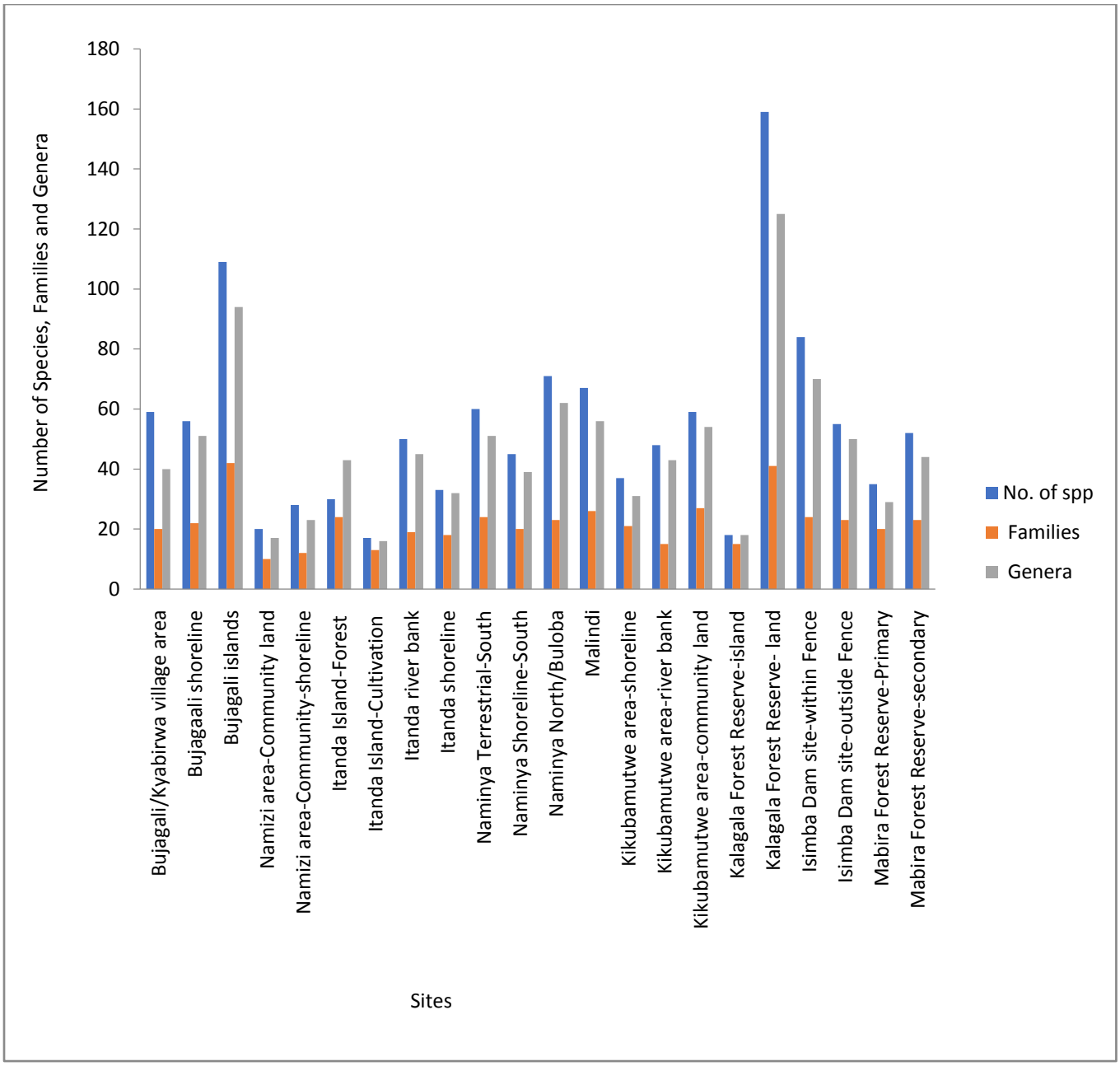

Figure 1b: Observed Plant species, Families and Genera at different microhabitats of the sites, 2017

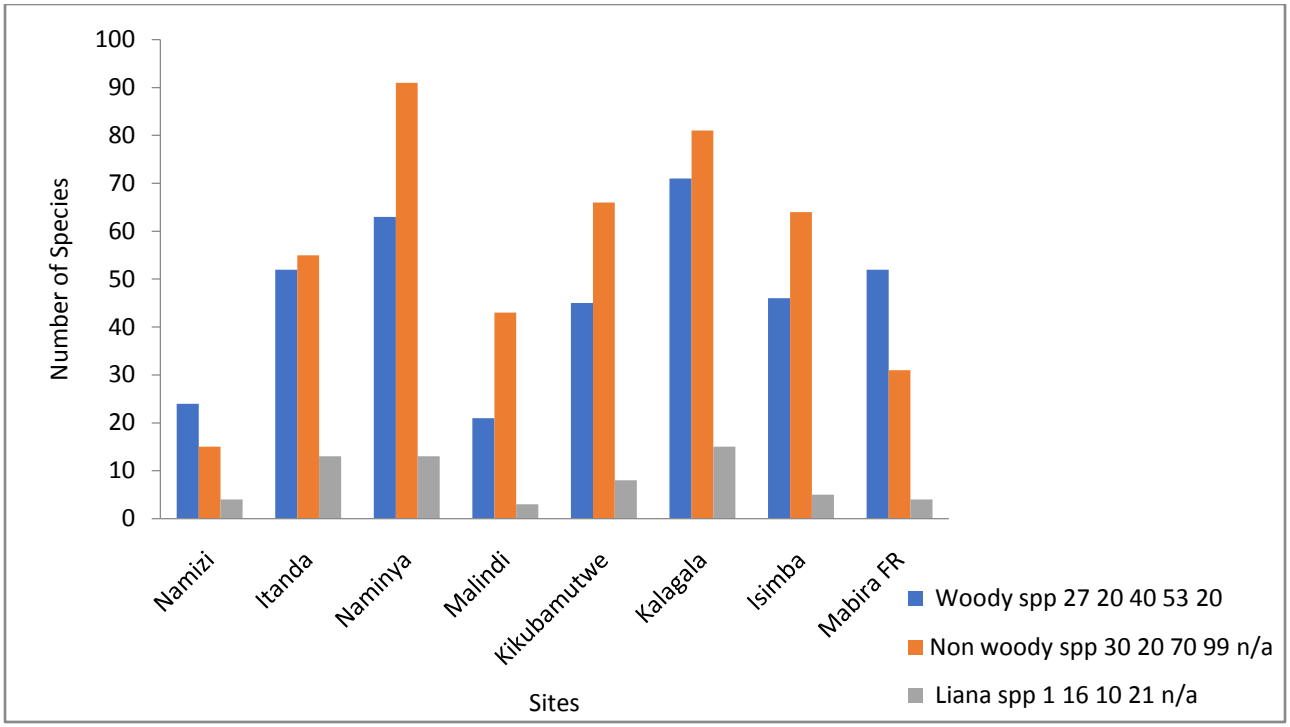

Figure 1c: Observed Woody, Non woody and Liana plant species at various sites, 2017

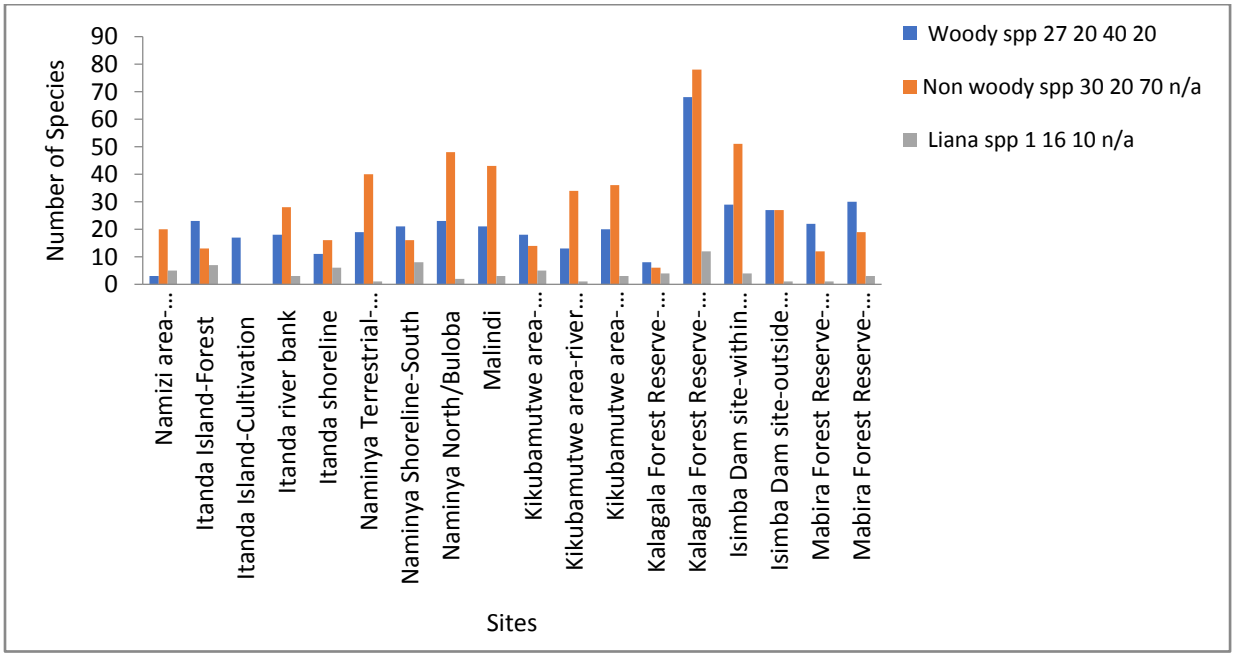

Figure 1d: Observed Plant Woody, Non woody and Liana species at different microhabitats of the sites, 2017

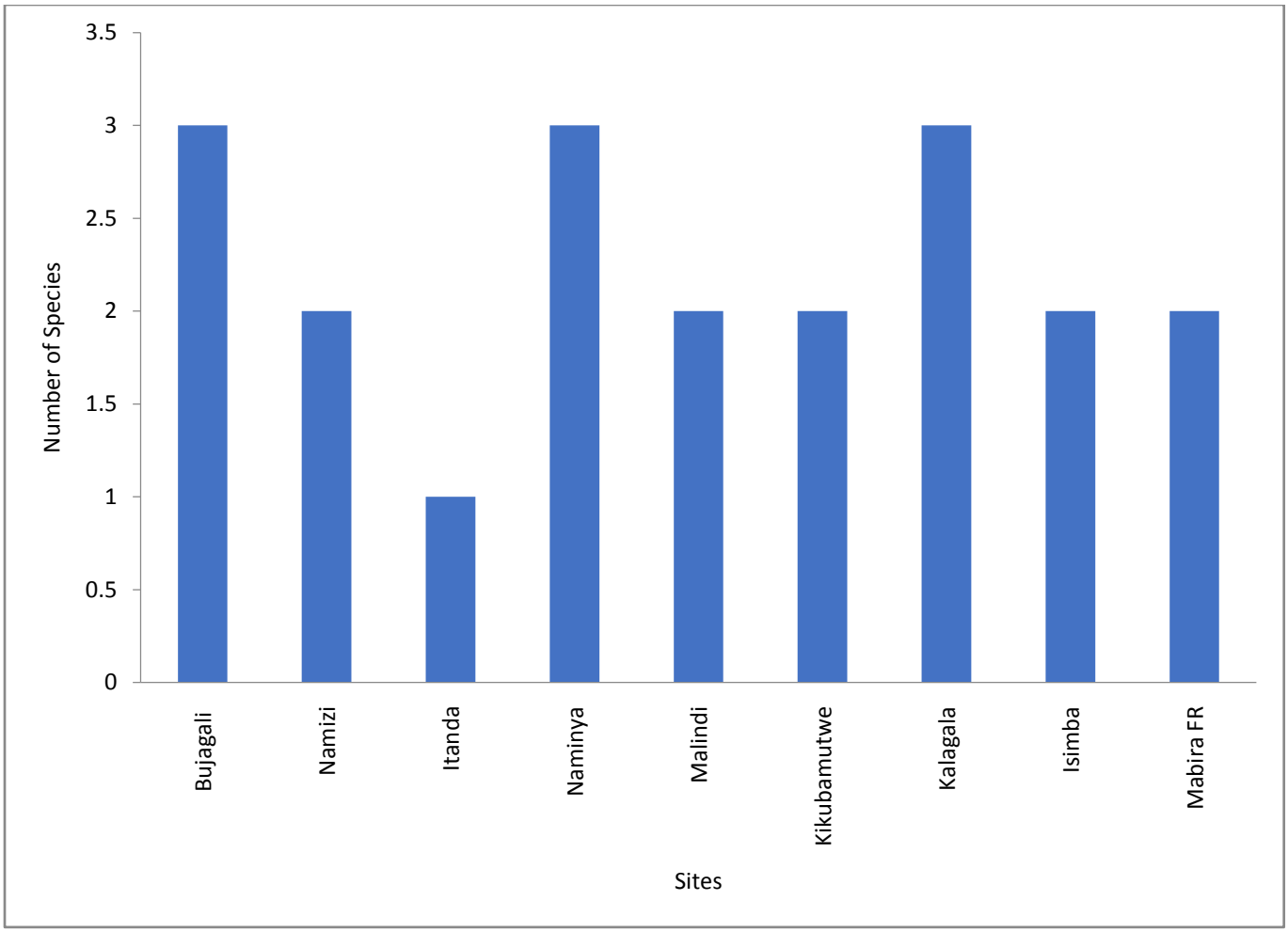

Figure 1e: Observed Invasive plant species at various sites, 2017

2.3.3 Site similarity

Species presence or absence was scored in the 13 sites and provided the basis for cluster analysis which, provided evidence of the similarlyof species assemblages among the 13 sites of the project area (Figure 2).

Three clusters were identified viz: Cluster A included Bujagali, Namizi, Itanda Islands and Nile Bank FR, sites that are all located on the eastern side of the river Nile (Figure 2). Cluster B had two subgroups consisting of B(i) that included Bujagali islands, Kikubamutwe, Naminya South and Kalagala Forest Reserve sites, and B (ii) that included Naminya North, Malindi and Isimba dam sites, all located on the western side of river Nile with exception of Bujagali islands. Cluster C included Mabira Forest Reserve both the primary and secondary sites (Figure 2), sites located abit further away from the west bank of the river Nile.

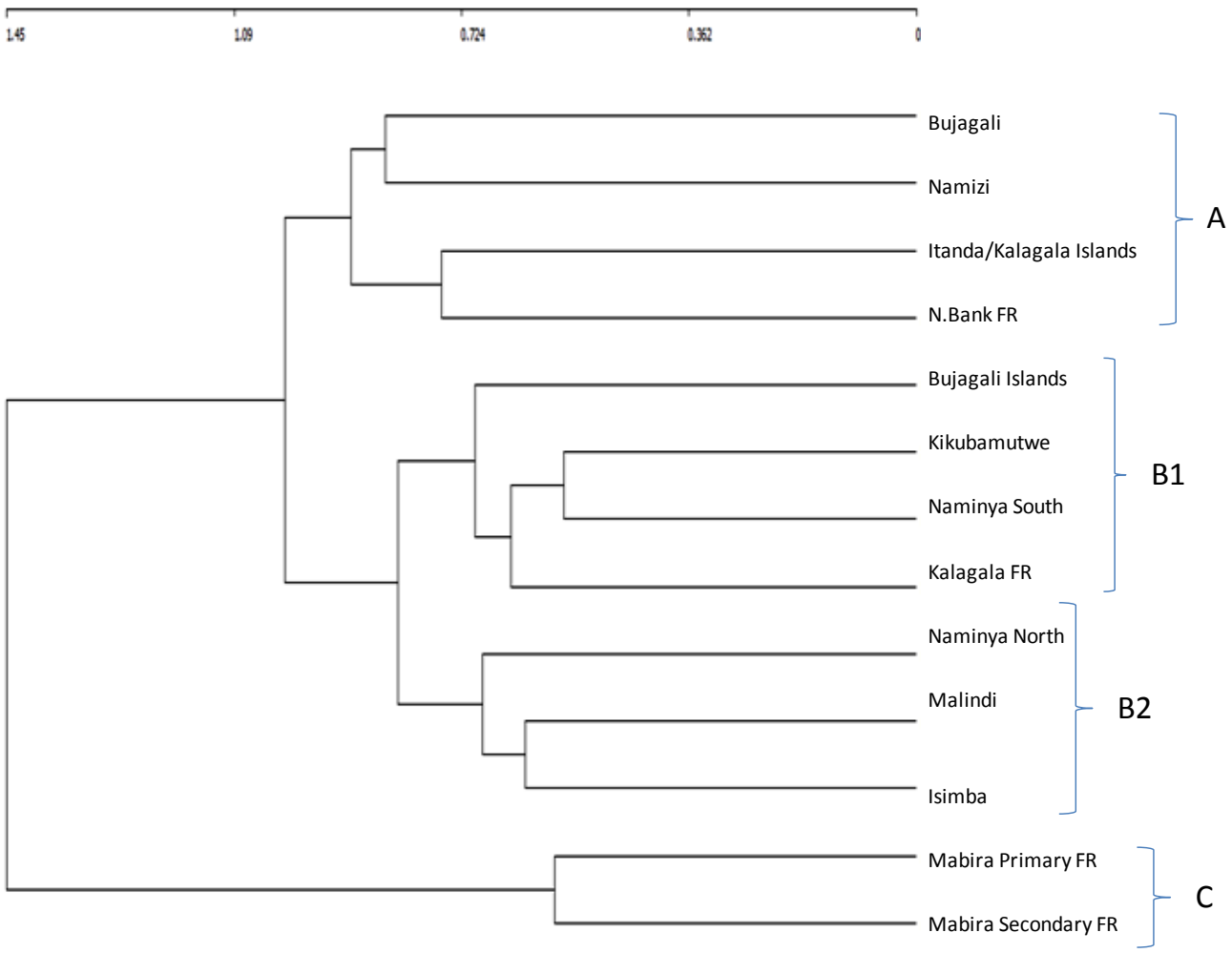

Figure 2: A Dendogram from the Cluster analysis of 13 sites of the project area based upon the presence or absence of 451 plant species. Site groupings (A, B & C) were done with ANOSIM (Analysis of similarity) and SIMPER (Similarity percentage).

Within **Cluster A**, Bujagali was more similar to Namizi than to Itanda Islands and Nile riverbank sites. This was due to high human disturbance mainly by agriculture (*Zea mays* and *Phaseolus vulgaris* crops) at Bujagali and Namizi than at Itanda site. Bujagali dam construction effects mainly though flooding had affected Namizi and Bujagali as they belong to the immediate impact zones, while Itanda was an offset zone and more characterized by natural vegetation. The common tree speices were *Artocarpus heterophylla*, *Broussonetia papyrifera*, *Markhamia lutea* and *Milicia excelsa*.

Cluster B (i) had Bujagali islands, Kikubamutwe, Naminya South and Kalagala Forest Reserve sites. This has less human effects of agriculture, thus with patches of natural or seminatural vegetation. Bujagali islands had much cultivation (*Zea mays* and *Phaseolus vulgaris* crops) done there but with natural plant species, some of them of forest type within patches in the centre and at the peripheries.Bujagali islands, Kikubamutwe, Naminya South had a lot of introduced and invasive plant

species of*Broussonetia papyrifera* and *Lantana camara.* Other common tree species were *Albizia grandbracteata, Albizia zygia, Broussonetia papyrifera, Markhamia lutea, Antiaris toxicaria* and *Coffea canephora*.

Cluster B (ii) had Naminya North, Malindi and Isimba dam sites were characterized by human activities mainly those of agriculture (*Zea mays* and *Phaseolus vulgaris* crops) especially at Naminya North, and Dam construction, with the latter affecting more Malindi and Isimba dam sites. The common tree species was *Broussonetiapapyrifera* with most plant species being of shrub growth form such as *Aeschynomene abyssinica, Senna hircuta,* and *Vernonia amygadalina*.

Cluster C consisted of only Mabira Forest Reserve, a natural plant community with vegetation charactristic of the natural tropical forests, and had minimal human disturbances. The common tree species were *Albizia grandbracteata, Celtis durandii, Celtis mildbraedii, Funtumia africana, Markhamia lutea, Ficus polita, Antiaris toxicaria* and *Broussonetia papyrifera*. Other common plant species were a shrub *Acalypha ornata* and a herb *Leptaspis zeylanica*.

Analysis of Similarity results:

The two groups considered were the immediate impact sites (Bujagali and Isimba) and offset sites (Kalagala, Itanda, Mabira) with different species observed in the field. The hypothesis was that there is no difference in the species composition between the sites of the two groups.The test statistics from ANOSIM and SIMPER for the significance of the two defined groups was 0.065, (Appendix iv a&b) and the probability value was 0.118, No. of observations (species) = 118.If we take 95% confidence interval, the results suggest that sites within each of these groups are not more similar in species composition than sites between the two groups.

3.4. Management options for the invasive exotic species

The 2017 reassessment identified four invasive plant species namely *Broussonetia papyrifera, Lantana camara, Senna spectabilis* and *Mimosa pigra,* with the first two being most common in most sites. All the plant invasives are introduced species from outside Uganda and thrive well in disturbed sites with minmal competition from the indigenous plant species. *Broussonetia papyrifera*was introduced for paper manufacture in Mabira and Budongo. It has the capacity to colonise open sites in pure stands. *Lantana camara* is believed to have been introduced in the 1960s for hedges and to construct stands for drying plates. It has the capacity to dominate (or suppress) other plant species.*Mimosa pigra has the capacity to* supress the growth of grass and prevents entry or movement by large animals.

Their invasiveness is due to their unique characteristics, namely of rapid growth rate, great dispersal characteristics, large reproductive capacity, broad environmental tolerance (posses life history traits that confer superior colonizing ability or ability to acclimate to a wide range of habitats), an effective

competitor with local plants, thus readily adapting to local selective pressures. Other factors are the local microhabitat conditions, mainly due to disturbance and the nature of the plant community.

There were indications by the 2006 survey that the late successional trees such Celtis, and Albizia would colonise the area resulting in reduction in coverage of *Broussonetia papyrifera* and *Lantana camara*. The current survey has observed a tendency of increase of these invasive species, however, especially *Broussonetia papyrifera,* in almost all sites surveyed. Therefore human interventions may be necessary to enhance the rate of reduction of the the invasive species.

2.3.5. A comparative overview with the previous vegetation survey done in 2006

The comparative overview is guided by the following questions viz: Are there plant species lost, gained or retained by 2017 reassessment, and which species are these? Are there plant species recorded in 2006 that are not encountered in all sampled sites in 2017, and which species are these? Dothe offset sites have all the plant species which were previously recorded in the impact zones (important if no net loss is the aim), and do they have any new plant species? Are the new plant species recorded in 2017 representative of the original natural vegetation in the area, or are they cultivated or invasive? Has overall natural vegetation cover changed over time in the assessed sites, and if so, is this more likely to be because of activities linked to the development or offset or human activity more generally?

There was a proportionately greater increase in species (increase of 52%) than genera (+36%) and families (+3%), which would be expected given the larger numbers involved at the lower taxonomic levels (Figure 3).

The composition of the species recorded changed, over time; in 2006, herbs made up 30% of the observations while in 2017 they made up 51%. This went along with a slight reduction in the % of the sample made up of other growth forms (with trees down from 31% to 25%, shrubs from 19% to 15% and lianas from 21% to 10% (Figure 4). Some of the most common tree species recorded in 2006 were less common in 2017 (*Albizia grandibracteata* and *Maesopsis eminii*) although they were still frequently encountered in the sites. There were 20 exotic (non-native) species recorded in 2017 of which *Broussonetia papyrifera* (Paper Mulberry) and *Lantana camara* were the most common.

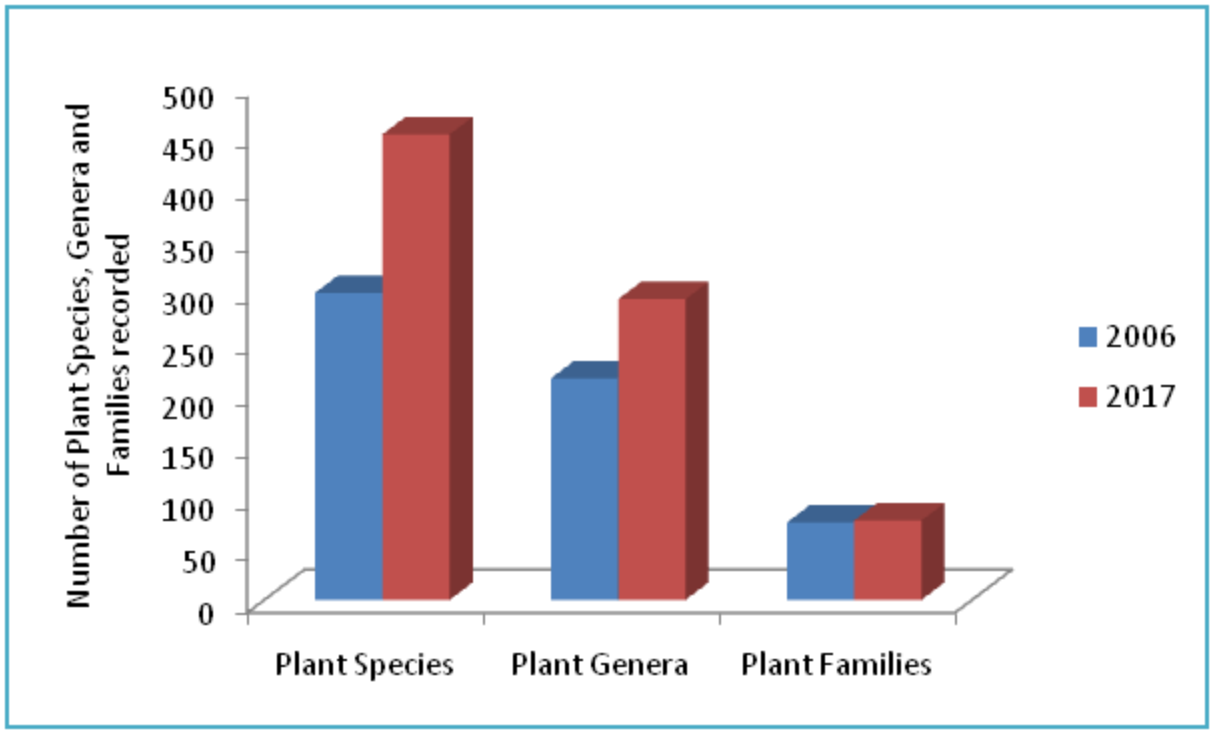

Figure 3: Variation in the plants recorded in the sites surveyed in 2006 and 2017

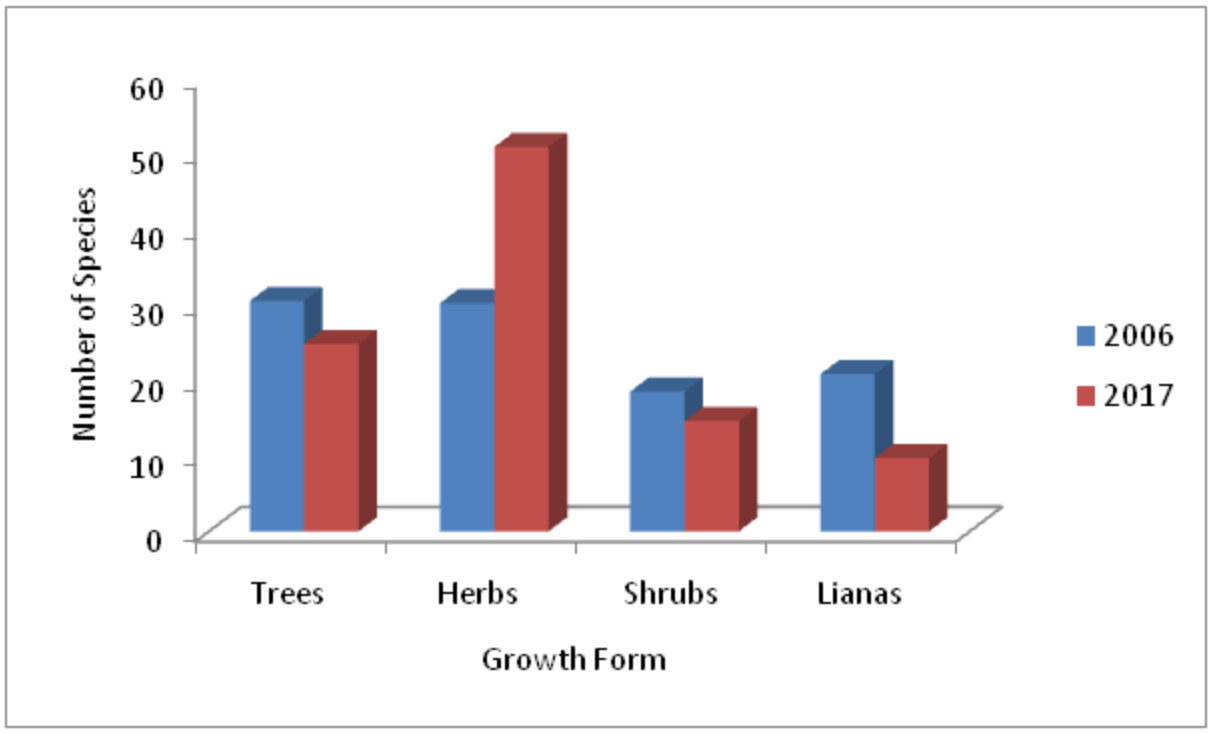

Figure 4: Variations between the plant growth forms recorded in 2006 and 2017 in the sites surveyed

A total of 134 (45% of 298) plant species were only encountered in 2006, 239 (53% of452) in 2017 only, and 137 (30% of 452) in both 2006 and 2017 assessments. Therefore, a total of 134 (45%) plant species were lost by the 2017 survey. Some of the key woody indigenous plant species which were not recorded in 2017 were *Albizia glaberima, Alstonia boonei, Baikiaea insignis, Celtis wightii, Cola gangentica, Combretum collinum, Ficus conraui, Ficus cordata, Ficus mukuso, Ficus saussareana, Harrisonia abyssinica, Larnea schwenfurthii, Manilkara obovata, Mimusops bagshawei, Parkia filicoidea, Premna angolensis, Raphia farinifera, Pycnanthus angolensis, Ricinodendron heudelotii* and *Warbugia ugandensis*.

The most probable reason for the plant species not being encountered in 2017 is that some species have been lost out of the area or their numbers significantly reduced so that they were not recorded in the resampled area, due to the increased human activities in the area such as agricultureand other landcover conversion activities.

Key woody plant species retained between 2006 and2017 were:*Milicia excelsa, Maesopsis eminii, Antiaris toxicaria, Markhamia lutea, Acacia polycantha, Acacia kirkii, Albizia coriaria, Albizia grandbracteata, Albizia gummifera, Albizia zygia, Acalypha neptunica, Blighia unijugata, Canarium schweinfurthii, Dombeya mukole, Ficus exasperata, Ficus natalensis, Ficus pseudomangifera, Ficus ovata, Ficus vallis choudae, Celtis mildbraedii, Celtis africana, Ficus ottoniifolia, Artocarpus heterophylla, Mangifera indica* and *Persea americana*, with the last three being introduced fruit tree species.

Key woody plant species gained were:*Cordia milleni, Pseudospondias microcarpa, Spathodea campanulata, Vepris nobilis* (Teclea sp), *Shirakiopsis elliptica* (Sapium sp), *Aeschynomene elaphroxylon, Aphania senegalensis, Balanites wilsoniana, Beilschiemedia ugandensis, Bequaertiodendron oblanceolatum, Barkea africana, Elaeis guinensis, Ficus brachypoda, Ficus eriobotryoides, Ficus polita, Ficus stipulifera, Hallea rubrostipulata, Kigelia africana, Macaranga schweinfurthii, Trilepisium madagascariensis (Bosquea* sp*), Phoenix reclinata,* and *Psidium guajava*, with the last being an introduced fruit species. The increased agricultural activity and construction activities as forms of disturbance may have given a chance to opportunistic species to grow, hence increasing the species richness.. Additionally, the increase may also be due to the higher sampling effort and sampling in othe other microhabitats, such as shoreline zones which were surveyed in 2017 but not in 2006.

Key woody species in the offset areas were: *Markhamia lutea, Antiaris toxicaria, Ficus exasperata, Fucus polita, Albizia grandbracteata, Albizia coriaria, Albizia zygia, Cordia milleni, Pseudospondias microcarpa, Acalypha neptunica, Acacia kirkii, Aeschynomene abyssinica, Croton megalocarpus, Rothmania urcelliformis, Trilepisium madagascariensis,* Trichillia spp, *Funtumia africana, Celtis mildbraedii* and *Celtis durandii*, with the last three common in Mabira FR. Two of the 10 sites surveyed had high plant species richness for all growth forms. These were Kalagala with 38% of the species and Isimba and Kikubamutwe with 25% of the species observed. Overall, in 2017 the Biodiversity-offset areas contained 54% of the plant species encountered in 2006 (162 out of 298).

Biodiversity-offset areas were expected to fully compensate for biodiversity impacts in the development impact sites, hence resulting in an overall biodiversity gain. With the above findings,there seems to be a

reasonable amount of species diversity in the area, although the increase is mainly in the herbaceous growth form rather than the trees, which instead reduced from 30.5% in 2006 to 24.8% in 2017. The observed increase in human activities, especially agriculture and plantation tree planting, may have contributed to the loss of plant species from these areas, as well as an increase in the number of invasive species, which lowered the integrity of the sites.

Reassessed sites that were significantly different between the years were Namizi site, where in comparison with the 2006 assessment cultivation habitat had expanded.The second overall difference is the dominance of introduced planted tree species at the expense of native ones (with the exception of *Milica excelsa*) within cultivated areas.The third one is that, the riverbanks are dominated by *Zea mays* (Maize) and *Phaseolus vulgaris* (Beans), cultivation, with a few Eucalyptus trees planted in one locality. The Namizi Island itself was not seen, suggesting that it had been fully submerged and not existing any more due to the dam construction. This was confirmed by our local resident. The list of plant species recorded in 2006 does not indicate loss of any threatened plant species, so the difference is more to do with loss of areas of semi-natural vegetation rather than loss of species.

The 2017 reassessment did not encounter Dumbell Island, suggesting that it might have been submerged by water after dam construction, with further loss of semi-natural vegetation. The Itanda site had significant changes only at *Nile Bank Forest Reserve.*Since the 2006 assessment, much of the Nile Bank Forest Reserve was under a Pine (*Pinus* sp) plantation established in 2008, with a few areas of*Tectonia grandis*;both are introduced tree species. A large section of the bank had *Zea mays* (Maize) cultivation up to the shoreline. In comparison with the 2006 report, Kalagala site had differences in the dominant species mainly due to human activities rather than the dam construction.

Reassessed sites that were not significantly different were Bujagali, apart from the observed feature of the presence of tree stumps emerging out of the water surface suggesting submergence of small islands and extension of the water line into the riverbank (Image). This observation is likely to be caused by the dam installation. Another one is Itanda site for the Itanda Island, Itanda Island cultivation area, and the riverbank. Naminya South site and Kikubamutwe area had no significant changes in the plant community as compared to 2006 survey.

Sites with no 2006 comparison were: first, Malindi that was not assessed in 2006. However, plant regeneration was observed after levelling the soil that had been dumped there and the refilled valleys that used to lead water to the river. Second was Naminya North site. However, when compared with the nearest 2006 assessed area of Naminya South, it is significantly different due to intense cultivation that has taken place over the years. The other sites without a 2006 assessment were Isimba and Mabira Forest Reserves.

2.4 CONCLUSIONS

Current findings indicate that there were no significant differences in the plant species composition of the sites within and between the immediate impact sites and offset sites. In comparison with the 2006 plant survey, there was an increase in the species richness in the areas resurveyed in 2017 mainly due more herbaceous plant species that came up due to the disturbance by human activities, especially from agriculture and dam construction activites in most of the sites. However, on the basis of the common species in the impact zone sites, there is little evidence of effective recovery towards the original natural plant community, as many woody indigenousspecies had been lost.

Some species may still be present in low abundance although not sampled; hence it would be possible to find them in future sampling efforts, while other species may have been lost from the area. The increased agricultural activity on the eastern and western sides of the river and on the islands, together with the dam construction activity contribute to the change in plant composition especially in the immediate impact zones as opposed to the offset areas. It is most likely that dam construction activities could have led to increased agricultural activities on the riverbanks. The dam construction activities most likely led to the disappearance of two islands with all their natural vegetation, although there were no threatened plant species lost, and most of the others were found in other areas.

In 2017, the Biodiversity-offset areas contained about half the species which were found in the Bujagali Hydro Power Project area in 2006. The hydropower project area retains about 30% of the species which were there in 2006. This suggests that some biodiversity net loss may have taken place in our study sample sites in terms of species, alongside the definite and uncompensated loss of semi-natural habitat from island submergence of all land area for the two islands of Dumbell and Namizi which were meant to be in our sampling area but were not found. The degree to which the non-construction land use changes in the development and offset areas (plantations, agricultural expansion, especially in the riparian zone) were affected either positively or negatively by the hydropower project is not possible to ascertain.

Therefore, from a biodiversity offset perspective, there has been a net gain of species diversity (although not all these are desirable) since local species diversity has increased, and threatened species have been retained, but there has been a net loss of habitat area due to the fact that the total area of semi-natural vegetation that was originally in the area before the dam construction has decreased (especially due to the loss of the islands and loss of natural vegetation in favour of exotic trees).

The mitigation measures which were envisaged in the 2006 ESIA, especially replanting with trees on the riverbanks, were very minimal.Most riverbanks still had human activities commonly observed onthem.riverbankAttempted tree planting was observed at Kikubamutwe, Kalagala, Itanda and to small extent at Naminya South and North. This suggests that more efforts for tree planting, especially with indigenous species along riverbanks, are needed.

CHAPTER III

FAUNA DIVERSITY-BIRDS

3.1 INTRODUCTION

Hdropower production is widely accepted as a high potential strategy in climate change mitigation, however, it is important to identify and tone down the most important cause-effect pathways related to hydropower production on biodiversity, as one of the most common renewable energy sources (Gracey & Verones, 2016). There's need to balance the achievement of the development goals of the country in terms of water, food and energy production, as an integrated whole, together with the biodiversity and other related sectors and scales (van der Bliek et al. 2014). Although biodiversity for example some bird species, are affected by the dam construction activities, other species like ducks can happily survive in such areas, but appropriate management may also improve the chances of such areas being rich habitats for several duck species (Sandvik, 1996). The implementation of offsets in such project can help in achieving this and ensuring not many species are affected. The weakness in this is ensuring that the offset is implemented as required for the successful survival of the species.

In this study on birds we assess the state of the birds of Bijjagali Area after the construction of Bujjagali Dam and the success of the Kalagala offset in safeguarding the species which were likely to be affected by the dam construction activities and the after effects of the consruction. We furtherassess the likelihood of the Isimba Dam construction to affect the performance of the Kalagala offset.

Uganda holds at least 1057 confirmed bird species representing almost 50% of the species recorded on the African continent (NatureUganda, 2015). Bujjagali area consists of a wide range of bird species resulting from the diverse habitats in the area ranging from Forests through weltlands (including open water) to grasslands. The sites surveyed covered sections of most of these habitats resulting in a good record of species.

3.2. BIRD SURVEY METHODS

To understand the story about the birds in the area, two kinds of bird surveys were conducted; these were the Land Bird surveys and Water bird surveys, which exploited different survey protocols.

3.2.1. Land Bird survey Methods

In both the previous and the current surveys, the Timed Species Count (TSC) method was used where birds are counted for an hour in a semi-randomly selected site, and repeats done at each site. Semi-random in such a way that transects follow pre-existing routes (paths or tracks) rather than cutting fresh transects through the selected sites. During the counts, bird species are recorded in the order in which they are seen or heard or and scored at 10-minute intervals. The species encountered in the first 10 minutes are given a score of 6, those in next 10-20 minutes 5, those 20-30 minutes 4 and so on until the score of 1 for those recorded in the last 10 minutes (Freeman *et al.* 2003). This method assumes that species that are common will often be recorded earlier on in the first minutes, and the rare less abundant

will be seen in the last minutes. The counts are repeated for each site preferably using a different route and the average of the TSC score for a species gives the estimate of the abundance of that species (relative abundance). .

3.2.2. Water Bird Surveys

During the surveys, opportunistic observations of water birds were made at various points along the river at all the sites and we registered a great number of migratory birds. The birds recorded in this case were those species seen on the open water.

3.2.3. Species identification

In the field, 8 x 42-field binoculars and field guides were used. Birds in the sites were identified using standard field guide reference books: A Field guide to the Birds of East Africa by Stevenson & Fanshawe (2002); The Uganda Bird Atlas by Carswell et al. (2005).

3.2.4. Bird classifications

Bird species recorded were grouped into different categories basing on different criteria.

i) Habitat classifications

Birds recorded were classified into ecological categories where possible basing on the standard habitat classification by Bennun *et al* (1996). In this classification, we have;

- FF forest specialists – these are true forest species most characteristic of the interior of undisturbed forest. Breeding also happens in the forest.
- F Forest generalists – typical birds of forest edges and gaps.
- f species – forest visitors and breeding is outside the forest.
- G species – grassland species
- W Water birds normally found near water, in wetlands or open water.

ii) Migratory classifications

Bird species with migratory tendency were also considered as derived from the Uganda Bird atlas (Carswell *et al*. 2005). There were two categories of migrant species considered below.

AM Afro-tropical migrants PM Pale-arctic migrants

However some species can be both Afro-tropical and Pale-arctic migrants.

iii) Conservation status

Birds were further classified according to their conservation status i.e. whether they are species of conservation concern (C) as from (Collar & Stuart 1985, Bennun & Njoroge 1996) described as species of Global (G-) or Regional (R-) importance in the categories of;

- CR Critically Endangered e.g. (Globally (G-CR) or Regionally (R-CR))
- EN Endangered VU Vulnerable
- NT Near-threatened *RR Regional Responsibility

Species not in any of these categories are Least Concern.

*(species whose status is not of global concern but regionally, it may be under threat in some areas)

3.2.5. Data Analysis

For analysis and comparison of the results and the previous years, relative abundance of all the species in the different sites was computed by finding average for the TSC score of the species in the different sites. This average depicts the relative abundance for the bird species seen or heard. The TSC method assumes that the birds seen first are more abundant than those seen last and thus those seen first are assumed to have been seen easily and thus are more abundant than those seen later which are more difficult to see (Freeman *et al.* 2003). The scores for the relative abundance thus range between 0 for species not recorded to 6.0 for species recorded in all counts. The opportunistic records for the water birds were used as an indication of the presence of the species at the site. The breeding records were the major highlights here and they indicate the level of importance of the sites for the survival of the bird species.

3.3. RESULTS AND DISCUSSION

3.3.1. Land Birds

A total of 259 bird species was recorded during this study (Appendix 3.1). Kalagala, Naminya and Namizi sites recorded the highest number of species during this count. Similarly, Kalagala, Naminya and Isimba sites recorded the highest relative abundance of species (Figure 3.1). Generally, most sites were species rich with the majority having more than 80 species (Figure 3.1).

3.3.1.1. Species of Conservation Concern

Species of global concern were recorded and these included; an individual of Basra Reed Warbler *Acrocephalus griseldis* (Endangered) recorded at Namizi in the reeds next to the shores as well as the Grey-crowned Crane *Balearica regulorum* (Vulnerable) recorded in Kalagala (Appendix 3.1). However many other species of regional concern were also recorded during the surveys as shown in the Appendix 3.2 & 3.3.

3.3.1.2. Comparing past and present records

The number of birds recorded in 2017 (190 species) was much higher compared to 1998 (77 species) and 2006 (120 Species, Figure 3.2). A total of 210 bird species was recorded for all sites surveyed in 1998, 2006 and 2017 (excluding Mabira and Isimba areas which were not surveyed in previous years). Even with the number of species from 1998 and 2006 combined (129 species), 2017 still recorded more species. This change could be attributed to either changes in the habitat of the surveyed sites, increased area surveyed or increase in survey effort but this was not assessed. Although (8%) 15 of the species

recorded in 1998 and 2006 were lost in the 2017 surveys, most of which were migratory species (Appendix 3.3), 32% (67) of the species were maintained in all counts and 39% of the species (81) were gained in 2017. 18% (37) of the species were maintained between 2006 and 2017. There were other variations in species classes over the years but these generally indicate an increase in the number of sensitive species in the sites surveyed over the three years (Figure 3.4, Figure 3.5, Figure 3.6 and Figure 3.7)

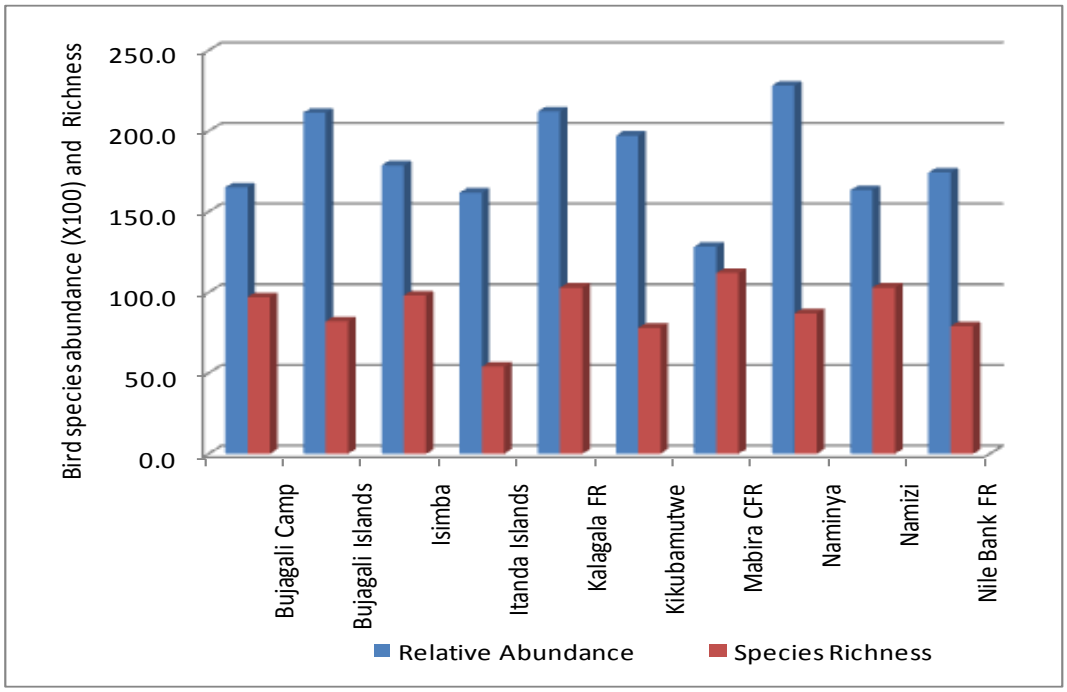

Figure 3.1: Relative abundance and species richness of the sites surveyed

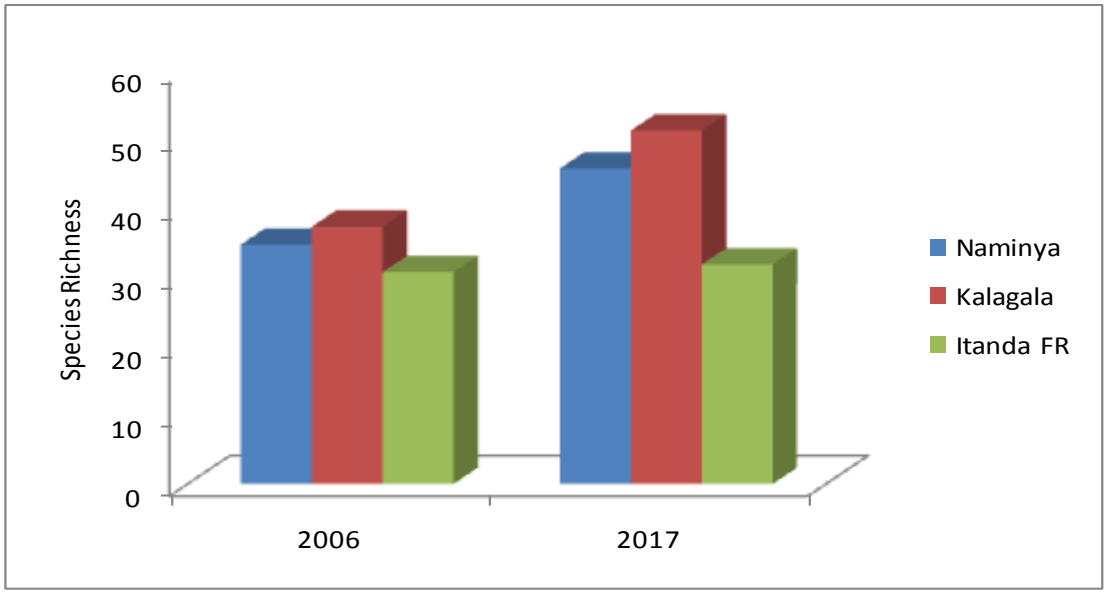

Figure 3.2: Comparing number of species recorded during the 2006 survey and the 2017 survey.

The trend shows increasing number of species recorded over the years for Kikubamutwe, Namizi and Bujagali, the only sites which have been consistently included in the three surveys being considered (Figure 3.3). Considering these counts, Namizi seems to have improved in its capacity to support bird species, as indicated by the increase in the number of species recorded from the lowest amongst the three sites in 1998, to the highest in 2017 (Figure 3.3). But on average, all the sites seem to have improved in their capacity to support species, as seen from the increasing average number of species per count recorded for the three years (Figure 3.4). However, it is important to note that the two submerged islands of Dumbell and Namizi (among the Bujjagali Islands) completely lost their land area and some species might have been lost as well especially those that did not find suitable habitat within the offset and other availble sites. Among the 135 species recorded in the Bujagali Islands, 4% (5species) of the species were lost in the 2017 count, while 43% were maintained. This might indicate that although theland cover was lost, mot of the species were able to find suitable sites to continue their lives within the Islands. However, due to the long period between the counts, it is not known how quickly the species tsabilised within their new sites. On the contrary, 49% of the species recorded were gained in 2017, which may indicate stability or increase in suitable habitat conditions for more species on the islands (Appendix 3.5).

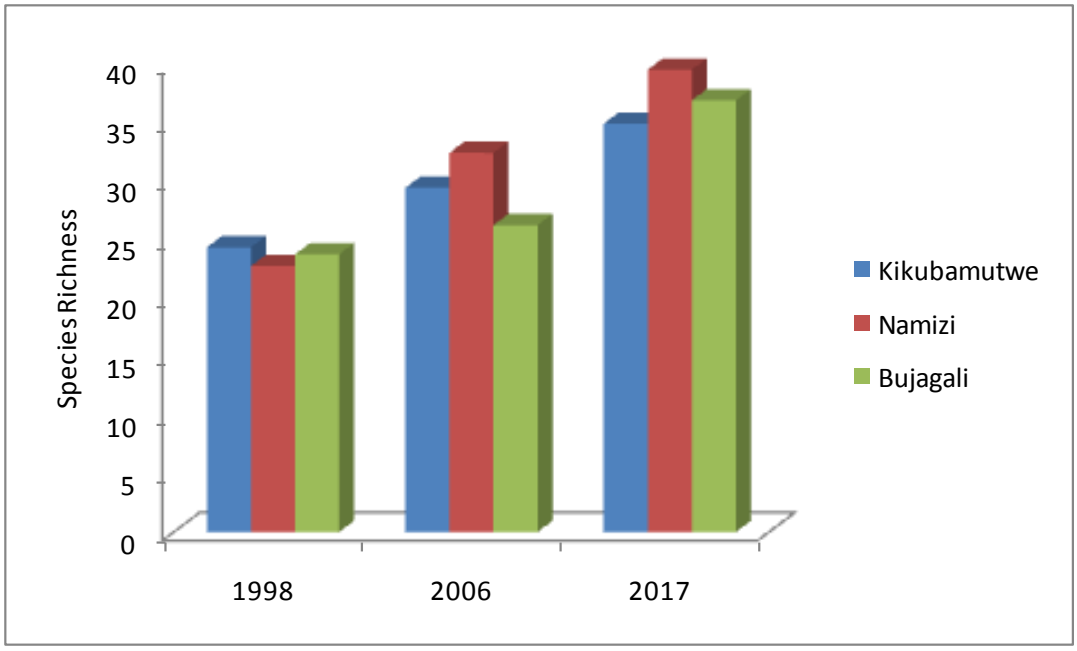

Figure 3.3: Comparing number of species (species richness) recorded during the surveys conducted in 1998, 2006 and 2017.

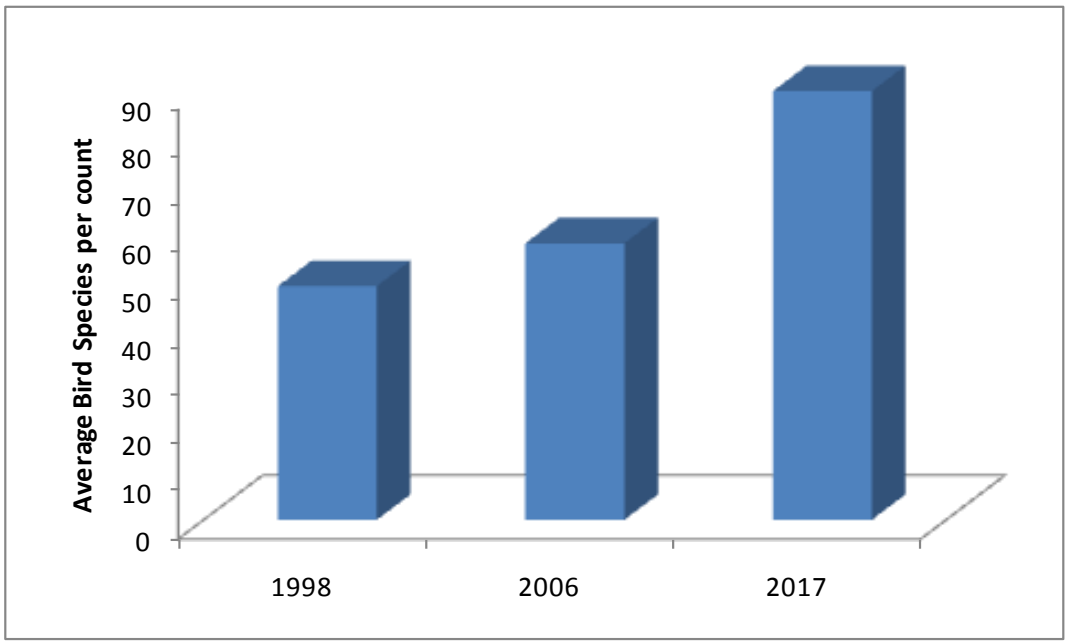

Figure3.4: Average number of Bird species recorded for the counts conducted in each of the three years, indicating a general increase in the number of species recorded per count. This may indicate an increase in the density of birds as each one-hour count increasingly recorded more species over the years.

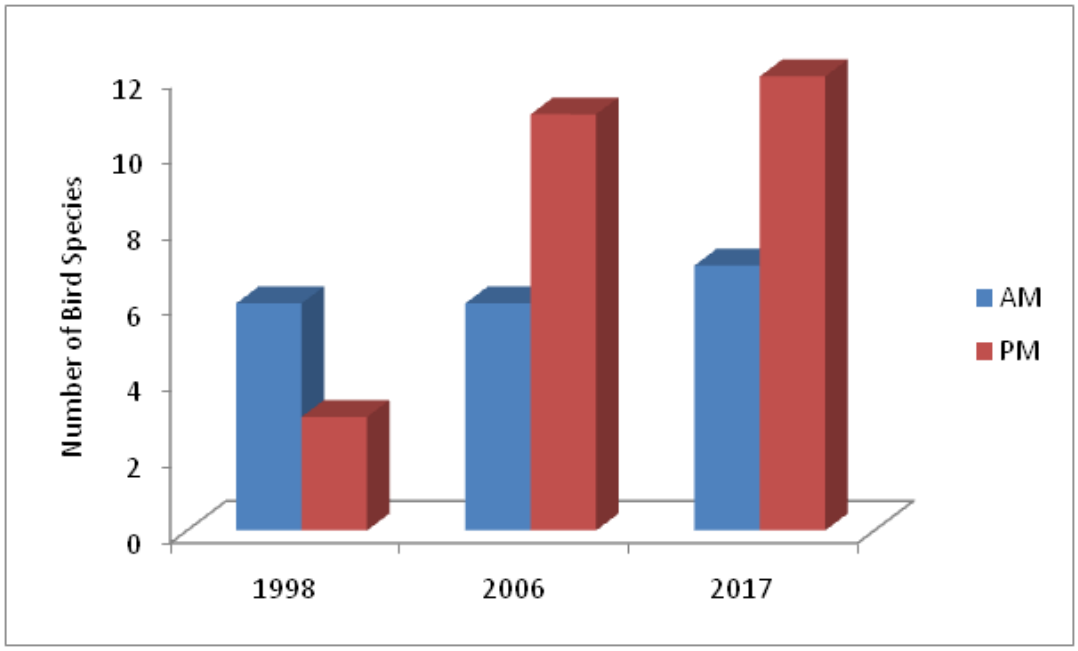

Figure 3.5: Variation in the number of Migrants (AM-Afrotropical and PM-Palearctic) recorded during the surveys in Kikubamutwe, Namizi and Bujagali over the years. Results indicate an increase in the number of migrants in all sites over the years.

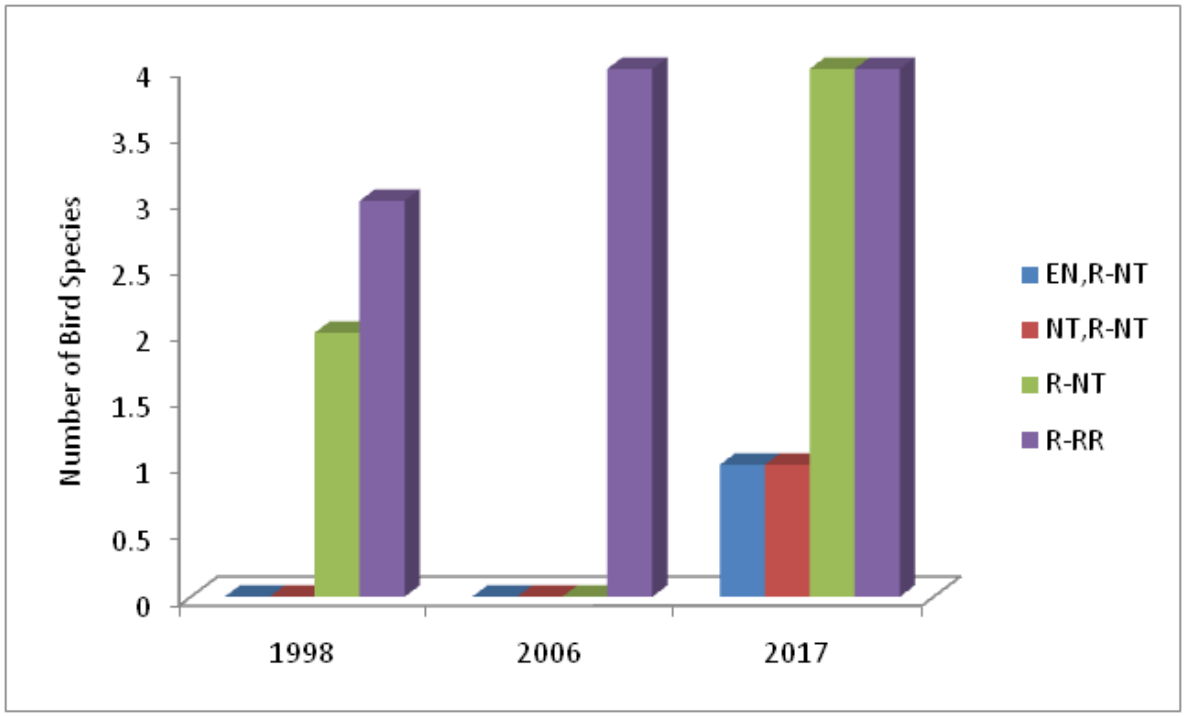

Figure 3.6: Variation in the number of Red-data species recorded during the surveys in Kikubamutwe, Namizi and Bujagali over the years. (Key: EN= Globally endangered, Globally Near threatened, R-NT= Regionally Near threatened, R-RR= Species of regional responsibility).

Results indicate a general increase in the number of Red-data species recorded in the sites. There was however an initial disappearance of the R-NT species in 2006, but they later returned in 2017 together with globally threatened species.

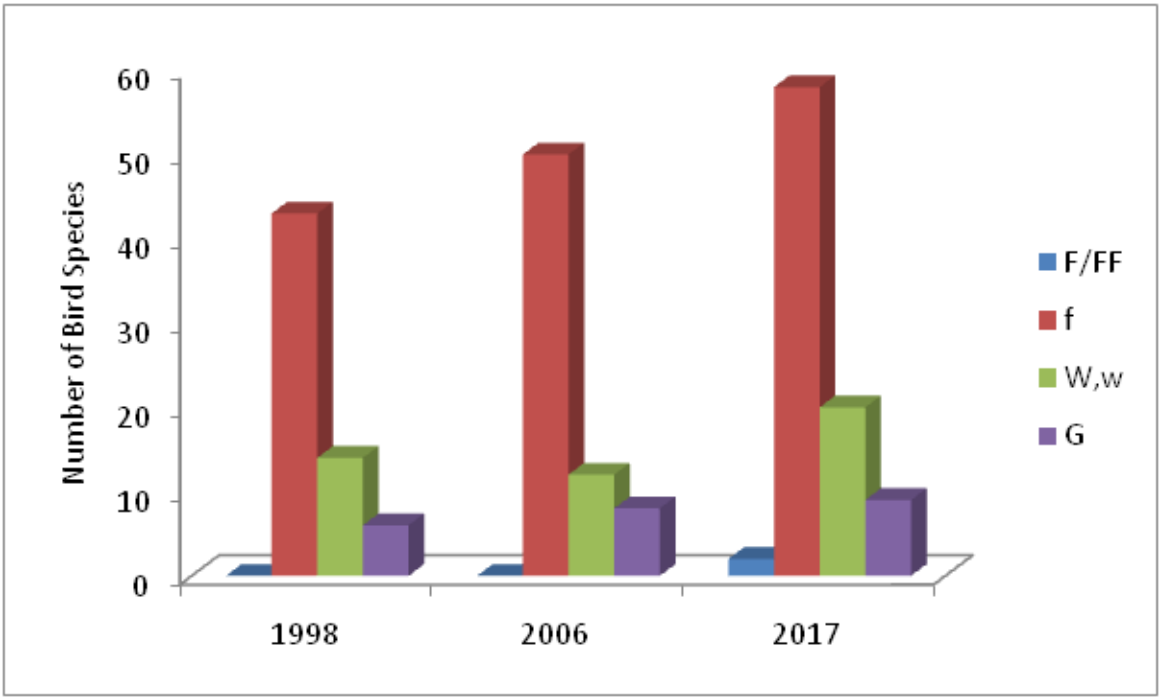

Figure 3.7: Variation in the number of species in the habitat classes recorded during the surveys in Kikubamutwe, Namizi and Bujagali in the three counts. Results indicate a general increase in the forest visiting species (f) and an appearance of the forest generalists and specialists (F/FF), which may indicate a state of improved suitable habitat for the species. These two classes of sopecies are more sensitive to the changes in habitat that the rest of the classes of waterbirds (W,w) and grassland birds (G), which seemed not to have changed much. It is however important to note that the W,w species also lightly reduced between 1998 and 2006, but later returned in 2017. This might indicate an initial loss of species as the waters increased in some areas and reduced in others, destabilizing the ecosystem, which later stabilised or species adapted to the changes.

3.3.2. Waterbirds

Very few water birds were recorded during the surveys and systematic analysis was not possible due to the limited data. Species sighted during the Land bird TSC counts were allocated their respective scores and are listed in Appendix II. Most of the records obtained were for nesting or roosting birds. A roost of over 70 Cattle Egrets was encountered on one of the trees at Isimba Dam construction site. A colony of Greater Cormorant *Phalacrocorax carbo* (55 birds) and the African Darter (20 birds) were nesting at

Itanda Islands (Figure 3.5), upstream at the falls with a total of about 35 nests counted but with no young seen. The African Fish Eagle *Haliaeetus vocifer* nests in the area,and the African Open-billed Stork *Anastromus lamelligerus*is known to nest along this stretch of the Nile (Pomeroy D, per Comm.). These two species were not seen nesting during our surveys but might probably be still using the site. A number of breeding White-winged Terns were seen flying over the stream from the different points of the streams.

Pairs of the Regionally Vulnerable Rock Pratincole *Glareola nuchalis* that were reported previously near Dumbbell Island and perceived to breed locally were unfortunately not seen in 2017, as Dumbbell Island is believed to have been submerged by the construction of the dam. However, several pairs of Rock Pratincole were seen on the Rock Outcrops near Kalagala Falls, Isimba and Itanda Falls.

3.3.3. Other Records

An interesting record of a pair of Giant Kingfisher with 2 juveniles was seen in Kikubamutwe on the Western Bank of the Nile. Unlike in 2006 where there were no records of Pied Kingfishers, the survey in 2017 registered a number of them from all the sites surveyed with suitable habitat (not Mabira Forest as it is too far inland). Interestingly, the African Darter, Great and Long-tailed cormorants and White-winged Tern were seen at all points along the river.

Figure 3.5: The African Darter and Great Cormorant nesting near Itanda Island

3.3.4. General Discussion

The surveys in 2017 recorded a much higher number of bird species overall compared to the combined 1998 and 2006 surveys. This also held for the individual sites. Mabira registered the highest number of bird species and this can be attributed to the fact that it is the only natural vegetation in the area, and remains in relatively good condition. In addition, Mabira forest is a large area and had more counts compared to the rest of the sites.

Part of the sites in Naminya and Kikubamutwe continue to be fenced off as private land and land belonging to the electricity generation company and thus we were denied access for our counts. The Dumbell and Naminya Islands that were surveyed in 1998 and 2006 are reported to have been submerged by the water resulting from the Dam construction, and so those habitats were lost together with most of the biodiversity, which could not swim or fly to refugee sites. This is one of the negative results from the dam construction.

Seven species of birds were observed in all the sites and all the years, and this can be explained by the species having a big geographical and habitat range. The Common Bulbul was the commonest with the highest relative abundance and is known to be abundant occurring in all habitats (Carswell *et al*, 2005). Fifteen species that were registered in 1998 and 2006 were not seen in the 2017 surveys. The species in question, for example the Honey Buzzard, Whinchat and Blackcap, are migratory in nature, mostly seen in Uganda inOctober-April (Carswell *et al*, 2005). By the timeour surveys took place (15^{th}-23^{rd} April) they might have already left.

From the surveys, a number of farmland birds were recorded (Appendix I) indicating the increased numberof the farms that have developed along the Nile. Unfortunately, the farming is done up to the shorelines and this has led to continued silting of the stream evidenced by the heavily eutrophicated waters, which are detrimental to biodiversity conservation. This needs to be halted to protect the waters especially upstream to avoid the spread of the eutrophication effect to the whole river. This calls for community sensitization and enforcement of the set guidelines to avoid farming on riverbanks.

3.3.5. Conclusions and Recommendations

Despite the new dam developments, there has been a general increase in the number of bird species indicating that the construction of the dam may not have had detrimental effects on birds and it also might indicate that the offsets (Mabira Forest, Isimba, Itanda Forest and Kalagala Forest) are performing their role of protecting biodiversity by providing suitable habitats. This depends, however, on the counterfactual; they are only performing as offsets for any biodiversity loss if they would have deteriorated in biodiversity in the absence of the offset. There is no evidence of additional active management over what would have happened anyway, and so it is not possible to state whether or not the offset is functioning as expected.

The results generally indicate that the sites surveyed still host a wide range of species and these have increased over the years probably due to the disturbance by human activities, which result in changes in the habitat. This indicated the potential of the sites to still host bird species even with the dam in place and operational.

CHAPTER IV

4.0 FINAL CONCLUSIONS

In our study, we observe a net loss of natural habitat due to the submerged bujagali Islands. This may have led to loss of land area, as well as some species, but overall, there has been an increase in the number of flora and Fauna species. The loss of natural habitat was the biggest failure for the offset although this did not show direct effects on the species surveyed.

The implementation of the mitigation hierarchy requires developers to first Avoid, then Minimise, then Remediate, then Offset their impacts. These impacts included changes in water level (including complete submergence), loss of land to the footprint of the hydropower project, dumping of construction materials, loss of flora and fauna species with the submerged areas,change in habitat complexity especially with the increase in water levels for aquatic life and increase in open areas following habitat clearance for terrestrial life Noise during and after construction, which affetecs the normal activity pattern of some organisms especially during breeding,air quality, among others.

AVOIDANCE: This was not possible in this case, given that the hydropower project was deemed to be necessary for national economic development, and therefore needed to be sited on the river Nile.given its potential in Hydropower generation.

MINIMISATION:This was done in a number of areas including native vegetation clearance and flooding of land area,minimising the amount of water drawn from river nile by reusing the water flowing from other existing dams,

RESTORATION: In one site, the dumping of construction materials had been levelled after the completion of the dam butvin other sites it was still evident. Also some areas of native vegetation had been replanted but with exotic species which don't really restore the habitat to its previous potential.

OFFSETTING: Offsets which were envisaged included riparian tree planting, removal of agriculture and human disturbance from riparian areas, clearing of invasive species from forest reserves, increasing of the Kalagala CFR conservation efforts to counter the effects on Bujagali area. However, there is very limited evidence for offsetting activities having taken place.

We found that the overall impact on plants and birds of the development and the offset were not particularly severe. In particular, the ongoing development of the area for agriculture and plantation forestry, both of which led to loss of areas of semi-natural land, including a Forest Reserve and riparian areas which are important for soil retention, are likely to have happened anyway, regardless of the dam and the offset. Overall, the number of species recorded has increased and the status of species of concern seems not to have worsened.

Our survey was not a full census of all the biodiversity impacts of the development. We did not cover key taxa that local people felt had been severely impacted by the dam, particularly fish species. We did not look at erosion, pollution or overall loss of land area, all of which are likely to have been damaged. Therefore, it is likely that there was a biodiversity impact, and that this was not satisfactorily compensated, given the lack of offsetting activities.

The offsets would have performed better if designated areas of better habitat in this case, Kalagala CFR, were identified as offsets and something proactive done to ensure their integrity is maintained. It would be important to ensure that these areas are similar to the areas lost during the initial stages of dam construction, and that the most affected taxa (e.g. fish) were given improved habitat or reductions in other human pressure (e.g. fishing) to compensate for the impacts of the hydropower project.

Given the biodiversity in the area and the changes in landuse which have been observed, there is a need to continue educating the communities on how best farming can be carried along watercourses to avoid runoff creating silting of the river. There are set guidelines and regulations especially by the Wetlands Management department and the National Environment Management Authority of farming near riverbanks which need to be followed and enforced. It is recommended for example in Wetland Booklet No. 3 on guidelines for wetland edge gardening (MWE 2009) that a buffer zone of not less that 100m be left between the cultivation and the river and 200m be left if it is a lake. This buffer should be left with its natural vegetation that sieves the runoff and protects the water body from contamination. The conversion of wetland into farmland should also follow the NEMA 2000 Guidelines, Regulation 11 (2) (a), which limits the converted area to not more than 25% of the total wetland area (NEMA 2000).

Given the evidence of cultivation happening around the survey sites, there is need to try and avert any possible risk of ecosystem damage from future events resulting from habitat change through cultivation and related effects following the completion of the Isimba Dam. This can be through introduction of wise-use and sustainable-use programmes and encouraging improved farming and fishing practices, among other avenues.

The findings from this assessment should be shared with the legislators in the government of Uganda, business developers, donors or development partners and local communities in the area especially those affected by the existing dam and those or likely to be affected by the impacts of the new dam.

5.0 REFERENCES

Bennun, L. & Njoroge, P . 1996. Birds to Watch in East Africa: A Preliminary Red Data List. Centre for Biodiversity Research Reports. National Museums of Kenya: Ornithology 23:1–16.

Bennun, L, Dranzoa, C and Pomeroy, D E. 1996. The forest birds of Kenya and Uganda. Journal of East African Natural History, 85: 23-48.

Carswell. M., Pomeroy, D. Reynolds, J. & Tushabe, H. 2005. The Bird Atlas of Uganda. British Ornithologists Club. University of Oxford, OX1 3PS.

Clarke KR (1993). Nonparametric multivariate analyses of changes in community structure. *Aust J Ecol* 18:117–143

Collar N.J. & Stuart S.N. (1985) Threatened Birds of Africa and related Islands. The ICBP/IUCN Red Data book, part 1. ICBP/IUCN, Cambridge, UK.Freeman N. Stephen, Pomeroy E. Derek, & Tushabe Herbert. 2003. On the use of Timed Species Counts to estimate avian abundance indices in species-rich communities. *African Journal of Ecology*. Vol: 41.337-348.

Gracey E.O. & Verones F. 2016. Impacts from hydropower production on biodiversity in an LCA framework—review and recommendations. The International Journal of Life Cycle Assessment. Volume 21, Issue 3, pp 412–428

IUCN. 2000. The IUCN Red List of Threatened Species. International Union for Conservation of Nature.United Kingdom.

Langdale-Brown, H. A. Osmaston and J. G. Wilson, "The Vegetation of Uganda and Its Bearing on Land Use," Government of Uganda, Entebbe, 1964, pp. 1-159.

MWE. 1995. National Wetlands Policies. National Policy for the Conservation and Management of Wetland Resources. Ministry of Natural Resources, Uganda.

MWE/WMD 2009. Guidelines for Wetland edge gardening. Wetland Booklet 3. Kampala, Uganda.

NatureUganda. Achilles Byaruhanga, Dianah Nalwanga & Michael Opige (Eds.). 2015. The State of Uganda's Birds 2014. Indicators forour changing environment. NatureUganda, Kampala, Uganda.

NEMA. 2000. National Environment (Wetlands; Riverbanks and Lake Shores Management) Regulations.

NEMA. 1995. National Environment Statute. Statute No. 4. Kampala, Uganda.

Sandvik J. & Reitan O. 1996. An assessment of retaining dams in hydropower reservoirs for enhancing bird habitat. Journal of River Research and applications, Volume12, Issue4-5, Pages 523-534

Stevenson, T & Fanshawe, J. (2001). A Field Guide to birds in East Africa. T & AD Poyser, London,

UK.

van der Bliek J., McCornick P., and Clarke J. (eds.). 2014. Chapter 2 of On Target for People and Planet: Setting and Achieving Water-Related Sustainable Development Goals, pp. 9-12. Colombo, Sri Lanka: International Water Management Institute

CHAPTER VI

6.0 APPENDICES

Appendix 1: Re-assessments of Terrestrial Ecology/Biodiversity in Bujagali and Kalagala; Records for the different species in the sutes surveyed in 2017

Key to abbreviations:Buj = Bujagali area; Buj Islands = Bujagali Islands; Kiku = Kikubamutwe area; Nmy-S = Naminya South area; Nmy-N = Naminya North area; Nmz = Namizi area; Ita/Kala Island = Itanda/Kalagala Island; Kala FR = Kalagala Forest Reserve; N. Bank FR = Nile Bank Forest Reserve, and Isimba site = Ismba; Mabira Primary FR = Mbra P- FR and Mabira Secondary FR = Mbra S- FR. (* - signifies exotic (non-native) species)

Family	**Species**	**Habit**	**Buj**	**Buj Islands**	**Kiku**	**Nmy-S**	**Nmy-N**	**Nmz**	**Mldi**	**Ita/Kala Islands**	**N.Bank FR**	**Kala FR**	**Ismba**	**Mbra P-FR**	**Mbra S-FR**
			Immediate impact zone												
Cyperaceae	Abildgaardia ovata (Burm.f.) Kral	Herb	0	**1**	0	0	0	0	0	0	**1**	**1**	**1**	0	0
Fabaceae. Faboideae	Abrus precatorius L.	Herb	0	0	0	0	0	0	**1**	0	0	**1**	0	0	0
Malvaceae. Malvoideae	Abutilon mauritianum (Jacq.) Medic.	Shrub	0	**1**	0	**1**	**1**	0	0	0	**1**	0	**3**	0	0
Fabaceae. Mimosoideae	Acacia kirkii Oliv.	Tree	0	0	0	**1**	0	0	0	0	0	0	**3**	0	0
Fabaceae. Mimosoideae	Acacia polycantha	Tree	0	0	0	0	**1**	0	0	0	0	0	**1**	0	0
Euphorbiaceae	Acalypha acrogyna	Herb	0	0	0	0	0	0	0	0	0	0	0	0	**2**
Euphorbiaceae	Acalypha neptunica Muell. Arg.	Shrub	0	**6**	0	0	0	0	0	**3**	**1**	**3**	0	0	**2**
Euphorbiaceae	Acalypha ornata Hochst.	Shrub	0	**1**	**1**	0	0	0	0	0	0	**1**	0	0	**8**
Euphorbiaceae	Acalypha villicaulis A. Rich.	Herb	0	0	0	0	0	0	0	0	0	**1**	0	0	**2**
	Acanthaceae sp	Herb	0	0	0	0	0	0	0	0	0	0	0	0	**2**
Amaranthaceae	Achyranthes aspera L.	Herb	**1**	**1**	**3**	**1**	0	0	0	**1**	**3**	**1**	0	0	0

Asteraceae	Acmella caulorrhiza Delile	Herb	**2**	0	0	0	0	0	0	**2**	0	**2**	0	0	0
Passifloraceae	Adenia bequaertii Rob. & Lawel.	Liana	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Fabaceae. Faboideae	Aeschynomene abyssinica (A. Rich.) Vatke	Herb	0	0	**1**	0	0	0	**3**	0	0	**1**	**1**	0	0
Fabaceae. Caesalpinioideae	Aeschynomene elaphroxylon (Guill. & Perr.) Taub.	shrub	0	0	0	0	0	0	**1**	0	0	0	0	0	0
Zingiberaceae	Aframomum angustifolium (Sonn.) K. Schum.	Herb	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Agavaceae	Agave sp.	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	Ageratum conyzoides L.	Herb	**1**	0	0	0	**1**	**1**	0	0	0	**1**	**2**	0	0
Fabaceae. Mimosoideae	Albizia coriaria Welw. ex Oliv.	Tree	0	0	0	**1**	0	0	0	0	0	0	**4**	**1**	0
Fabaceae. Mimosoideae	Albizia grandibracteata Taub.	Tree	0	**6**	**1**	**3**	0	0	0	0	0	**2**	0	**7**	**6**
Fabaceae. Mimosoideae	Albizia gummifera (Gmel.) C.A. Smith	Tree	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Fabaceae. Mimosoideae	Albizia zygia (DC) Macbr.	Tree	0	**1**	**2**	**1**	**2**	**1**	0	0	**2**	**4**	0	0	0
Euphorbiaceae	Alchornea cordifolia (Schumach. & Thonn.) Mull. Arg.	Shrub	0	**3**	**2**	0	0	0	0	0	0	**2**	0	0	0
Sapindaceae	Allophylus abyssinicus (Hochst.) Radlk.	Shrub	0	**1**	**1**	0	0	0	0	0	0	0	**1**	0	0
Sapindaceae	Allophylus macrobotrys Gilg.	Tree	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**
Aloaceae	Aloe sp.	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Amaranthaceae	Alternanthera sessilis (L.) CD.	Herb	0	0	0	0	0	0	**2**	0	0	0	0	0	0
Amaranthaceae	Alternanthera pungens H.B.K.	Herb	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Amaranthaceae	Alysicarpus glumaceus	Herb	0	0	0	0	**1**	0	0	0	0	0	0	0	0
Amaranthaceae	Amaranthus hybridus subsp. cruentus	Herb	0	**3**	**2**	**3**	0	**1**	0	0	0	0	0	0	0
Amaranthaceae	Amaranthus hybridus subsp. hybridus	Herb	0	**3**	0	0	0	**1**	0	0	0	0	0	0	0
Amaranthaceae	Amaranthus spinosus L.	Herb	0	0	0	0	0	0	0	0	**1**	0	**1**	0	0
Commelinaceae	Aneilema beniniense (P. Beauv.) Kunth	Herb	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Commelinaceae	Aneilema spekei C.B.Cl.	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0

Annonaceae	Annona muricata L.	Tree	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Anthericaceae	Anthericum subpetiolatum Bak.	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Moraceae	Antiaris toxicaria (Rumph.ex Pers.) Lesch.	Tree	0	**3**	0	0	0	**1**	0	0	0	**6**	0	**3**	**1**
Euphorbiaceae	Antidesma membranaceum Muell.Arg.	Tree	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Sapindaceae	Aphania senegalensis (Juss.ex Poir.) Radlk.	Tree	0	0	0	0	0	0	0	0	0	**2**	0	0	0
Fabaceae. Faboideae	Arachis hypogea L.	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	Argomuellera macrophylla Pax	Tree	0	0	0	0	0	0	0	**1**	**1**	**3**	0	0	0
Aristolochiaceae	Aristolachia bracteata Retz.	Liana	0	0	**1**	0	0	0	0	0	0	**1**	0	0	0
Moraceae	Artocarpus heterophyllus Lam.	Tree	**2**	**1**	**1**	0	**1**	**8**	0	0	0	**2**	**1**	0	0
Poaceae	Arundinaria sp.	Shrub	**1**	0	0	0	0	0	0	0	0	0	0	0	0
Asclapiadaceae	Asclapiadaceae (light leaf and pale down)		0	0	0	0	0	0	0	0	0	**1**	0	0	0
Asparagaceae	Asparagus africanus Lam.	Herb	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Asteraceae	Aspilia africana L.	Herb	0	0	0	0	0	0	0	0	0	0	0	0	0
Aspleniaceae	Asplenium elliottii C.H. Wright	Herb	0	0	0	0	0	0	0	0	0	**2**	0	0	0
Aspleniaceae	Asplenium emerginatum P. Beauv.	Herb	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Aspleniaceae	Asplenium errectum Willd.	Herb	0	0	0	0	0	0	0	0	0	0	0	**1**	0
Aspleniaceae	Asplenium inaequuilaterale Willd.	Herb	0	0	0	0	0	0	0	0	0	0	0	**1**	0
	Asplenium sp 1		0	0	0	0	0	0	0	0	0	0	0	**2**	0
	Asplenium sp 2		0	0	0	0	0	0	0	0	0	0	0	**1**	0
Acanthaceae	Asystasia gangetica (L.) T. Anders.	Herb	0	**8**	**3**	**3**	**3**	**1**	**2**	0	**1**	**1**	**4**	0	0
Apocynaceae	Baissea major (Stapf) Hiern	Liana	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Balanitaceae	Balanites wilsoniana Dawe & Sprague	Tree	0	0	0	0	0	0	0	0	0	0	0	**1**	0

Basellaceae	Basella alba L.	Herb	0	0	**1**	0	0	**1**	0	0	0	**1**	0	0	0
Lauraceae	Beilschiemedia ugandensis Rendle	Tree	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Sapotaceae	Bequaertiodendron oblanceolatum Hiern & J.H.Hemsel	Tree	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Asteraceae	Bidens pilosa L.	Herb	**2**	**5**	**4**	0	**1**	0	0	0	0	**1**	0	0	0
Sapindaceae	Blighia unijugata Bak.	Tree	0	**3**	0	0	0	0	0	**1**	**1**	0	0	0	**7**
Dennstaedtiaceae	Blotiella glabra (Bory) A.F. Tryon	Herb	0	0	0	0	0	0	0	0	0	**1**	0	**2**	0
Dennstaedtiaceae	Blotiella sp (Fern)	Herb	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Nyctaginaceae	Boerhavia coccinea Mill.	Herb	0	**3**	0	**3**	0	0	0	0	0	0	0	0	0
Nyctaginaceae	Brachiaria brizantha (A.Rich.) Stapf	Herb	0	0	**2**	0	0	0	0	0	0	**3**	0	0	0
Poaceae	Bridelia micrantha	Herb	0	**1**	**1**	0	0	0	0	**1**	0	**2**	0	0	0
Acanthaceae	Brillantaisia cicatricosa Lindau	Shrub	0	0	0	0	0	0	0	0	**3**	0	0	0	0
Acanthaceae	Brillantaisia madagascariensis Lindau	Herb	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Moraceae	Broussonetia papyrifera Vent.	Tree	0	**9**	**11**	**7**	**1**	**2**	**2**	**2**	**5**	**4**	**1**	**6**	**5**
Cyperaceae	Bulbostylis hispidula subsp. hispidula	Herb	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Fabaceae. Caesalpinioideae	Burkea africana Hook.	Tree	0	0	0	0	0	0	0	0	0	0	0	**3**	0
Fabacae. Faboideae	Cajanus cajan (L.) Millsp.	Herb	0	0	0	0	0	**1**	0	0	0	0	0	0	0
Araceae	Culcasia falcifolia	Shrub	0	0	**1**	0	0	0	0	0	0	0	0	**1**	**6**
Fabaceae. Caesalpinioideae	Calliandra calothyrsus Meis.	Shrub	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Burseraceae	Canarium schweinfurthii Engl.	Tree	0	0	0	0	0	**2**	0	0	0	0	0	**1**	0
Fabaceae	Canavalia sp	Liana	0	**1**	0	0	**1**	0	0	0	0	0	0	0	0
Cannaceae	Canna indica L.	Herb	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Rubiaceae	Canthium vulgare (K.Schum) Bullock	Tree	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Capparaceae	Capparis erythrocarpos Isert.	shrub	0	**1**	0	0	0	0	0	0	0	**2**	0	0	0

Solanaceae	Capsicum frutescens L.	Shrub	**2**	0	0	0	0	0	0	0	0	0	0	0	0
Sapindaceae	Cardiospermum halicacabum L.	Liana	0	**2**	0	**1**	**2**	0	0	**1**	**1**	**1**	0	0	0
Caricaceae	Carica papaya L.	Tree	0	**2**	0	0	0	0	0	0	0	0	0	0	0
Ulmaceae	Celtis africana Burm.f.	Tree	0	0	0	0	0	0	0	0	0	0	0	**1**	**3**
Ulmaceae	Celtis durandii Engl.	Tree	0	0	**1**	0	0	0	0	0	0	**1**	0	**6**	**4**
Ulmaceae	Celtis mildbraedii Engl.	Tree	0	0	0	0	0	0	0	**2**	0	**1**	0	**19**	**9**
Ulmaceae	Celtis zenkeri Engl	Tree	0	0	0	0	0	0	0	0	0	0	0	**2**	**1**
Apiaceae	Centella asiatica (L.) Urb.	Herb	0	0	0	0	0	0	**1**	0	0	**4**	0	0	0
Fabaceae. Faboideae	Centrosema pubescens Benth.	Herb	**1**	**1**	**1**	**1**	0	0	**1**	0	**1**	0	0	0	0
Cucurbitaceae	Cephalopentandra ecirrhosa (Cogn.) C. Jeffrey	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Ulmaceae	Chaetacme aristata Planch.	Shrub	0	0	0	0	0	0	0	0	0	**1**	0	0	**1**
Fabaceae. Caesalpinioideae	Chamaecrista kirkii (Oliv.) Stendley.	Herb	0	0	0	0	**2**	0	0	0	0	0	0	0	0
Menispermaceae	Chasmmansera dependens Hochst	Liana	**1**	0	0	0	0	0	0	0	0	0	0	0	0
Pteridaceae	Cheilanthus sp (fern)	Herb	0	0	0	0	0	0	0	0	0	0	0	0	**2**
Oleaceae	Chionanthus mildbraedii (Gilg & Schellenb.) Stearn	Tree	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Poaceae	Chloris pycnothrix Trin.	Herb	0	0	0	0	**1**	0	0	0	**1**	0	0	0	0
Sapotaceae	Chrysophyllum muerense Engl.	Tree	0	0	0	0	0	0	0	0	0	0	0	**1**	0
Sapotaceae	Chrysophyllum sp	Tree	0	0	0	0	0	0	0	0	0	**1**	0	**1**	0
Menispermaceae	Cissampelos mucronata A. Rich.	Liana	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Vitaceae	Cissus rotundifolia (Forssk.) Vahl	Liana	0	0	**3**	**5**	0	0	0	**2**	**1**	**4**	0	0	0
Rutaceae	Citrus sinensis (L.) Osbeck.	Tree	0	0	0	0	0	0	0	**1**	0	0	**1**	0	0
Capparaceae	Cleome gynandra L.	Herb	0	**4**	0	0	0	0	0	0	0	**1**	0	0	0
Verbanaceae	Clerodendrum capitatum Schum. & Thonn	Shrub	0	0	0	0	0	0	0	0	0	**1**	**1**	0	0
Rubiaceae	Coffea canephora A. Froehner	Shrub/ Tree	**3**	**2**	**5**	**4**	0	0	**1**	0	0	0	**3**	0	0
Rubiaceae	Coffea eugenioides S. Moore	Tree	0	0	0	0	0	0	0	**1**	0	0	**1**	0	0

Poaceae	Coix lacryma- jobi L.	Herb	0	0	0	0	0	0	0	0	**1**	0	0	0	0
Commelinaceae	Commelina africana L.	Herb	0	**3**	0	0	0	0	**1**	0	0	**2**	**2**	0	0
Commelinaceae	Commelina benghalensis L	Herb	0	**5**	0	**3**	**1**	0	**1**	0	**2**	**4**	**3**	0	0
Commelinaceae	Commelina capitata Benth.	Herb	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Commelinaceae	Commelina latifolia A. Rich.	Herb	0	**1**	0	0	**1**	0	0	0	0	**1**	0	0	0
Commelinaceae	Commelina petersii Hassk.	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Commelinaceae	Commelina sp	Herb	**1**	0	0	0	0	0	0	0	0	0	0	0	0
Commelinaceae	Commelina zenkeri C.B.Cl.	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Commelinaceae	Commellina latifolia A. Rich.	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	Conyza sumatrensis (Retz.) E.H. Walker	Herb	**1**	**1**	0	0	**2**	0	0	0	0	**1**	**1**	0	0
Malvaceae. Tilioideae	Corchorus olitorius L.	Herb	0	**2**	0	**2**	0	0	0	0	0	0	0	0	0
Malvaceae. Tilioideae	Corchorus sp	Herb	0	0	**1**	0	**1**	**1**	0	0	0	0	**1**	0	0
Malvaceae. Tilioideae	Corchorus sp (small)	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Malvaceae. Tilioideae	Corchorus tridens L.	Herb	0	0	0	**1**	0	**1**	0	0	0	0	0	0	0
Malvaceae. Tilioideae	Corchorus trilocularis L.	Herb	0	0	0	**1**	0	0	0	0	0	0	0	0	0
Boraginaceae	Cordia milleni Bak.	Tree	0	0	0	0	0	0	0	**2**	0	**1**	0	0	0
Boraginaceae	Cordia sp.	Tree	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Asteraceae	Crassocephalum bojeri (DC) Robyns	Herb	0	0	0	**1**	0	0	0	0	0	0	0	0	0
Asteraceae	Crassocephalum crepidioides (Benth.) S.Moore	Herb	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Fabaceae. Faboideae	Crotalaria brevidens Benth.	Shrub	0	0	0	0	**1**	0	**2**	0	0	0	**1**	0	0
Fabaceae. Faboideae	Crotalaria pallida var. obovata	Shrub	0	0	0	0	0	0	**1**	0	0	0	0	0	0
Fabaceae. Faboideae	Crotalaria spinosa Benth.	Herb	0	0	0	0	0	**1**	**1**	0	0	0	0	0	0
Euphorbiaceae	Croton macrostachyusHochst.ex Del.	Tree	0	0	0	0	0	0	0	0	0	0	**1**	**1**	**4**
Araceae	Culcasia falcifolia	Herb	0	0	**1**	0	0	0	0	0	0	0	0	0	**4**

Poaceae	Cynodon dactylon (L.) Pers.	Herb	0	0	**5**	**2**	0	**1**	**3**	0	0	**2**	**4**	0	0
Cyperaceae	Cyperus articulatus L.	Herb	0	0	0	0	0	0	0	0	**2**	0	0	0	0
Cyperaceae	Cyperus brevifolius ssp. intricatus	Herb	0	0	0	0	**1**	0	0	0	0	0	0	0	0
Cyperaceae	Cyperus cyperoides (L.)Kuntze subsp.cyperoides	Herb	0	**2**	0	**2**	**1**	0	**1**	0	0	**1**	**3**	0	0
Cyperaceae	Cyperus denudatus Linn.f.	Herb	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Cyperaceae	Cyperus distans	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	Cyperus dives Del.	Herb	0	0	**1**	**0**	**1**	**1**	**1**	0	0	**1**	**2**	0	0
Cyperaceae	Cyperus dubius Rottb.	Herb	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Cyperaceae	Cyperus esculentus L.	Herb	0	**2**	0	**1**	0	0	0	0	0	0	**1**	0	0
Cyperaceae	Cyperus latifolius Poir.	Herb	0	0	0	0	0	0	0	**1**	0	0	**1**	0	0
Cyperaceae	Cyperus papyrus L.	Herb	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Cyperaceae	Cyperus tenuiculmis var. tenuiculmis	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Vitaceae	Cyphostema sp	Herb	0	0	**1**	**2**	0	0	0	0	**1**	**1**	0	0	0
Vitaceae	Cyphostemma adenocaule Wild. & D. Drummond	Liana	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Solanaceae	Datura stramonium L.	Herb	**1**	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae. Faboideae	Desmodium adscensionis	herb	**1**	0	0	0	**1**	0	0	0	0	**1**	0	0	0
Fabaceae. Faboideae	Desmodium incinuatum	Liana	**1**	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae. Faboideae	Desmodium rammosissimum G. Donn.	Herb	0	0	0	0	0	0	**1**	0	0	**1**	0	0	0
Fabaceae. Faboideae	Desmodium repandum (Vahl) DC	Herb	0	**4**	**1**	**6**	0	0	0	0	0	**1**	**1**	0	**1**
Fabaceae. Faboideae	Desmodium salicifolium (Poir) DC	Liana	0	0	**2**	0	0	0	0	0	0	0	0	0	0
Fabaceae. Faboideae	Desmodium sp	Herb	0	0	0	**3**	**1**	0	0	0	**1**	0	0	0	0
Fabaceae. Faboideae	Desmodium tortuosum	Herb	0	0	0	0	**1**	0	0	0	0	0	0	0	0
Fabaceae. Faboideae	Desmodium triflorum (L.) DC	Herb	0	0	0	**3**	0	0	**2**	0	**1**	**1**	**1**	0	0
Fabaceae. Faboideae	Desmodium variegatum	Herb	0	0	0	**1**	0	0	0	0	0	**1**	0	0	0
Fabaceae. Faboideae	Desmodium velutinum (Willd.) DC	Herb	0	0	0	0	0	0	0	0	0	0	0	0	0

Fabaceae. Faboideae	Desmodium wightii	Herb	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	Dichondra repens J.R. & G. Forst.	Herb	0	0	0	0	0	0	0	0	0	**2**	0	0	0
Acanthaceae	Dicliptera laxata C.B.Cl.	Herb	0	0	0	0	0	0	0	**1**	0	**1**	0	0	0
Rubiaceae	Dictyandra arborescens Welw.ex Benth. & Hook.f.	Shrub	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Poaceae	Digitaria abyssinica (A.Rich.) Stapf	Herb	0	0	**5**	**2**	**1**	0	**1**	0	**2**	**2**	**5**	0	0
Poaceae	Digitaria ternata (A. Rich.) Stapf	herb	**1**	0	**1**	**2**	**2**	0	0	0	**2**	0	**2**	0	0
Dioscoreaceae	Dioscorea bulbifera L.	Herb	0	0	0	0	0	0	**1**	0	0	0	0	0	**1**
Malvaceae. Sterculioidae	Dombeya bagshawei Bak.f.	Shrub/Tree	0	0	0	0	**1**	0	**2**	0	0	0	0	0	0
Sterculiaceae	Dombeya burgessiae Gerrard	Tree	0	0	0	**1**	0	0	0	0	**1**	0	0	0	0
Stercuiaceae	Dombeya mukole Sprague	Tree	0	0	0	**1**	0	0	0	0	0	0	0	0	0
Dracaenaceae	Dracaena fragrans (L.) Ker-Gawl.	Shrub	0	0	0	0	0	0	0	0	0	**2**	**1**	0	0
Dracaenaceae	Dracaena laxissima Engl.	Herb	0	0	**3**	0	0	0	0	0	0	0	0	0	0
Pteridaceae??	Droypteris dentata	Herb	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**
Pteridaceae	Dryopteris inaequalis (Schlechtend.) O. Kuntze	Herb	**5**	0	0	0	0	0	0	0	0	0	0	0	0
Pteridaceae	Dryopteris sp	Herb	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	Drypetes gerrardii Hutch.	Tree	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Euphorbiaceae	Drypetes sp	Tree	0	0	0	0	0	0	0	**1**	0	**1**	0	0	0
Acanthaceae	Dyschoriste radicans Nees	Herb	1	**1**	**3**	**1**	0	0	**2**	0	**1**	**2**	**2**	0	0
Poaceae	Echinochloa colona (L.) Link	Herb	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Poaceae	Echinocloa pyramidalis (Lam.) Hitchc. & Chase	Herb	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Pontederiaceae	Eichonia crassipes (C. Martius) Solms-Laub.	Herb	0	0	**3**	**3**	0	**2**	0	0	**3**	0	0	0	0
Arecaceae	Elaeis guineensis Jacq.	Tree	0	0	0	**1**	0	0	0	0	0	0	0	0	0
Poaceae	Eleusine africana Ken-O'Byrne	Herb	0	**2**	0	0	0	0	0	0	0	**1**	0	0	0
Poaceae	Eleusine coracana (L.) Gaertn.	Herb	0	0	0	0	0	0	0	**3**	0	0	0	0	0
Poaceae	Eleusine indica (L.) Gaertn.	Herb	0	**2**	0	0	0	**1**	0	0	**1**	**1**	0	0	0

Poaceae	Emilia discifolia	Herb	0	0	0	0	**1**	0	0	0	0	0	0	0	0
Asteraceae	Emilia discifolia (Oliv.) C.Jeffrey	Herb	0	**3**	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	Enhydra fluctuans Lour	Herb	0	0	**1**	0	0	0	0	0	**2**	0	0	0	0
Poaceae	Eragrostis olivacea K. Schum.	Herb	0	0	**1**	0	**1**	0	**1**	0	0	0	0	0	0
Cruciferae	Erucastrum arabicum Fisch. & Mey.	Herb	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Fabaceae. Caesalpinioideae	Erythrophleum suaveolens (Guill. & Perr.) Brenan	Tree	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Erythroxylaceae	Erythroxylum fischeri Engl.	Tree	0	0	0	0	0	0	0	0	0	0	0	**1**	0
Asteraceae	Ethulia conyzoides L.	Herb	0	0	0	**1**	0	**1**	0	0	0	0	**1**	0	0
Capparaceae	Euadenia eminens Hook.f.	Tree	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Myrtaceae	Eucalyptus sp.	Tree	**1**	0	0	**1**	0	0	0	0	0	0	0	0	0
Myrtaceae	Eugenia bukobensis Engl.	Tree	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Euphorbiaceae	Euphorbia heterophylla L	Herb	**1**	**3**	**4**	0	**1**	0	0	0	0	**2**	**2**	0	0
Euphorbiaceae	Euphorbia hirta L.	Herb	0	**2**	0	**2**	**1**	0	**1**	0	**1**	**1**	**3**	0	0
Euphorbiaceae	Euphorbia schimperiana Scheele	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	Euphorbia teke Pax	Tree	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Moraceae	Ficus brachypoda Hutch.	Tree	0	0	0	0	0	0	0	0	0	**1**	**1**	0	0
Moraceae	Ficus eriobotryoides Kunth & Bouche	Tree	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Moraceae	Ficus exasperata Vahl	Tree	0	0	0	0	0	0	0	**3**	**1**	**2**	0	0	0
Moraceae	Ficus natalensis Hochst	Tree	0	0	0	0	0	**2**	0	0	0	0	**1**	0	0
Moraceae	Ficus ottoniaefolia (Miq.) Miq.	Tree	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Moraceae	Ficus ovata Vahl	Tree	**1**	0	0	0	0	**1**	0	0	0	0	0	0	0
Moraceae	Ficus polita (Miq.) Vahl	Tree	0	0	0	0	0	0	0	0	0	0	0	**2**	**2**
Moraceae	Ficus pseudomangifera Hutch.	Tree	0	0	0	0	0	0	0	0	**1**	0	0	0	0
Moraceae	Ficus stipulifera Hutch.	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0
Moraceae	Ficus sur Forssk.	Tree	0	0	**1**	0	0	0	0	**1**	0	**1**	0	0	0
Moraceae	Ficus thonningii Blume	Tree	0	0	**2**	0	0	**2**	0	0	0	0	0	0	0
Moraceae	Ficus vallis- choudae Del.	Tree	0	0	0	0	0	**1**	0	0	0	**1**	0	0	**1**

Moraceae	Fimbristylis dichotoma	Tree	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Cyperaceae	Flacourtia indica (Burm.f.) Merr.	Herb	0	**1**	0	0	0	0	0	0	0	**1**	0	0	0
Flacourtiaceae	Flacourtia sp .	Tree	0	**1**	0	0	0	0	0	0	0	**2**	0	0	0
Flacourtiaceae	Floscopa glomerata C.B.Cl.	Shrub	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**
Commelinaceae	Flueggea virosa Viogt.	Herb	0	**2**	**6**	**4**	**2**	0	**1**	**1**	**2**	**2**	0	0	0
Euphorbiaceae	Funtumia africana (Benth.) Stapf	Shrub	0	0	0	0	0	0	0	0	0	0	0	**2**	**20**
Apocynaceae	Funtumia elastica (Preuss) Stapf	Tree	0	0	0	0	0	0	0	0	0	0	0	**1**	0
Asteraceae	Galinsoga parviflora Cav.	Herb	**1**	0	0	0	**1**	0	0	0	0	**1**	0	0	0
Rubiaceae	Geophila repens (L.) I,M. Johnst.	Herb	0	0	0	0	0	0	0	0	0	**1**	0	**2**	0
Sapindaceae	Glenniea africana (Radlk.) Leenh.	shrub?	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Fabaceae. Faboideae	Glycine max (L.) Merr.	Herb	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Malvaceae. Tilioideae	Glyphea brevis (Spreng.) Monach.	shrub	0	0	0	0	0	0	0	0	**1**	0	0	0	0
Proteaceae	Grevillea robusta Cunn.ex R. Br.	Tree	**1**	0	**2**	0	0	**2**	0	**4**	0	0	0	0	0
Malvaceae. Tilioideae	Grewia bicolor Juss.	Tree	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Malvaceae. Tilioideae	Grewia pubescens P. Beauv.	Tree	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Malvaceae. Tilioideae	Grewia similis	Tree	0	**3**	0	0	0	0	0	0	0	0	0	0	0
Malvaceae. Tilioideae	Grewia trichocarpa Hochst.ex A. Rich.	Tree	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Rubiaceae	Hallea rubrostipulata (K.Schum.) J.F. Leroy	Tree	0	0	**3**	0	0	0	0	0	0	0	0	0	0
Asteraceae	Helianthus annuus L.	Herb	0	0	0	0	0	0	0	0	**1**	0	0	0	0
Convolvulaceae	Hewettia sublobata (L.f) O. Kuntze	Liana	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Malvaceae. Malvoideae	Hibiscus cannabinum L.	Herb	0	**1**	**2**	0	0	0	0	0	0	0	**1**	0	0
Malvaceae. Malvoideae	Hibiscus diversifolius Jacq.	Herb	0	**3**	**1**	**1**	0	**1**	0	**1**	**1**	**2**	**1**	0	**1**
Malvaceae. Malvoideae	Hibiscus rosa-sinensis L.	Shrub	0	0	0	**1**	0	0	0	0	0	0	0	0	0

Ulmaceae	Holoptelea grandis (Hutch.) Mildbr.	Tree	0	0	0	0	0	0	0	0	0	0	0	0	**2**
Ulmaceae	Holoptelea grandis Mildbr.	Tree	0	**3**	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	Hoslundia opposita Vahl.	Shrub	0	**4**	0	0	0	0	**1**	0	0	0	**3**	0	0
Poaceae	Hyparrhenia filipendula (Hochst) Stapf	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Acanthaceae	Hypoestes aristata (Vahl) Roem. & Schult.	Herb	0	0	**1**	0	0	0	0	0	0	**1**	**1**	0	0
Lamiaceae	Hyptis suaveolens (L.) Poit.	Herb	0	0	0	0	0	0	**1**	0	0	0	0	0	0
Poaceae	Imperata cylindrica (L.) Pal.	Herb	0	0	0	**3**	0	0	**1**	0	0	0	**1**	0	0
Fabaceae. Faboideae	Indigofera spicata Forrsk.	Herb	0	**2**	**1**	**1**	0	0	**3**	0	0	**1**	**1**	0	0
Convolvulaceae	Ipomoea acuminata (Vahl) Roem & Schult	Liana	0	0	**1**	0	0	**2**	0	0	0	**1**	0	0	0
Convolvulaceae	Ipomoea aquatica Forssk.	Herb	0	0	0	0	0	0	0	0	**1**	0	0	0	0
Convolvulaceae	Ipomoea batatas (L.) Lam.	Liana	0	**1**	0	0	0	0	**1**	0	0	**2**	0	0	0
Caricaceae	Ipomoea cairica (L.) Sweet	Tree	0	**2**	**3**	0	0	**1**	**1**	0	0	0	0	0	0
Convolvulaceae	Ipomoea hederifolia L.	Herb	0	0	**1**	0	0	0	0	0	**1**	0	0	0	0
Convolvulaceae	Ipomoea obscura (L.) Ker- Gawl.	Herb	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Convolvulaceae	Ipomoea purpurea (L.) Roth	Liana	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Convolvulaceae	Ipomoea rubens Choisy	Liana	0	**1**	**2**	0	**1**	0	**1**	0	**1**	0	**2**	0	0
Convolvulaceae	Ipomoea wightii (Wall.) Choisy	Liana	0	0	**1**	**5**	0	0	0	0	0	**1**	0	0	0
Oleaceae	Jasminum dichotomum Vahl	Liana	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Oleaceae	Jasminum floribunda?	liana	0	0	**1**	0	0	0	0	0	0	0	0	0	**1**
Oleaceae	Jasminum fluminense Vell.	Liana	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Euphorbiaceae	Jatropha curcas L.	Shrub	**2**	**2**	**2**	0	0	0	0	0	0	**1**	**3**	0	0
Cuppressaceae	Juniperus procera	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0
Acanthaceae	Justicia exigua S.Moore	Herb	0	0	**1**	**1**	**1**	0	**1**	0	0	**3**	**3**	0	0
Acanthaceae	Justicia fulva Vahl	Herb	0	0	0	**1**	0	0	0	0	**1**	0	0	0	0
Meliaceae	Trichilia dregeana Sond	Tree	0	0	0	0	0	0	0	0	0	0	0	0	**4**
Bignoniaceae	Kigelia africana (Lam.) Benth	Tree	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Cyperaceae	Kyllinga alba	Herb	0	0	0	**1**	0	0	0	0	0	0	**1**	0	0

Asteraceae	Lactuca capensis Thunb.	Herb	0	**2**	0	0	0	0	0	0	0	0	**1**	0	0
Asteraceae	Lagascea mollis Cav.	Herb	0	0	**1**	**1**	0	0	0	0	0	0	0	0	0
Cucurbitaceae	Lagenaria sphaerica (Sond) Naud.	Herb	0	0	0	0	0	0	0	0	**1**	0	0	0	0
Asteraceae	Laggera elatior R. E. Fries	Herb	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Verbenaceae	Lantana camara L.	Shrub	**2**	**1**	**5**	**6**	0	0	**3**	0	**3**	**3**	**4**	0	0
Verbenaceae	Lantana trifolia L.	Shrub	0	0	**2**	0	0	0	**1**	0	0	0	0	0	0
Urticaceae	Laportea ovalifolia (Schum.) Chew.	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Sapindaceae	Lecaniodiscus fraxinifolius Bak.	Tree	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Poaceae	Leersia hexandra Sw.	Herb	0	0	**2**	0	1	0	0	0	0	**1**	**2**	0	0
Lamiaceae	Leonotis nepetifolia (L.) Ait.f.	Herb	0	**3**	**1**	**4**	**1**	0	**1**	0	0	**1**	**1**	0	0
Celastraceae	Leoseneriella africana (Willd.) N. Halle	Liana	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Poaceae	Leptaspis zeylanica Steud.	Herb	0	0	0	0	0	0	0	0	0	0	0	**5**	**7**
Verbenaceae	Leucas martinicensis (Jacq.)R. Br.	Herb	0	0	**2**	**1**	0	0	0	0	0	**1**	0	0	0
Poaceae	Loudetia kagerensis (K. Schum.) Hutch.	Herb	0	**1**	0	0	0	0	0	0	0	**1**	0	0	0
Meliaceae	Lovoa swynnertonii Bak.f.	Tree	0	0	0	0	0	0	0	0	0	0	0	**2**	0
Onagraceae	Ludwigia leptocarpa (Nutt.) Hara	Herb	0	0	0	0	**1**	0	0	0	0	**1**	0	0	0
Solanaceae	Lycopersicon esculentum Miller	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	Macaranga schweinfurthii Pax	Tree	0	0	0	0	0	0	0	0	0	**3**	0	0	0
Primulaceae	Maesa lansecolata Forssk.	Shrub	0	0	0	0	0	0	0	0	0	**2**	0	0	0
Primulaceae	Maesa welwitschii	Shrub	0	0	**2**	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	Maesopsis eminii Engl.		**1**	**1**	**3**	0	0	0	0	0	0	**6**	0	0	**1**
Euphorbiaceae	Mallotus oppositifolius (Geisel.)Muell.Arg.	Tree	0	0	0	0	0	0	0	0	0	**2**	0	0	0
Cucurbitaceae	Momordica foetida K.Schum.	Herb	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Anacardiaceae	Mangifera indica L .	Tree	**1**	**2**	0	**2**	**1**	**5**	0	0	0	**2**	**1**	0	0
Euphorbiaceae	Manihot esculenta Crantz.	Shrub	**1**	**5**	**1**	0	**1**	0	**2**	**1**	0	0	0	0	0
Euphorbiaceae	Margaritaria discoidea (Baill.)	Tree	0	0	0	0	0	0	0	**1**	0	0	0	**1**	0

	Webs.														
Cyperaceae	Mariscus sp.	Herb	0	0	0	0	0	0	0	0	0	0	0	0	0
Bignoniaceae	Markhamia lutea (Benth.) K. Schum.	Tree	**3**	**3**	**8**	**5**	**1**	**2**	**4**	**3**	**2**	**6**	**9**	**5**	**15**
Celastraceae	Maytenus heterophylla (Eckl. & Zehyl.) N. Robson	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	Measopsis eminii Engl. *	t	0	0	0	0	0	**6**	0	0	0	0	0	0	0
Asteraceae	Melanthera scandens (Schum. & Thonn.) Brenan	Herb	0	**2**	**2**	**3**	**1**	**1**	0	**1**	0	**2**	0	0	**1**
Poaceae	Melinis repens (Willd) Zizka	Herb	0	**5**	**2**	**1**	0	0	**1**	0	0	**1**	**1**	0	0
Cyperaceae	Meriscus sp (sedge)	Herb	0	0	0	0	0	0	0	0	0	**2**	0	0	0
Euphorbiaceae	Micrococca mercurialis (L.) Benth.	Herb	0	**1**	**1**	**1**	**1**	0	0	0	0	**1**	0	0	0
Asteraceae	Microglossa angolensis	Herb	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	Mikania cordata (Burm.f.)B.L. Robinson	Herb	0	0	0	0	0	0	0	0	0	0	0	0	0
Miliaceae	Miliaceae (Mahogany)	Tree	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Moraceae	Milicia excelsa (Welw.) C.C. Berg.	Tree	**1**	**1**	**2**	**3**	0	**6**	**1**	**2**	0	0	**2**	0	0
Fabaceae. Mimosoideae	Mimosa pigra L.	Herb	0	0	0	0	**1**	0	**5**	0	0	0	**2**	0	0
Fabaceae. Mimosoideae	Mimosa pudica L.	Herb	0	0	**1**	0	**1**	**1**	**1**	0	0	**2**	0	0	0
Molluginaceae	Mollugo nudicaulis Lam.	Herb	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Cucurbitaceae	Momordica foetida K.Schum.	Liana	0	0	0	**1**	0	0	0	1	**1**	0	0	0	0
Vitaceae	Momordica friesiorum (Harms.) C. Jeffrey	Liana	0	0	0	0	0	0	0	0	0	0	0	0	0
Annonaceae	Monanthotaxis buchananii (Engl.) Verdc.	Tree	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Fabaceae. Faboideae	Mucuna poggei Taub.	Liana	0	0	0	0	0	0	0	**2**	0	**1**	0	0	0
Cucurbitaceae	Mukia maderaspatana (L.) M.J. Roem.	Tree	0	0	0	0	**1**	0	**1**	0	0	0	0	0	0
Musaceae	Musa acuminata Colla	Tree	**2**	**4**	**3**	0	0	0	**1**	0	0	0	0	0	0
Cecropiaceae	Myrianthus arboreus Beauv.	Tree	0	0	0	0	0	0	0	**1**	0	0	0	0	0

Annonaceae	Maytenus heterophylla (Eckl. & Zehyl.) N. Robson	Tree	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Lamiaceae	Ocimum gratissimum L.	Shrub	0	0	0	0	0	0	0	0	**1**	0	0	0	0
Poaceae	Olyra latifolia L.	Herb	0	0	0	0	0	0	0	0	0	0	0	**3**	0
Apocynaceae	Oncinotis sp.	Liana	0	0	0	0	0	0	0	0	0	0	0	0	0
Flacourtiaceae	Oncoba spinosa Forssk.	Tree	0	0	0	0	0	0	0	0	0	0	0	**1**	0
Poaceae	Oplismenus hirtellus (L.) P. Beav.	Herb	0	0	0	0	0	0	0	**1**	0	0	0	0	**1**
Poaceae	Oryza longistaminata A. Chev. & Roehr.	Herb	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Oxalidaceae	Oxalis corniculata L.	Herb	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Oxalidaceae	Oxalis latifolia L.	Herb	0	0	**3**	0	**1**	0	0	0	0	**4**	**1**	0	0
Polygonaceae	Oxygonum sinuatum (Meisn.) Dummer (Meisn) Dummer	Herb	**1**	**1**	**2**	**2**	0	0	0	0	0	0	**1**	0	0
Poaceae	Panicum atrosanguineum A. Rich.	Herb	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Poaceae	Panicum duestum Thunb.	Herb	0	0	0	**1**	**1**	0	0	0	0	0	**1**	0	0
Poaceae	Panicum maximum Jacq.	Herb	0	0	**4**	**1**	**1**	0	**3**	0	0	**2**	**2**	0	0
Poaceae	Paspalum conjugatum Berg.	Herb	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Poaceae	Paspalum scrobiculatum (A. Rich.) Stapf.	Herb	0	0	**3**	**1**	0	0	0	0	**1**	**3**	**2**	0	0
Passifloraceae	Passiflora edulis sims	Liana	0	0	0	**1**	0	0	0	0	0	0	0	0	0
Rubiaceae	Pavetta insignis Bremeck.	Tree	0	0	0	0	0	0	0	0	**1**	0	0	0	0
Sapindaceae	Paulinia pinnata L.	Liana	0	0	0	0	0	0	0	0	0	**2**	0	0	0
Poaceae	Pennisetum polystachion (L.) Schult.	Herb	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Poaceae	Pennisetum purpureum Schumach	Herb	0	0	**2**	0	0	0	0	0	0	0	0	0	0
Apocynaceae. Asclepioideae	Pentarrhinum insipidum E. Mey	Liana	0	0	**2**	0	0	0	0	0	0	**1**	**1**	0	0
Piperaceae	Peperomia abyssinica Miq.	Herb	0	0	0	0	0	0	0	0	0	0	0	**1**	0
Apocynaceae. Asclepioideae	Pergularia daemia (Forsk.) Chiov.	Liana	0	0	0	**1**	0	0	**1**	0	0	**1**	0	0	0
Lauraceae	Persea americana Mill.	Tree	**1**	**1**	0	**2**	0	0	0	0	0	0	0	0	0

Polygonaceae	Persicaria madagascariensis	Herb	0	0	0	0	0	0	**1**	0	0	0	0	0	0
Polygonaceae	Persicaria salicifolium	Herb	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Fabaceae. Faboideae	Phaseolus vulgaris L.	Herb	0	0	**4**	**1**	0	**5**	0	0	0	0	**1**	0	0
Arecaceae	Phoenix reclinata Jacq.	Tree	0	0	**1**	**1**	0	0	0	0	0	0	**1**	0	0
Loranthaceae	Phragmanthera uisuiensis	Liana	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Poaceae	Phragmites mauritianus Kunth.	Herb	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Phyllanthaceae	Phyllanthus amarus Schum. & Thonn.	Herb	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Phyllanthaceae	Phyllanthus guinensis Pax	Shrub	0	0	0	**1**	0	0	0	0	0	**1**	**1**	0	0
Phyllanthaceae	Phyllanthus nummulariifolius Poir.	Herb	**1**	0	0	0	0	0	0	0	0	0	0	0	0
Phyllanthaceae	Phyllanthus ovalifolia	Herb	0	**1**	0	0	0	0	0	0	0	**1**	0	0	0
Phyllanthaceae	Phyllanthus pseudonuruli	Herb	**2**	**2**	**2**	**0**	0	0	0	0	0	**4**	**1**	0	0
Euphorbiaceae	Phyllanthus sp	Herb	0	0	0	0	**1**	0	0	0	0	0	0	0	0
Solanaceae	Physalis minima L.	Herb	0	0	0	**1**	0	0	0	0	0	**2**	0	0	0
Apocynaceae	Picralima nitida (Stapf) Th. & Hel. Dur.	Tree	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Pinaceae	Pinus sp*	Tree	0	0	**1**	**1**	0	**1**	0	0	0	0	0	0	0
Piperaceae	Piper umbellatum L.	Herb	0	0	0	0	0	0	0	0	0	0	0	**1**	0
Araceae	Pistia stratiotes L.	Herb	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Lamiaceae	Plectranthus comosus Sims.	shrub	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	Pluchea ovalis DC	Herb	0	0	0	0	0	0	**2**	0	0	0	**3**	0	0
Commelinaceae	Pollia condesta C.B. Cl.	Herb	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Polygonaceae	Polygonium sp	Herb	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Polygonaceae	Polygonum salicifolium	Herb	0	0	0	0	**1**	0	0	0	0	0	0	0	0
Polygonaceae	Polygonum senegalense Meisn	Herb	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Araliaceae	Polyscias fulva (Hien) Harms	Tree	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Portulacaceae	Portulaca oleracea L.	Herb	0	**4**	0	0	0	0	0	0	0	0	0	0	0
Portulacaceae	Portulaca quadrifida L.	Herb	0	**2**	0	0	0	0	0	0	0	0	0	0	0
Verbenaceae	Priva cordifolia (L.) Druce	Herb	0	0	0	**2**	0	0	0	0	0	0	0	0	0
Anacardiaceae	Pseudospondias microcarpa (A.	Tree	0	0	0	0	0	0	0	**1**	0	**1**	**1**	0	0

	Rich.) Engl.														
Myrtaceae	Psidium guajava L.	Tree	0	0	**1**	**2**	**1**	0	**1**	0	0	**1**	0	0	0
Rubiaceae	Psychotria pendicularis	Shrub	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Rubiaceae	Psydrax parviflora ssp. parviflora	Tree	0	0	0	0	0	0	0	**1**	**1**	**1**	0	0	0
Pteridaceae	Pteris aqui	Herb	0	0	0	4	0	0	0	0	0	0	0	0	0
Pteridaceae	Pteris catoptera Kunze	Herb	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Lamiaceae	Pycnostachys coerulea Hook.	Herb	0	0	0	0	0	0	0	0	**2**	0	0	0	0
Lamiaceae	Pycnostachys meyeri Guerke	Herb	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Vitaceae	Rhoicissus tridentata (L.f.) Willd. & Drummond	Liana	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Anacardiaceae	Rhus natelensis Krauss	Shrub	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Fabaceae. Faboideae	Rhynchosia hirta Andrews Meikle & Verdc.	Liana	**1**	**1**	0	0	0	0	0	**1**	0	0	0	0	0
Euphorbiaceae	Ricinus communis L.	Herb	0	0	**1**	**4**	**1**	0	0	0	**1**	0	0	0	0
Rubiaceae	Rytiginia sp	Shrub	0	0	0	0	0	0	0	**2**	0	0	0	0	0
Rubiaceae	Rothmania urceliformis (Hiern.) Bullock ex Robyns	Tree	0	0	0	0	0	0	0	0	0	**2**	0	**8**	0
Poaceae	Rottboellia cochinchinensis (Lour.) W.D. Clayton	Herb	**1**	**1**	**2**	0	**1**	0	0	0	0	**1**	0	0	0
Acanthaceae	Ruellia humilis Nutt.	Herb	0	0	0	0	**1**	0	0	**1**	0	0	0	0	0
Apocynaceae	Saba comorensis (Boj.) Pic.	Liana	0	0	0	0	0	0	0	**1**	0	0	0	0	**1**
Poaceae	Saccharum officinarum L.	Herb	0	**4**	0	0	0	0	0	0	0	0	0	0	0
Celastraceae	Salacia elegans Oliv.	Liana	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Agavaceae	Sanseviera sp	Herb	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Sapindaceae	Sapindus saponaria L.	Tree	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Sapotaceae	Sapotaceae (Ficus like)	Tree	0	0	0	0	0	0	0	0	0	0	0	**1**	0
Apocynaceae. Asclepioideae	Sarcostemma viminale (L.) R. Br	Liana	**1**	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnaceae	Scutia myrtina (Burm.f.) Kurz.	Shrub	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Asclepiadaceae	Secamone africana (Oliv.) Bullock	Liana	0	0	0	0	0	0	0	**2**	**1**	**1**	0	0	0
Fabaceae.	Senecio discfolius	Shrub	0	**1**	0	0	0	0	0	0	0	0	0	0	0

Caesalpinioideae															
Fabaceae. Caesalpinioideae	Senna bicapsularis	Shrub	**2**	**2**	0	0	0	0	**1**	0	0	0	0	0	0
Fabaceae. Caesalpinioideae	Senna hirsuta (L.) Irwin & Barneby	Shrub	0	**1**	**3**	**2**	**2**	0	**4**	0	**1**	**2**	0	0	0
Fabaceae. Caesalpinioideae	Senna occidentalis (L.)Link	Shrub	0	0	0	**2**	0	0	0	0	0	0	0	0	0
Fabaceae. Caesalpinioideae	Senna siamea (Lam.) Irwin & Barneby	Shrub	0	0	**1**	0	**1**	**2**	0	0	0	0	0	0	0
Fabaceae. Caesalpinioideae	Senna spectabilis (DC) H.S. Irwin & Barneby	Shrub	0	0	0	0	0	0	0	0	0	**1**	**1**	0	0
Fabaceae. Caesalpinioideae	Sesbania sesban (L.) Merr.	Shrub	0	0	0	0	**1**	0	0	0	0	0	**1**	0	0
Poaceae	Setaria homonyma (Steud.) Chiov.	Herb	**1**	**2**	0	0	0	0	0	0	0	**1**	0	0	0
Poaceae	Setaria megaphylla (Steud.) Th. Dur. & Schinz	Herb	0	0	0	1	0	0	0	0	0	0	0	0	0
Euphorbiaceae	Shirakiopsis elliptica (Hochst.) Esser	Tree	0	0	**1**	**3**	**1**	0	0	0	0	**2**	0	0	0
Malvaceae. Malvoideae	Sida acuta Burm.f. Burm.f.	Herb	0	0	**3**	**1**	**2**	0	0	0	0	**2**	**3**	0	0
Malvaceae. Malvoideae	Sida cordifolia L.	Herb	**2**	**1**	0	0	0	0	0	0	0	0	0	0	0
Malvaceae. Malvoideae	Sida ovata Forsk.	Herb	**1**	**2**	1	0	0	0	**1**	0	**1**	0	0	0	0
Malvaceae. Malvoideae	Sida rhombifolia L.	Herb	0	0	4	**3**	**1**	0	**3**	0	0	**3**	**2**	0	0
Malvaceae. Malvoideae	Sida veronicifolia Lam.	Herb	0	0	0	0	0	0	**1**	0	0	**1**	0	0	0
Asteraceae	Sigesbeckia orientalis L.	Herb	**1**	**1**	0	0	**1**	0	**1**	0	0	0	**1**	0	0
Solanaceae	Solanum anguivi Lam.	Shrub	0	0	0	0	**1**	0	0	0	0	0	0	0	0
Solanaceae	Solanum campylacanthum Hochst. ex A. Rich.	Shrub	0	0	0	0	0	0	**1**	0	0	0	**1**	0	0
Solanaceae	Solanum gilo	Shrub	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Solanaceae	Solanum melongana L.	Herb	0	**3**	0	0	0	0	0	0	0	0	0	0	0

Solanaceae	Solanum nigrum L.	shrub	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Poaceae	Sorghum arundinaceum (Desv.) Stapf	Herb	0	0	**2**	**0**	**1**	**1**	**3**	0	0	**1**	**1**	0	0
Bignoniaceae	Spathodea campanulata Beauv.	Tree	0	0	**2**	**2**	0	**2**	0	0	0	**1**	**1**	0	0
Poaceae	Sporobolus pyramidalis P. Beauv.	Herb	0	0	0	0	**1**	0	**2**	0	0	0	**1**	0	0
Oleaceae	Steganthus welwitschii (Knobl.) Knobl.	Tree	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Bignoniaceae	Stereospermum kunthianum Cham.	Tree	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Poaceae	Suddia sagittifolia Renvoize	Herb	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Asteraceae	Synedrella nodiflora (L.) Gaertner	Herb	**2**	0	0	**2**	**1**	0	0	**1**	**2**	**2**	**2**	0	0
Myrtaceae	Syzygium cordatum Hochst.ex Krauss	shrub	0	0	0	**1**	0	0	0	0	0	0	0	0	0
Fabaceae. Caesalpinioideae	Tamarindus indica L.	Tree	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Rubiaceae	Tarenna pavettoides ssp. gilmanii	Shrub	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Bignoniaceae	Tectona grandis L.f.	Tree	0	0	0	**1**	0	**1**	**1**	0	0	0	0	0	0
Fabaceae. Faboideae	Tephrosia pumila	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Fabaceae. Faboideae	Teramnus labialis (L.f.) Spreng.	Herb	0	0	**1**	**1**	0	0	**1**	0	**1**	**1**	**1**	0	0
Combretaceae	Terminalia grandis	Tree	0	0	0	0	0	0	0	0	0	**4**	0	0	0
Euphorbiaceae	Tetrorchidium didymostemon (Baill)Pax & K. Hoffm.	Tree	0	0	0	0	0	0	0	**1**	0	**2**	0	0	0
Apocynaceae	Thevetia peruviana (Pers.) Schum	shrub	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Acanthaceae	Thunbergia alata Sims	Liana	0	0	0	0	0	0	0	0	**2**	**2**	**1**	0	0
Menispermaceae	Tiliacora funifera (Miers) Oliv.	Liana	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Euphorbiaceae	Tragia brevipes Pax	Herb	0	0	**1**	0	0	0	0	0	**1**	**1**	0	0	0
Ulmaceae	Trema orientalis (L.) Blume	Tree	0	0	0	0	**1**	0	0	**1**	0	0	0	0	0

	Treya sp (herb)	Herb	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Rubiaceae	Tricalysia niamniamensis	Tree	0	0	0	0	0	0	0	**1**	0	**2**	0	0	0
Meliaceae	Trichilia dregeana Sond	Tree	0	0	0	0	0	0	0	0	0	0	0	0	**3**
Meliaceae	Trichilia prieuriana A. Juss	Tree	0	0	0	0	0	0	0	**1**	0	**1**	0	0	0
Meliaceae	Trichilia sp (Meliaceae)	Tree	0	0	0	0	0	0	0	**1**	0	**1**	**4**	0	**9**
Asteraceae	Tridax procumbens L.	Herb	0	0	**1**	0	**1**	0	**1**	0	0	0	0	0	0
Moraceae	Trilepisium madagascariense DC	Tree	0	0	0	0	0	0	0	0	0	0	0	**6**	**8**
Melastomataceae	Tristemma maritianum A. Juss.	Herb	0	0	**1**	0	0	0	0	0	0	**1**	0	0	0
Malvaceae. Tilioideae	Triumfetta macrophylla K. Schum.	Shrub	0	0	**3**	**1**	0	0	0	**1**	0	**1**	**2**	0	0
Malvaceae. Tilioideae	Triumfetta rhomboidea Jacq.	Herb	0	0	0	0	0	0	0	0	0	**1**	**1**	0	0
Fabaceae. Caesalpinioideae	Tylosema fassoglensis (Schweinf.) Torre & Hillc.	Liana	0	0	0	0	0	0	0	0	0	0	**1**	0	0
Typhaceae	Typha latifolia L.	Herb	0	0	0	0	0	0	0	0	0	0	**2**	0	0
	Unident 1		0	0	0	0	0	0	0	0	0	**1**	0	**1**	0
	Unident2		0	0	0	0	0	0	0	0	0	**1**	0	**2**	0
	Unident 4		0	0	0	0	0	0	0	0	0	**1**	0	0	0
Malvaceae	Urena lobata L.	Shrub	0	0	0	0	**2**	0	**1**	0	**2**	**4**	**1**	0	0
Urticaceae	Urera hypselodendra Wedd.	Liana	0	0	0	0	0	0	0	**1**	**1**	**1**	0	0	0
Rubiaceae	Vangueria acutiloba Robyns	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubiaceae	Vangueria apiculata K.Schum.	Tree	**1**	**1**	0	0	0	0	0	**1**	0	**1**	0	0	0
Rutaceae	Vepris grandifolia (Engl.) Mziray	Tree	0	0	0	0	0	0	0	0	0	**1**	0	**1**	0
Rutaceae	Vepris nobilis (Del.) Mziray	Shrub	0	0	0	0	0	0	0	**1**	0	0	0	0	0
Asteraceae	Vernonia amygdalina Del.	Shrub	**1**	**1**	**6**	**8**	**1**	**1**	**5**	**1**	**2**	**5**	**3**	0	0

Asteraceae	Vernonia auriculata Hiern.	Shrub	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Asteraceae	Vernonia campanea S.Moore	Herb	0	0	0	0	0	0	**1**	0	0	**1**	0	0	0
Asteraceae	Vernonia lasiopus O. Hoffm.	Herb	0	**1**	0	0	0	0	0	0	0	0	0	0	0
Fabaceae. Faboideae	Vigna luteola (Jacq.) Benth	Herb	0	0	**1**	0	0	0	0	0	0	0	0	0	0
Fabaceae. Faboideae	Vigna uniguiculata (L.) Walp	Liana	0	0	**2**	0	0	0	0	0	0	0	0	0	0
Poaceae	Vossia cuspidata (Roxb.) Griff.	Herb	0	0	**3**	**1**	0	**2**	0	0	0	0	**2**	0	0
Acanthaceae	Whitfieldia elongata (Beauv.) C.B.Cl.	Shrub	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Araceae	Xanthosoma sagittifolium (L.) Schott	Herb	0	0	0	0	0	0	**1**	0	0	0	0	0	0
Poaceae	Zea mays L.	Herb	**1**	**1**	**4**	**1**	**1**	**5**	**4**	0	0	**1**	**3**	0	0
Cucurbitaceae	Zehneria scabra (Linn.f.) Sond	Liana	0	0	0	0	0	**1**	0	0	0	0	0	0	0
	# spp		**47**	**109**	**112**	**88**	**71**	**42**	**67**	**62**	**59**	**172**	**112**	**42**	**52**

Appendix 2a: Observed species, Families and Genera of the plant at various sites, 2017

SITE	No. of spp	Families	Genera
Bujagali/Kyabirwa village area	59	20	40
Bujagaali shoreline	56	22	51
Bujagali islands	109	42	94
Namizi area-Community land	20	10	17
Namizi area-Community-shoreline	28	12	23
Itanda Island-Forest	30	24	43
Itanda Island-Cultivation	17	13	16
Itanda riverbank	50	19	45
Itanda shoreline	33	18	32
Naminya Terrestrial-South	60	24	51
Naminya Shoreline-South	45	20	39
Naminya North/Buloba	71	23	62
Malindi	67	26	56
Kikubamutwe area-shoreline	37	21	31
Kikubamutwe area-riverbank	48	15	43
Kikubamutwe area-community land	59	27	54
Kalagala Forest Reserve-island	18	15	18
Kalagala Forest Reserve- land	159	41	125
Isimba Dam site-within Fence	84	24	70
Isimba Dam site-outside Fence	55	23	50
Mabira Forest Reserve-Primary	35	20	29
Mabira Forest Reserve-secondary	52	23	44

Appendix 2b: Summary of observed species, Families, Genera and other classifications of the plant at various sites, 2017

SITE	Area	SITE	No. of spp	Families	Genera	Woody spp	Non woody spp	Liana spp	Invasive spp
1	Bujagali	Bujagali/Kyabirwa village area	59	20	40	27	30	1	1
		Bujagaali shoreline	56	22	51	20	20	16	2
		Bujagali islands	109	42	94	40	70	10	2
		Total	156	49	128	53	99	21	3
2	Namizi	Namizi area-Community land	20	10	17	20	n/a	n/a	0
		Namizi area-Community-shoreline	28	12	23	3	20	5	1
		Total	42	19	39	24	15	4	2
3	Itanda	Itanda Island-Forest	30	24	43	23	13	7	0
		Itanda Island-Cultivation	17	13	16	17	n/a	0	0
		Itanda riverbank	50	19	45	18	28	3	2
		Itanda shoreline	33	18	32	11	16	6	2
		Total	121	34	104	52	55	13	1
4	Naminya	Naminya Terrestrial-South	60	24	51	19	40	1	2
		Naminya Shoreline-South	45	20	39	21	16	8	1
5		Naminya North/Buloba	71	23	62	23	48	2	1
		Total	159	41	138	63	91	13	3
6	Malindi	Malindi	67	26	56	21	43	3	2
7	Kikubamutwe	Kikubamutwe area-shoreline	37	21	31	18	14	5	2
		Kikubamutwe area-riverbank	48	15	43	13	34	1	2
		Kikubamutwe area-community land	59	27	54	20	36	3	2

		Kikubamutwe Total	112	37	96	45	66	8	2
8	Kalagala Forest Reserve	Kalagala Forest Reserve-island	18	15	18	8	6	4	1
		Kalagala Forest Reserve- land	159	41	125	68	78	12	3
		Kalagala Forest Reserve Total	172	44	121	71	81	15	3
9	Isimba Dam Area	Isimba Dam site-within Fence	84	24	70	29	51	4	2
		Isimba Dam site-outside Fence	55	23	50	27	27	1	2
		Isimba Dam Area Total	112	29	99	46	64	5	2
10	Mabira Forest Reserve	Mabira Forest Reserve-Primary	35	20	29	22	12	1	1
		Mabira Forest Reserve-secondary	52	23	44	30	19	3	1
		Mabira Forest Reserve Total	94	35	58	52	31	4	2

NB: Itanda/Nile Bank Forest Reserve- Not sampled, it is all Pine & Tectonia sps plantations

Appendix 2c: Observed Invasive plant species at various sites, 2017

SITE	FAMILIES	GENERA	INVASIVE SPP
Bujagali	Asteraceae, Poaceae, Eurphobiaceae,Fabaceae	Ipomea, Vernonia, Commelina, Amaranthus	Broussonetia papyrifera, Lantana camara, Eichhornia crassipes
Namizi	Moraceae , Poaceae	none	Eichhornia crassipes
Itanda	Rubiaceae, Eurphobiaceae, Asteraceae, Poaceae, Moraceae	none	Broussonetia papyrifera
Naminya	Poaceae, Fabaceae, Asteraceae	none	Broussonetia papyrifera, Lantana camara, Eichhornia crassipes
Malindi	Poaceae, Fabaceae	Broussonetia, Ipomea, Vernonia, Zea	Broussonetia papyrifera, Lantana camara
Kikubamutwe	Poaceae, Fabaceae, Eurphobiaceae, Moraceae	Ipomea, Vossia, Truimpheta, Eichhornia,	Broussonetia papyrifera, Eichhornia crassipes
	Convulvalaceae	Fluggea, Sida, Broussonetia,Coffea, Cynodon,	, Lantana camara
		Bidens, Lantana	
Kalagala	Asteraceae, Poaceae, Eurphobiaceae, Fabaceae	Maesopsis, Commelina, Markhamia, Albizia	Broussonetia papyrifera, Lantana camara, Senna spectabilis
Isimba	Asteraceae, Poaceae, Malvaceae, Fabaceae	Cyperous, Markhamia, Cynodon	Broussonetia papyrifera, Lantana camara
	Cyperaceae, Moraceae	Ficus, Markhamia	
Mabira FR	Moraceae,Eurphobiaceae, Ulmaceae, Fabaceae	Acalypha, Albizia, Celtis, Funtumia, Trilepisium	*Broussonetia papyrifera*
		Celtis, Leptaspis, Trilepisium, Broussonetia	

Appendix 3.1: Relative Abundance for the Land Bird Species Recorded in different sites during the three different years

		1998 RESULTS					2006 RESULTS							2017 Results									
												Forest Reserves							Offset Areas				
Atlas No.	Name	Class	Kiku*	Naz	Buj	Overall	Nany	Kiku	Naz	Buj	Overall	Kalagala	Itanda	Nany	Buj. Is	Buj	Kiku	Naz	Itanda Is	Mabira	Isimba	Itanda/Nile Bank FR	Kalagala
17	CATTLE EGRET *Bubulcus ibis*	G	1.8	1.4	4.4	2.5	1		1	2	1.5	2.3	2.7	1.3	0.7	1		1.9			3.3	1.8	4.5
18	STRIATED HERON *Butorides striatus*	R-NT													2.3	1.8	1.3					1	
19	BLACK HERON *Egretta ardesiaca*	R-NT													0.3								
25	GREY HERON *Ardea cinerea*	R-NT													1						0.1	0.5	
26	BLACK-HEADED HERON *Ardea melanocephala*	w		0.4		0.1	1.7	0.3	1		0.4	3	0.3	3.5	2		2.5	0.1	1.2		1.1	0.8	1.3
28	HAMERKOP *Scopus umbretta*	w														2	2.3	0.9	1		0.4		
30	AFRICAN OPENBILL STORK *Anastomus lamelligerus*	w					4.3	1.5	2.8		1.4	4	2.7	0.5	4.7	2.7	4.3	4.5	2.2		4.1	2.8	2.5
36	MARABOU STORK *Leptoptilos crumeniferus*	w					0.3					1				1							
39	HADADA IBIS *Bostrychia hagedash*	w	0.4		1.2	0.5	1	0.8		1.7	0.8			1.3	1.8	2.8		1.4	2.6		0.7	0.3	0.3
69	OSPREY *Pandion haliaetus*	PM														1			0.6				
71	HONEY BUZZARD *Pernis apivorus*	P,F							0.8		0.3												
73	BLACK-SHOULDERED KITE *Elanus caeruleus*	G					Pb					0.7	0.3				0.8						
75	BLACK KITE *Milvus migrans*	pA			0.6	0.2	3	3.8	1.5	3.3	2.9		1	5.8	4.5	4	2.8	4		0.4	3	3.2	2
76	AFRICAN FISH EAGLE *Haliaeetus vocifer*	W												1	1.3	1.8	0.8	1.8	0.8			1	1.5

77	PALM-NUT VULTURE *Gypohierax angolensis*	**G**						**1.5**			**0.5**	**2**		**1.3**		**0.7**		**1.6**		**0.4**		**0.5**	
80	HOODED VULTURE *Necrosyrtes monachus*	**f**	**0.2**			**0.1**		**1.5**			**0.5**	**1.7**							**0.4**	**0.8**			
86	BROWN SNAKE EAGLE *Circaetus cinereus*	**R-NT**		**1**		**0.3**							**0.7**										
90	AFRICAN HARRIER HAWK *Polyboroides typus*	**f**		**0.8**	**0.2**	**0.3**	**1.7**	**1.3**	**0.3**	**3**	**1.5**	**2**		**0.3**				**1.4**		**0.3**	**0.3**		**0.8**
93	AFRICAN MARSH HARRIER *Circus ranivorus*	**R-NT, W**	**p0.6c**			**p0.2**																	
98	AFRICAN GOSHAWK *Accipiter tachiro*	**F**		**0.4**		**0.1**		**0.3**		**2**	**0.8**			**1.5**								**0.8**	
100	SHIKRA *Accipiter badius*	**F**	**1.2**	**1.2**		**0.8**	**1**			**2**	**0.7**					**1**		**0.8**	**0.2**				
103	LITTLE SPARROWHAWK *Accipiter minullus*	**f**												**1.5**									
106	BLACK SPARROWHAWK *Accipiter melanoleucus*	**F**												**0.3**									
109	LIZARD BUZZARD *Kaupifalco monogrammicus*	**F**			**3**	**1**	**2**	**0.8**	**0.5**	**3.3**	**1.5**	**1.3**	**0.7**		**0.7**	**2.3**	**0.8**	**1.1**	**1.8**		**0.9**	**1**	**4.3**
116	TAWNY EAGLE *Aquila rapax*											**1.7**											
118	WAHLBERG,S EAGLE *Aquila wahlbergi*	**A,f**						**1.3**	**1.5**		**0.9**							**0.8**					**0.3**
122	LONG-CRESTED EAGLE *Lophaetus occipitalis*	**F**	**1.8**			**0.6**			**2.6**		**0.9**		**P**						**1.2**		**0.7**		**2.3**
124	CROWNED EAGLE *Stephanoaetus coronatus*	**R-VU**																		**1.3**			
136	EURASIAN HOBBY *Falco subbuteo*	**PM**														**1.8**			**0.4**		**0.3**	**0.8**	
137	AFRICAN HOBBY *Falco cuvieri*	**F**											**2**		**0.8**	**1**		**0.6**					
142	HELMETED GUINEAFOWL *Numida meleagris*													**2.5**	**0.7**						**1.4**		

155	SCALY FRANCOLIN *Francolinus squamatus*	**F**											**2.7**		**0.8**	**0.5**		**0.4**					
168	WHITE-SPOTTED FLUFFTAIL *Sarothrura pulchra*	**F**																		**0.6**			
185	GREY CROWNED CRANE *Balearica regulorum*	**VU,R-NT**																					**0.3**
268	AFRICAN GREEN-PIGEON *Treron calvus*	**F**			**1.4**	**0.5**		**0.3**	**0.8**		**0.4**	**2**					**1**				**1**		**3**
270	TAMBOURINE DOVE *Turtur tympanistria*	**F**	**1.8**			**0.6**		**1.5**		**2**	**1.2**	**1.3**		**2.8**	**0.5**		**1.5**	**0.5**	**1.8**	**2.5**	**0.7**	**0.7**	**4.5**
271	BLUE-SPOTTED WOOD DOVE *Turtur afer*	**f**	**3.2**	**1.6**	**2.8**	**2.5**	**2.7**	**3**	**3.5**		**3.2**			**3.5**	**2.3**	**3.3**	**1.8**	**3.5**	**1.2**		**5.3**	**2.7**	**3.8**
273	EMERALD-SPOTTED WOOD DOVE *Turtur chalcospilos*	**F**														**0.7**							
280	AFEP PIGEON *Columba unicincta*	**FF**																		**0.6**			
281	SPECKLED PIGEON *Columba guinea*	**G**												**1.3**		**0.3**					**0.1**		
283	RED-EYED DOVE *Streptopelia semitorquata*	**f**	**1.4**	**4.4**	**2.6**	**2.8**	**2.7**	**1.8**	**5.8**	**0.2**	**2.6**	**3**	**2.7**	**6**	**5**	**4.8**	**2**	**5.4**	**3**	**0.3**	**3.1**	**2.8**	**3.5**
289	LAUGHING DOVE *Streptopelia senegalensis*	**G**	**1.2**			**0.4**		**0.5**	**2.3**		**0.9**										**4.3**		**1.3**
290	GREY PARROT *Psittacus erithacus*	**NT,R-NT**												**3**		**1.5**				**1.3**			**4.3**
292	BROWN PARROT *Poicephalus meyeri*	**p**								**0.3**	**0.1**			**1.3**		**0.3**	**0.5**				**0.7**		
293	RED-HEADED LOVEBIRD *Agapornis pullarius*	**f**															**0.3**				**0.3**		
296	GREAT BLUE TURACO *Corythaeola cristata*	**F**										**6**								**2**			
297	BLACK-BILLED TURACO *Tauraco schuetti*	**FF**																		**0.9**			
302	ROSS'S TURACO *Musophaga rossae*	**F**	**0.4**		**1.2**	**0.5**			**1.5**	**0.3**	**0.6**	**0.7**		**2**		**1.3**	**1**	**0.3**					**0.5**

305	EASTERN GREY PLANTAIN-EATER *Crinifer zonurus*	**G**	**2.8**	**1**	**0.4**	**1.4**	**3.7**	**4.5**	**5.8**	**4.7**	**5**	**5.3**	**1**	**4.8**	**3.7**	**3.8**	**0.5**	**4.6**	**1.4**		**2.9**		**3.8**
306	JACOBIN CUCKOO *Clamator jacobinus*	**AM**																			**0.3**		
309	RED-CHESTED CUCKOO *Cuculus solitarius*	**AM,F**							**P**						**0.3**					**3.3**			
310	BLACK CUCKOO *Cuculus clamosus*	**AM, FF**																		**0.3**			
312	AFRICAN CUCKOO *Cuculus gularis*	**AM**														**0.5**				**0.1**			
314	DUSKY LONG-TAILED CUCKOO *Cercococcyx mechowi*	**FF**																		**2.3**			
317	AFRICAN EMERALD CUCKOO *Chrysococcyx cupreus*	**FF**																		**4.2**	**0.9**		
319	KLAAS' CUCKOO *Chrysococcyx klaas*	**f**			**2.6**	**0.9**			**1**		**0.3**		**2.3**	**1.8**						**2.8**	**1.1**	**1.3**	**4.5**
320	DIDRERIC CUCKOO *Chrysococcyx caprius*	**f**					**2.3**					**1.3**		**4.8**	**1.7**			**0.9**	**0.6**		**3.4**		**3.3**
321	YELLOWBILL *Ceuthmochares aereus*	**F**													**0.7**					**0.4**			
323	WHITE-BROWED COUCAL *Centropus superciliosus*	**G**		**0.6**	**2.8**	**1.1**		**1**	**3.8**		**1.6**			**1.5**	**2.8**	**1**	**1**	**1.1**			**3.1**	**1.5**	
325	SENEGAL COUCAL *Centropus senegalensis*	**f**																			**0.4**		
326	BLUE-HEADED COUCAL *Centropus monachus*	**w**													**0.5**								
356	CASSIN'S SPINETAIL *Neafrapus cassini*	**FF**																		**0.2**			
357	SCARCE SWIFT *Schoutedenapus myioptilus*	**F**																				**2.2**	**1.3**
358	AFRICAN PALM SWIFT *Cypsiurus parvus*		**1.2**	**1.8**		**1**	**3**		**1.5**	**0.7**	**0.7**	**2**	**2**	**1.5**		**2.3**	**0.8**	**0.8**	**2.4**	**0.5**	**0.7**		**1.8**
362	COMMON SWIFT *Apus apus*	**PM**																**0.1**					

369	SPECKLED MOUSEBIRD *Colius striatus*	**G**	**2.8**	**3.6**	**3**	**3.1**	**5.3**	**2.3**	**1.5**		**1.3**	**3.3**	**2.7**	**4**	**2.2**	**3**	**0.5**	**2.5**		**0.5**	**3.7**	**1.5**	**3.8**
371	NARINA,S TROGON *Apaloderma narina*	**F**																		**0.3**			
374	BLUE-BREASTED KINGFISHER *Halcyon malimbica*	**F**																	**1**	**0.9**			
375	WOODLAND KINGFISHER *Halcyon senegalensis*	**AM**		**1**	**1.4**	**0.8**			**1.5**		**0.5**	**4.3**	**1.7**	**2.3**	**1.3**	**1.7**	**2.5**	**1**	**4**		**4.7**	**2.3**	**4.3**
376	STRIPED KINGFISHER *Halcyon chelicuti*																						**1.3**
377	AFRICAN DWARF KINGFISHER *Ceyx lecontei*	**FF**																		**0.8**			
378	AFRICAN PYGMY KINGFISHER *Ceyx pictus*	**f,w**		**0.4**	**0.4**	**0.3**			**0.8**		**0.3**			**1.5**		**2.8**	**1.3**	**0.5**	**0.6**	**1.9**	**0.6**	**1.7**	**2.3**
385	LITTLE BEE-EATER *Merops pusillus*																						**0.8**
390	WHITE-THROATED BEE-EATER *Merops albicollis*	**AM**	**0.8**	**4.6**	**0.4**	**1.9**														**0.3**			
392	BLUE-CHEEKED BEE-EATER *Merops persicus*	**PM,Ae**		**1**		**0.3**																	
394	EUROPEAN BEE-EATER *Merops apiaster*	**PM**						**4.5**	**1.8**		**2.1**	**1**				**0.5**	**1.5**			**0.7**		**1**	**1**
401	BROAD-BILLED ROLLER *Eurystomus glaucurus*	**AM,f,w**		**1.8**	**0.4**	**0.7**			**1**		**0.3**	**5.7**					**2**				**2**		**0.8**
403	WHITE-HEADED WOOD-HOOPOE *Phoeniculus bollei*																			**0.3**			
418	AFRICAN PIED HORNBILL *Tockus fasciatus*	**F**											**1**							**2.3**			
419	CROWNED HORNBILL *Tockus alboterminatus*	**f**		**1.2**		**0.4**						**1.7**											**1.5**
420	AFRICAN GREY HORNBILL *Tockus nasutus*																						**1.3**

422	BLACK-AND-WHITE CASQUED HORNBILL *Bycanistes subcylindricus*	**F**							**1.5**	**1.3**	**0.9**	**0.7**				**0.8**				**4**			**2.8**
425	GREY-THROATED BARBET *Gymnobucco bonapartei*	**F**																		**2.1**			
426	SPECKLED TINKERBIRD *Pogoniulus scolopaceus*	**F**					**0.3**													**5.1**			
430	YELLOW-THROATED TINKERBIRD *Pogoniulus subsulphureus*																		**1**	**4.7**			
431	YELLOW-RUMPED TINKERBIRD *Pogoniulus bilineatus*	**F**					**2**	**4.8**	**3.3**	**4**	**4**	**2.7**		**0.8**		**0.5**	**0.3**	**1.5**		**3.7**			**1.5**
432	RED-FRONTED TINKERBIRD *Pogoniulus pusillus*																						**0.5**
433	YELLOW-FRONTED TINKERBIRD *Pogoniulus chrysoconus*	**f**	**1.2**		**3.6**	**1.6**	**2.3**	**3.3**	**2.3**	**4.7**	**3.4**	**1.7**		**5.8**		**1.5**	**3**	**0.6**			**0.4**		
434	YELLOW-SPOTTED BARBET *Buccanodon duchaillui*	**FF**																		**3.3**			
435	HAIRY-BREASTED BARBET *Tricholaema hirsuta*	**F**																		**2.9**			
443	DOUBLE-TOOTHED BARBET *Lybius bidentatus*	**f**			**1.2**	**0.4**			**0.8**		**0.3**			**4**		**1.5**		**0.6**					**0.3**
445	YELLOW-BILLED BARBET *Trachyphonus purpuratus*	**FF**										**2**								**2.3**			
449	CASSIN'S HONEYBIRD *Prodotiscus insignis*	**R-VU**																		**0.5**			
456	LESSER HONEYGUIDE *Indicator minor*	**f**														**1**							
465	NUBIAN WOODPECKER *Campethera nubica*																						**0.5**

470	BROWN-EARED WOODPECKER *Campethera caroli*	**FF**																	**0.3**			
477	GREY WOODPECKER *Dendropicos goertae*	**f**		**p0.2**		**p0.1**						**3**									**0.3**		**1.3**
498	WHITE-HEADED SAW-WING *Psalidoprocne albiceps*	**R-RR**		**1**	**0.4**	**0.5**		**1.3**	**1.5**		**0.9**	**1.7**				**1.2**		**0.5**	**1.8**	**1.6**			**1.5**
500	COMMON SAND MARTIN *Riparia riparia*	**PM**					**6**	**5.5**	**4.5**	**2.3**	**4.1**	**5.7**	**6**	**0.8**			**1.3**	**0.9**	**4.4**	**1.5**		**3.3**	**4.8**
504	MOSQUE SWALLOW *Hirundo senegalensis*														**0.3**						**1.9**		
506	RED-RUMPED SWALLOW *Hirundo daurica*																				**0.3**		
512	ANGOLA SWALLOW *Hirundo angolensis*	**w,Ae**	**1.2**			**0.4**			**3.8**	**0.7**	**1.5**		**0.7**		**0.8**		**1.3**			**0.5**			
513	BARN SWALLOW *Hirundo rustica*	**PM**	**0.2**	**1.4**	**0.8**	**0.8**	**2.7**	**1.5**	**1.8**		**0.8**		**3.3**	**0.5**	**3**	**1.7**	**1.3**	**3.5**	**2.8**	**0.3**		**0.7**	**0.3**
515	YELLOW WAGTAIL *Motacilla flava*	**PM**					**1.7**	**1.5**	**1.3**		**0.9**	**1**	**5.7**		**0.8**	**0.2**		**2.1**			**0.3**	**1**	
520	AFRICAN PIED WAGTAIL *Motacilla aguimp*	**w**			**1.4**	**0.5**							**0.7**		**0.2**			**0.8**		**0.5**		**2.2**	**0.3**
529	YELLOW-THROATED LONGCLAW *Macronyx croceus*																				**2.1**		**0.3**
538	LITTLE GREENBUL *Andropadus virens*	**F**					**4**	**2.8**			**0.9**			**1.5**						**3.9**			
539	LITTLE GREY GREENBUL *Andropadus gracilis*	**R-NT**																		**0.7**			
540	PLAIN GREENBUL *Andropadus curvirostris*	**FF**																		**1.8**			
541	SLENDER-BILLED GREENBUL *Andropadus gracilirostris*	**FF**																		**0.5**			

542	YELLOW-WHISKERED GREENBUL *Andropadus latirostris*	**F**																	**0.8**	**2.3**			
543	HONEYGUIDE GREENBUL *Baeopogon indicator*	**FF**																		**0.2**			
547	YELLOW-THROATED GREENBUL *Chlorocichla flavicollis*	**FF**												**3**	**3.7**	**0.7**	**1**		**0.2**		**0.4**	**0.7**	**0.3**
551	TORO OLIVE GREENBUL *Phyllastrephus hypochloris*	**R-VU**																		**1.7**			
556	WHITE-THROATED GREENBUL *Phyllastrephus albigularis*	**FF**																		**2.3**			
558	RED-TAILED BRISTLEBILL *Bleda syndactylus*	**FF**																		**3.3**			
561	RED-TAILED GREENBUL *Criniger calurus*	**FF**																		**1.3**			
562	COMMON BULBUL *Pycnonotus barbatus*	**f**	**6**	**6**	**6**	**6**	**5.7**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**5.8**	**5**	**6**	**4.8**	**4.2**	**2.1**	**5.4**	**4.8**	**6**
563	WESTERN NICATOR *Nicator chloris*	**F**																		**0.9**			**0.3**
566	FOREST ROBIN *Stiphrornis erythrothorax*	**FF**																		**2.1**			
575	BLUE-SHOULDERED ROBIN-CHAT *Cossypha cyanocampter*	**F**																		**0.8**			
576	WHITE-BROWED ROBIN-CHAT *Cossypha heuglini*	**f**								**1**	**0.3**				**0.2**	**0.8**					**0.1**	**0.8**	**1**
577	RED-CAPPED ROBIN-CHAT *Cossypha natalensis*	**F**																		**0.6**			
578	SNOWY-CROWNED ROBIN-CHAT *Cossypha niveicapilla*	**F**						**2**			**0.7**				**1.2**								**1.5**
579	FIRE-CRESTED ALETHE *Alethe diademata*	**FF**																		**1.2**			

581	BROWN-CHESTED ALETHE *Aletthe poliocephala*	**FF**																	**0.5**			
584	RUFOUS FLYCATCHER-THRUSH *Stizorhina fraseri*	**FF**																	**2.3**			
588	BROWN-BACKED SCRUB-ROBIN *Cercotrichas hartlaubi*	**f**																**0.8**					**1.5**
589	WHITE-BROWED SCRUB-ROBIN *Cercotrichas leucophrys*						**4.3**	**0.8**	**1.8**		**0.9**										**0.7**		
593	WHINCHAT *Saxicola rubetra*	**PM**										**1**											
612	AFRICAN THRUSH *Turdus pelios*	**f**		**0.8**	**0.6**	**0.5**	**3**		**4**	**4.3**	**2.8**	**4**	**4.7**	**1.3**		**2**	**1.3**	**2.3**	**2.2**	**1.8**	**2.7**	**2.3**	**5**
621	MOUSTACHED GRASS WARBLER *Melocichla mentalis*	**f**					**2**				**0.1**	**2**					**0.8**				**1.6**		
624	SEDGE WARBLER *Acrocephalus schoenobaenus*	**PM**					**4.0**	**0.5**			**0.2**		**2.0**		**0.2**	**1.3**						**1**	
626	AFRICAN REED WARBLER *Acrocephalus baeticatus*	**R-NT**													**1.8**	**1.7**		**0.6**			**1.7**	**0.7**	
628	GREAT REED WARBLER *Acrocephalus arundinaceus*	**PM**																**0.4**					
629	BASRA REED WARBLER *Acrocephalus griseldis*	**EN,R-NT**																**0.3**					
632	AFRICAN YELLOW WARBLER *Chloropeta natalensis*																			**0.5**			
638	RED-FACED CISTICOLA *Cisticola erythrops*	**G**	**4.2**	**5.6**	**4.8**	**4.9**	**5.7**	**5**	**0.3**	**1.3**	**2.2**	**1.3**	**5.3**	**5.8**	**5.5**	**3.8**	**3**	**5.6**			**3.9**	**2.3**	**3.5**
639	SINGING CISTICOLA *Cisticola cantans*													**4.5**		**1.3**		**1.9**			**1.6**		**2.5**
647	WINDING CISTICOLA *Cisticola galactotes*	**w**	**1.4**			**0.5**	**4.3**	**2.5**	**0.5**		**2.4**	**3**	**1.3**		**0.5**	**1**	**0.3**	**0.9**			**5**	**0.8**	**3.5**
650	CROAKING CISTICOLA *Cisticola natalensis*	**G**					**0.3**																

652	SHORT-WINGED CISTICOLA *Cisticola brachypterus*																			**1**		
658	TAWNY-FLANKED PRINIA *Prinia subflava*	**f**	**4.8**	**4**	**4.8**	**4.5**	**1.7**	**2**	**5**	**1.3**	**2.8**	**2**	**3.3**	**6**	**5.3**	**4.3**	**6**	**5.6**	**2.4**	**0.5**	**5.1**	**3.3**	**5.8**
661	WHITE-CHINNED PRINIA *Prinia leucopogon*	**F**		**0.6**		**0.2**											**0.8**					**0.5**	**2**
667	YELLOW-BREASTED APALIS *Apalis flavida*	**f**																					**0.3**
670	BLACK-THROATED APALIS *Apalis jacksoni*	**FF**																		**0.8**			
673	BUFF-THROATED APALIS *Apalis rufogularis*	**FF**																		**2.3**			
675	GREY APALIS *Apalis cinerea*																			**0.7**			
677	GREY-BACKED CAMAROPTERA *Camaroptera brachyura*	**f**	**5.6**	**4.8**	**5.6**	**5.3**	**5.3**	**5.8**	**5.8**	**6**	**5.9**	**5.7**	**4.7**	**5**	**3.8**	**4.3**	**3.5**	**3.6**	**1**	**0.8**	**2**	**3.8**	**5.5**
678	YELLOW-BROWED CAMAROPTERA *Camaroptera superciliaris*																			**1.6**			
679	OLIVE-GREEN CAMAROPTERA *Camaroptera chloronota*																			**0.4**			
690	NORTHERN CROMBEC *Sylvietta brachyura*													**0.3**		**0.8**	**0.3**	**0.8**					**0.3**
691	RED-FACED CROMBEC *Sylvietta whytii*	**F**			**p0.2**	**p0.1**																	
692	GREEN CROMBEC *Sylvietta virens*	**F**																		**0.9**		**1**	**0.8**
695	WILLOW WARBLER *Phylloscopus trochilus*	**PM**						**2.3**	**2.8**	**3.3**	**2.8**	**3.3**	**5.3**	**1.5**	**3.8**	**2.7**	**1.3**	**1.4**	**0.4**	**1**	**0.4**	**3.2**	**3.8**
701	GREY-CAPPED WARBLER *Eminia lepida*	**R-RR**	**0.4**	**0.6**	**2.6**	**1.2**	**1.7**	**1.8**	**0.3**		**0.7**	**1.7**	**0.7**		**5.3**	**2.5**	**5**	**2.8**	**2.4**		**3.4**	**2.5**	**2.8**

703	GARDEN WARBLER *Sylvia borin*	**P,f**					**2**	**p2.0**			**p0.7**												
704	BLACKCAP *Sylvia atricapilla*	**P,F**						**1.3**			**0.4**												
709	GREEN HYLIA *Hylia prasina*	**F**																		**0.6**			
713	NORTHERN BLACK FLYCATCHER *Melaenornis edoliodides*			**0.2**		**0.1**						**2.3**	**1.7**	**0.8**		**2**		**1.6**			**0.3**	**1.8**	**1.5**
719	ASHY FLYCATCHER *Muscicapa caerulescens*	**F**																		**1.2**			
720	SWAMP FLYCATCHER *Muscicapa aquatica*	**W**		**0.6**	**2.2**	**0.9**		**0.6**			**0.2**				**4.8**		**3.5**	**1.3**			**0.9**		
727	GREY-THROATED TIT- FLYCATCHER *Myioparus griseigularis*	**FF**																		**1.3**			
728	Lead-coloured Flycatcher *Myioparus plumbeus*)	**FF**																					**0.3**
732	AFRICAN BLUE-FLYCATCHER *Elminia longicauda*	**f**		**3.2**	**2.2**	**1.8**		**0.5**	**2.5**	**5.3**	**2.8**	**4**	**1**	**2.5**		**1.5**	**2.3**	**2.5**		**0.6**		**1.7**	**5.3**
739	AFRICAN PARADISE-FLYCATCHER *Terpsiphone viridis*	**f**	**0.8**	**1**		**0.6**			**0.5**		**0.2**		**1.3**				**2.3**	**0.5**		**0.3**	**0.4**	**0.7**	**2.8**
740	RED-BELLIED PARADISE-FLYCATCHER *Terpsiphone rufiventer*	**F**						**3**	**2.8**	**0.3**	**2**					**0.5**				**1.8**			
741	SHRIKE FLYCATCHER *Megabyas flammulatus*	**R-NT**																		**0.7**			
742	BLACK-AND-WHITE FLYCATCHER *Bias musicus*	**f**								**2**	**0.7**			**0.5**						**0.5**			
743	CHESTNUT WATTLE-EYE *Dyphorophyia castanea*	**FF**																		**2.9**			
744	JAMESON'S WATTLE-EYE *Dyphorophyia jamesoni*	**FF**																		**0.5**			

746	BROWN-THROATED WATTLE-EYE *Platysteira cyanea*	**f**	**1.8**	**1.2**	**3.8**	**2.3**	**1**	**5.5**	**2.8**	**4.3**	**4.2**	**4**		**2**	**1.7**	**2.3**	**2.5**	**2.9**	**1**	**1.1**	**2.1**	**1.8**	**3.8**
757	SCALY-BREASTED ILLADOPSIS *Illadopsis albipectus*	**FF**																		**1.9**			
761	BROWN BABBLER *Turdoides plebejus*						**2.7**																
771	WHITE-WINGED BLACK TIT *Parus leucomelas*				**0.6**	**0.2**				**0.7**	**0.2**		**0.3**	**1**				**0.3**					**0.3**
773	African Penduline Tit *Anthoscopus caroli*	**f**					**1**									**1**							
778	GREEN SUNBIRD *Anthreptes rectirostris*	**FF**																		**0.3**			
779	LITTLE GREEN SUNBIRD *Anthreptes seimundi*	**FF**																		**0.3**			
780	FRASER,S SUNBIRD *Deleornis fraseri*	**FF**																		**0.3**			
781	GREEN-HEADED SUNBIRD *Cyanomitra verticalis*	**F**	**0.8**			**0.3**				**2**	**0.7**	**1**		**1**		**1.3**			**1.2**	**0.3**			
782	BLUE-THROATED BROWN SUNBIRD *Cyanomitra cyanolaema*	**FF**																		**1.5**			
784	WESTERN OLIVE SUNBIRD *Cyanomitra obscura*															**0.5**				**0.3**			
785	GREEN-THROATED SUNBIRD *Chalcomitra rubescens*	**F**																**0.5**	**1**				**2.5**
787	SCARLET-CHESTED SUNBIRD *Chalcomitra senegalensis*	**f**	**2.2**	**3**	**1.8**	**2.3**	**4.7**	**1**	**3.5**	**4**	**2.8**	**4.7**	**1.7**	**5**	**1**	**3.8**	**3.8**	**2.8**	**2.2**	**0.8**	**3**	**2.8**	**5.5**
790	BRONZE SUNBIRD *Nectarinia kilimensis*	**f**												**1**									**1**
794	COLLARED SUNBIRD *Hedydipna collaris*	**F**												**4.3**		**0.2**		**0.4**	**1.4**	**0.7**	**0.9**		**2.3**

796	OLIVE-BELLIED SUNBIRD *Cinnyris chloropygius*	**F**	**2.5**	**4**	**0.8**	**2.4**			**1.8**	**1.7**	**1.2**	**1.4**	**0.3**	**1**	**0.8**	**0.8**	**2**	**0.8**	**2.6**	**0.3**		**3.2**	**5**
802	MARICO SUNBIRD *Cinnyris mariquensis*		**0.6**			**0.2**			**1.8**		**0.6**		**0.7**			**2.2**					**1.1**	**1**	**1**
803	RED-CHESTED SUNBIRD *Cinnyris erythrocerca*	**R-RR**	**6**	**5.8**	**5.6**	**5.8**	**6**	**6**	**4.3**	**5.7**	**5.3**	**5.7**	**3.3**	**4.8**	**4**	**3.7**	**3**	**3.9**	**2.4**		**5**	**3.8**	**1.5**
804	PURPLE-BANDED SUNBIRD *Cinnyris bifasciatus*													**0.3**									**0.3**
808	VARIABLE SUNBIRD *Cinnyris venusta*	**f**							**1.3**		**0.4**	**1.7**		**1.3**			**0.5**	**0.6**					
809	SUPERB SUNBIRD *Cinnyris superba*											**0.3**											
810	COPPER SUNBIRD *Cinnyris cupreus*	**f,w**	**0.8**	**1.4**	**0.4**	**2.6**	**1.3**	**1.5**			**0.5**		**0.7**	**1.8**		**0.5**		**0.5**			**1.3**		**1.3**
811	AFRICAN YELLOW WHITE-EYE *Zosterops senegalensis*	**f**	**4.6**	**1.4**	**4**	**3.3**	**1.3**	**5.3**	**4**	**3.3**	**4.2**	**4.3**	**1**	**5.5**	**2.7**	**4.3**	**3.8**	**2.1**	**1**	**3.4**	**1.6**	**1.5**	**3.3**
815	GREY-BACKED FISCAL *Lanius excubitoroides*																				**1.3**		
824	GREY-HEADED BUSH-SHRIKE *Malaconotus blanchoti*																				**0.6**		
827	BOCAGE'S BUSH-SHRIKE *Telophorus bocagei*																			**0.4**			
831	BROWN-CROWNED TCHAGRA *Tchagra australis*		**1.4**	**0.4**	**2**	**1.3**		**0.3**	**0.3**		**0.2**		**1**	**3.5**		**0.3**	**0.3**	**1.5**			**2.3**	**1.3**	
833	BLACK-CROWNED TCHAGRA *Tchagra senegalus*																	**0.8**					
836	NORTHERN PUFFBACK *Dryoscopus gambensis*	**F**	**1.2**	**1.2**		**0.8**			**0.8**	**1**	**0.6**		**0.3**	**1.3**		**1.8**	**2.8**	**1.1**			**1.3**	**1**	**1.3**
837	SOOTY BOUBOU *Laniarius leucorhynchus*																			**0.6**			
841	TROPICAL BOUBOU *Laniarius aethiopicus*	**f**					**1.7**		**0.8**		**0.3**	**1.7**		**2**				**0.9**					
843	BLACK-HEADED GONOLEK *Laniarius erythrogaster*	**f**					**0.7**							**1.5**	**3.2**	**2**	**1.3**	**3.8**			**5.3**	**0.8**	**0.3**

848	WESTERN BLACK-HEADED ORIOLE *Oriolus brachyrhynchus*																		**0.8**			
854	VELVET-MANTLED DRONGO *Dicrurus modestus*																		**0.2**			
855	PIED CROW *Corvus albus*								**0.3**		**0.1**			**5**	**1.8**	**0.2**		**1.8**					
858	PIAPIAC *Ptilostomus afer*															**1**							
866	PURPLE-HEADED STARLING *Lamprotornis purpureiceps*	**F**																	**0.8**	**0.9**			
867	PURPLE STARLING *Lamprotornis purpureus*													**1.8**									**1.5**
871	Splendid Glossy Starling *Lamprotornis splendidus*	**F**	**1**	**1.5**	**1**	**1.2**			**0.5**		**0.2**	**5.7**	**2.3**			**1.8**	**1.3**	**0.6**		**0.3**	**1.4**		
872	Ruppell,s Long-tailed Starling*Lamprotornis purpuropterus*											**1**			**0.7**	**0.8**		**1.5**			**1.6**		**1.5**
881	NORTHERN GREY-HEADED SPARROW *Passer griseus*		**1**			**0.3**		**0.8**	**4.3**	**1**	**2**		**0.3**	**4.5**	**0.5**	**1.2**		**1.9**			**1.6**		
893	BAGLAFECHT WEAVER *Ploceus baglafecht*	**f**							**1.5**		**0.5**				**0.2**								
894	SLENDER-BILLED WEAVER *Ploceus pelzelni*	**f,W**		**3.2**	**3.2**	**2.1**							**2.7**	**1.3**	**4.2**	**0.7**	**3**	**2.5**			**2.3**	**2.2**	**1.8**
895	LITTLE WEAVER *Ploceus luteolus*	**f**										**1.7**											
896	BLACK-NECKED WEAVER *Ploceus nigricollis*													**0.3**	**0.7**		**0.8**		**1.8**	**1.1**	**0.6**		
897	SPECTACLED WEAVER *Ploceus ocularis*	**f**	**1**		**0.8**	**0.6**		**1.5**		**2**	**1.2**	**0.3**		**1**	**0.8**	**1.8**	**1.3**	**0.8**			**3.3**		**0.3**
901	ORANGE WEAVER *Ploceus aurantius*																						**1**

902	NORTHERN BROWN-THROATED WEAVER *Ploceus castanops*	**R-RR**																				**2**	
907	VIEILLOT'S BLACK WEAVER *Ploceus nigerrimus*	**f**		**0.6**		**0.2**				**1.3**	**0.4**	**0.7**	**3.3**	**1**	**0.2**	**0.8**		**0.5**	**2**	**1**		**1.2**	
908	Village Weaver *Ploceus cucullatus*		**3.6**	**3.6**	**2.4**	**2.8**								**2.8**	**1.5**	**3**	**1.5**	**3.8**	**2.8**		**2.1**	**2.5**	**4.5**
910	YELLOW-BACKED WEAVER *Ploceus melanocephalus*	**W**	**1**	**1**		**0.7**	**3.3**	**2**	**4.5**		**2.2**	**2.7**	**4**	**1.5**	**2.8**	**0.5**	**1.5**	**2.9**			**1.7**	**0.5**	**0.8**
911	GOLDEN-BACKED WEAVER *Ploceus jacksoni*	**R-RR**					**2.3**	**1.3**		**1.3**	**0.9**	**2**	**1**	**1.3**	**3.3**		**4**	**2.4**			**1.4**	**3**	**3.8**
913	YELLOW-MANTLED WEAVER *Ploceus tricolor*																			**1.5**			
924	RED-HEADED QUELEA *Quelea erythrops*	**AM**							**0.5**		**0.2**												
927	BLACK BISHOP *Euplectes gierowii*	**w**	**0.6**			**0.2**								**2.3**	**1**		**1**	**1.8**			**3.4**		**2.8**
928	BLACK-WINGED BISHOP *Euplectes hordeaceus*	**w**												**1.8**							**1.4**		**1.5**
932	FAN-TAILED WIDOWBIRD *Euplectes axillaris*	**w**					**1**	**1**			**0.3**			**1.5**			**1.5**				**4.1**		**2**
937	GROSBEAK WEAVER *Amblyospiza albifrons*	**f,W**	**0.6**			**0.2**											**1.8**					**0.2**	**1**
939	GREY-HEADED NEGROFINCH *Nigrita canicapillus*	**F**	**0.4**			**0.1**														**0.8**			**1**
942	WHITE-BREASTED NEGROFINCH *Nigrita fusconota*	**F**																		**1.5**			
952	BLACK-BELLIED SEEDCRACKER *Pyrenestes ostrinus*	**F**															**1**			**0.3**			
955	GREEN TWINSPOT *Mandingoa nitidula*	**FF**																		**0.4**			

959	RED-BILLED FIREFINCH *Lagonosticta senegala*		**1.2**	**1.4**	**0.8**	**1.1**	**1**	**1.5**	**1.5**	**0.7**	**1.2**	**0.7**	**3.7**	**0.3**	**3.7**	**0.5**		**0.5**	**1.4**			**0.2**	**1.5**
963	AFRICAN FIREFINCH *Lagonosticta rubricata*						**1.3**											**0.9**					**3.5**
969	COMMON WAXBILL *Estrilda astrild*	**w,G**								**1.7**	**0.8**			**1.3**	**0.7**			**0.5**			**0.4**		
970	BLACK-CROWNED WAXBILL *Estrilda nonnula*	**f**	**4.2**	**2.8**	**1.8**	**2.9**	**1**		**2.8**	**1.7**	**1.5**	**2**		**1.8**	**4.2**	**1.7**	**5**	**2.9**		**1.3**		**2.7**	**1.3**
974	RED-CHEEKED CORDON-BLEU *Uraeginthus bengalus*				**1**	**0.3**		**1.5**		**1**	**0.8**	**1**	**3.7**	**1.5**	**0.3**	**2.5**	**1**	**2.3**	**0.8**		**3.3**	**3.7**	**2.8**
980	BRONZE MANNIKIN *Lonchura cucullata*	**f**	**1.6**	**0.8**	**4.2**	**2.2**	**5.3**	**3.3**	**4.5**	**3.3**	**3.7**	**2.7**	**2.7**	**4.5**	**4.3**	**1.3**	**4.5**	**2.8**	**4.4**		**4.7**	**3.5**	**3.8**
981	BLACK-AND-WHITE MANNIKIN *Lonchura bicolor*	**f**	**4.4**		**1**	**1.8**	**0.3**	**1.3**	**1.8**		**1**									**0.1**			**3**
982	MAGPIE MANNIKIN *Lonchura fringilloides*	**f**													**0.5**							**1**	
984	VILLAGE INDIGOBIRD *Vidua chalybeata*								**1.3**		**0.4**								**1**				
985	PIN-TAILED WHYDAH *Vidua macroura*											**4.7**	**2**		**0.5**			**0.8**		**0.3**	**1.6**	**1**	**2.8**
991	AFRICAN CITRIL *Serinus frontalis*	**f**	**4.4**	**0.8**	**0.8**	**2**	**2.7**		**1.8**		**0.6**		**0.3**				**1.3**						
994	BLACK-THROATED CANARY *Serinus atrogularis*																					**1.3**	
995	YELLOW-FRONTED CANARY *Serinus mozambicus*		**1**			**0.3**	**5**	**3.3**	**2.3**	**3.7**	**3.1**	**1.7**		**3.8**	**1.5**	**2.5**	**1.5**	**4.9**			**2.9**	**3.3**	**3.5**
997	BRIMSTONE CANARY *Serinus sulphuratus*													**1**	**0.5**			**1.4**					
1005	GOLDEN-BREASTED BUNTING *Emberiza flaviventris*												**0.7**									**1**	

Appendix 3.2: Relative abundances of water birds recorded in the sites in the surveys conducted in the three years

			1998 RESULTS				2006 RESULTS								2017 Results								
			Kiku*	Naz	Buj	Overall	Nany	Kiku	Naz	Buj	Overall	Forest Reserves								Offset Areas			
Atlas No.	Name	Red Data Status and specialism						1998 Comparison				Kalagala	Itanda	Nany	Buj. Is	Buj	Kiku	Naz	Itanda Is	Mabira	Isimba	Itanda/Nile	Kalagala
5	GREATER CORMORANT *Phalacrocorax carbo*	W													0.5	2	3.8	1.9			1	3	
6	LONG-TAILED CORMORANT *Phalacrocorax africanus*	W												2.5	6	2	4.5	2.1	1.4		3.1	4.2	1
7	AFRICAN DARTER *Anhinga rufa*	R-VU												1.5	3	0.7	2.8	0.6	3		1.7	3	1
9	PINK-BACKED PELICAN *Pelecanus rufescens*	W																0.5					
10a	LITTLE BITTERN *Ixobrychus minutus*	PM														0.2							
13	BLACK-CROWNED NIGHT	W													1								

	HERON *Nycticorax nycticorax*																						
14	SQUACCO HERON *Ardeola ralloides*	W													2.8		1	1.5			1.6		
17	CATTLE EGRET *Bubulcus ibis*	G	1.8	1.4	4.4	2.5	1		1	2	1.5	2.3	2.7	1.3	0.7	1		1.9			3.3	1.8	4.5
18	STRIATED HERON *Butorides striatus*	R-NT													2.3	1.8	1.3					1	
19	BLACK HERON *Egretta ardesiaca*	R-NT													0.3								
21	LITTLE EGRET *Egretta garzetta*	W													3.3	2	3.5	1.3	0.6			0.8	
24	PURPLE HERON *Ardea purpurea*	R-NT													1.7	0.7	1	1.4			0.4	0.8	
42	SACRED IBIS *Threskiornis aethiopicus*	W													0.7						0.9	0.3	
178	BLACK CRAKE *Amaurornis flavirostris*	W													4.5	1.8		1.4			1.1		
193	JACANA *Actophilornis africana*	W														0.8		1.5			0.4		
197	BLACK-WINGED STILT *Himantopus himantopus*	pW														0.5							

201	WATER THICK-KNEE *Burhinus vermiculatus*	W													3.5							1.8	
209	ROCK PRATINCOLE *Glareola nuchalis*	R-VU																			0.6	1.5	1
247	GREEN SANDPIPER *Tringa ochropus*	PM																0.3					
250	COMMON SANDPIPER *Actitis hypoleucos*	PM											1.2	1.5		1		0.9			0.7	2	
262	COMMON TERN *Sterna hirundo*	PM																0.8					
264	WHITE-WINGED TERN *Chlidonias leucopterus*	PM													1	1.3	1.3	0.8	1.2		0.4	2	
380	MALACHITE KINGFISHER *Alcedo cristata*	W												1.5	3.3	1.8	3.5	0.8			0.7		
382	GIANT KINGFISHER *Megaceryle maxima*	R-NT															2	0.6					
383	PIED KINGFISHER *Ceryle rudis*	W												1.5	5	2	1.8	2.4	1.2		1	0.2	
	Total species													**86**	**84**	**99**	**79**	**104**	**53**	**112**	**99**	**80**	**103**

Appendix 3.3: Summary of all the Bird Surveys

		1998				**2006**						**2017**										
									Forest Reserves									Forests and Offsets				
		Kikubamutwe	**Namizi**	**Bujagali**		**Naminya**	**Kikubamutwe**	**Namizi**	**Bujagali**	**Kalagala**	**Itanda**	**Kikubamutwe**	**Namizi**	**Bujaagali**	**Bujaagali Is**	**Itanda Is**	**Naminya**	**Kalagala**	**Isimba**	**Mabira**	**Bank**
Number of counts		5	5	5		3	4	4	3	3	3	4	8	5	6	5	4	4	7	12	6
HABITAT TYPE[a]		F	F	F		R	R	F	F	FR	FR	R	F	F	F	F	R	FR	F	FR	FR
SPECIES OF CONSERVATION CONCERN	R-NT[d]	1	1	0		0	0	0	0	0	1	3	3	4	5	0	1	2	2	3	4
	R-RR	2	3	3		3	4	3	2	4	3	2	4	3		3	2	4	3	1	2
	R-VU												1	1		1	1	2	1	4	2
	VU																	1			

RAPTORS		3	4	3		7	9	6	5	6	7	4	8	8	4	7	5	6	5	5	6
HABITAT SPECIALISTS	FF	0	0	0		0	0	0	0	1[e]	0	1	0	1	0	1	0	1	2	30	2
	F	7	7	7		4	14	13	11	11	7	8	10	9	5	8	7	9	6	29	14
	f	18	24	26		19	23	28	19	25	18	18	25	23	20	13	24	30	26	20	21
	WW	4	4	3		2	3	3	2	3	5	9	9	8	9	4	5	3	7	1	7
	W	8	7	9		15	14	12	6	10	15	7	7	5	5	4	5	8	11	3	5
	G	1	1	1		4	2	2	2	6	5	6	7	5	5	1	6	4	4	1	5
	Ae	3	3	3		3	4	7	3	4	6	0	0	0	0	0	0	0	0	1	0
MIGRANTS	PM	1	0	2		5	9	8	4	6	8	19	12	11	15	6	4	3	5	4	8
	AM	1	3	4		2	3	5	1	3	3	3	2	3	2	0	0	2	3	4	1
TOTAL SPECIES RECORDED	**All**	**50**	**48**	**49**		**54**	**56**	**70**	**46**	**65**	**55**	**79**	**104**	**99**	**84**	**53**	**86**	**103**	**99**	**112**	**80**

Notes a F = small-scale farms, R = fenced (regenerating) areas, FR = Forest Reserves

b Species total after 3 counts

c Bujagali Falls

d Categories are listed in Table 1

Appendix iva: Dissimilarity matrix (similarities done with ANOSIM (Analysis of similarity) and SIMPER (Similarity percentage) of the re-assessed sites. The highest values are shown in bold.

Cluster summary					
Cluster	Group 1	Group 2	Dissimilarity	Group Label	Group Size
1	3	4	0.561576	3	2
2	12	13	0.57551	12	2
3	7	11	0.622776	7	2
4	3	10	0.645238	3	3
5	5	7	**0.690859**	5	3
6	2	3	**0.702469**	2	4
7	8	9	**0.75641**	8	2
8	2	5	**0.825677**	2	7
9	1	6	**0.84507**	1	2
10	1	8	**0.899999**	1	4
11	1	2	**1.00643**	1	11
12	1	12	**1.44843**	1	13
13	0	0	0	0	

Appendix iv b: Group summary done with ANOSIM (Analysis of similarity) and SIMPER (Similarity percentage) of the re-assessed sites.

	Group summary													
Cluster	Group Label	Samples												
1	3	Kiku5pts	Nmy-S											
2	12	MbraP-FR	MbraS-FR											
3	7	Mldi	Ismba											
4	3	Kiku5pts	Nmy-S	KalaFR										
5	5	Nmy-N	Mldi	Ismba										
6	2	BujIslands	Kiku5pts	Nmy-S	KalaFR									
7	8	ItaKalaIslands	N.Bank FR											
8	2	BujIslands	Kiku5pts	Nmy-S	KalaFR	Nmy-N	Mldi	Ismba						
9	1	Buj	Nmz											
10	1	Buj	Nmz	ItaKalaIslands	N.Bank FR									
11	1	Buj	Nmz	ItaKalaIslands	N.Bank FR	BujIslands	Kiku5pts	Nmy-S	Kala FR	Nmy-N	Mldi	Ismba		
12	1	Buj	Nmz	ItaKalaIslands	N.Bank FR	BujIslands	Kiku5pts	Nmy-S	Kala FR	Nmy-N	Mldi	Ismba	MbraP-FR	MbraS-FR
13	0													

Appendix 3.4: Summary of the species recorded in all sites surveyed in 1998, 2006 and 2017.

Atlas No.	Name	Red data	1998.0	2006.0	2017.0	All	Mabira	Isimba
5	GREATER CORMORANT *Phalacrocorax carbo*	W			2.2	1.0		1.0
6	LONG-TAILED CORMORANT *Phalacrocorax africanus*	W			3.0	1.0		3.1
7	AFRICAN DARTER *Anhinga rufa*	R-VU			2.0	1.0		1.7
9	PINK-BACKED PELICAN *Pelecanus rufescens*	W			0.5	1.0		
13	BLACK-CROWNED NIGHT HERON *Nycticorax nycticorax*	W			1.0	1.0		
14	SQUACCO HERON *Ardeola ralloides*	W			1.8	1.0		1.6
17	CATTLE EGRET *Bubulcus ibis*	G	2.5	1.8	1.9	3.0		3.3
18	STRIATED HERON *Butorides striatus*	R-NT			1.6	1.0		
19	BLACK HERON *Egretta ardesiaca*	R-NT			0.3	1.0		
21	LITTLE EGRET *Egretta garzetta*	W			1.9	1.0		
24	PURPLE HERON *Ardea purpurea*	R-NT			1.1	1.0		0.4
25	GREY HERON *Ardea cinerea*	R-NT			0.8	1.0		0.1
26	BLACK-HEADED HERON *Ardea melanocephala*	w	0.4	1.3	1.6	3.0		1.1
28	HAMERKOP *Scopus umbretta*	w			1.6	1.0		0.4
30	AFRICAN OPENBILL STORK *Anastomus lamelligerus*	w		3.1	3.0	2.0		4.1
36	MARABOU STORK *Leptoptilos crumeniferus*	w		0.7	1.0	2.0		
39	HADADA IBIS *Bostrychia hagedash*	w	0.8	1.2	1.5	3.0		0.7
42	SACRED IBIS *Threskiornis aethiopicus*	W			0.5	1.0		0.9

69	OSPREY *Pandion haliaetus*	PM			0.8	1.0		
71	HONEY BUZZARD *Pernis apivorus*	P,F		0.8		1.0		
73	BLACK-SHOULDERED KITE *Elanus caeruleus*	G		0.5	0.8	2.0		
75	BLACK KITE *Milvus migrans*	pA	0.6	2.5	3.8	3.0	0.4	3.0
76	AFRICAN FISH EAGLE *Haliaeetus vocifer*	W			1.3	1.0		
77	PALM-NUT VULTURE *Gypohierax angolensis*	G		1.8	1.0	2.0	0.4	
80	HOODED VULTURE *Necrosyrtes monachus*	f	0.2	1.6	0.4	3.0	0.8	
86	BROWN SNAKE EAGLE *Circaetus cinereus*	R-NT	1.0	0.7		2.0		
90	AFRICAN HARRIER HAWK *Polyboroides typus*	f	0.5	1.7	0.8	3.0	0.3	0.3
93	AFRICAN MARSH HARRIER *Circus ranivorus*	R-NT, W	0.6			1.0		
98	AFRICAN GOSHAWK *Accipiter tachiro*	F	0.4	1.2	1.2	3.0		
100	SHIKRA *Accipiter badius*	F	1.2	1.5	0.7	3.0		
103	LITTLE SPARROWHAWK *Accipiter minullus*	f			1.5	1.0		
106	BLACK SPARROWHAWK *Accipiter melanoleucus*	F			0.3	1.0		
109	LIZARD BUZZARD *Kaupifalco monogrammicus*	F	3.0	1.4	1.7	3.0		0.9
116	TAWNY EAGLE *Aquila rapax*			1.7		1.0		
118	WAHLBERG,S EAGLE *Aquila wahlbergi*	A,f		1.4	0.6	2.0		
122	LONG-CRESTED EAGLE *Lophaetus occipitalis*	F	1.8	2.6	1.8	3.0		0.7
124	CROWNED EAGLE *Stephanoaetus coronatus*	R-VU					1.3	
136	EURASIAN HOBBY *Falco subbuteo*	PM			1.0	1.0		0.3
137	AFRICAN HOBBY *Falco cuvieri*	F		2.0	0.8	2.0		
142	HELMETED GUINEAFOWL *Numida meleagris*				1.6	1.0		1.4

155	SCALY FRANCOLIN *Francolinus squamatus*	F		2.7	0.6	2.0		
168	WHITE-SPOTTED FLUFFTAIL *Sarothrura pulchra*	F					0.6	
178	BLACK CRAKE *Amaurornis flavirostris*	W			2.6	1.0		1.1
185	GREY CROWNED CRANE *Balearica regulorum*	VU,R-NT			0.3	1.0		
193	JACANA *Actophilornis africana*	W			1.2	1.0		0.4
197	BLACK-WINGED STILT *Himantopus himantopus*	pW			0.5	1.0		
201	WATER THICK-KNEE *Burhinus vermiculatus*	W			2.7	1.0		
209	ROCK PRATINCOLE *Glareola nuchalis*	R-VU			1.3	1.0		0.6
247	GREEN SANDPIPER *Tringa ochropus*	PM			0.3	1.0		
250	COMMON SANDPIPER *Actitis hypoleucos*	PM		1.2	1.4	2.0		0.7
262	COMMON TERN *Sterna hirundo*	PM			0.8	1.0		
264	WHITE-WINGED TERN *Chlidonias leucopterus*	PM			1.3	1.0		0.4
268	AFRICAN GREEN-PIGEON *Treron calvus*	F	1.4	1.0	2.0	3.0		1.0
270	TAMBOURINE DOVE *Turtur tympanistria*	F	1.8	1.6	1.8	3.0	2.5	0.7
271	BLUE-SPOTTED WOOD DOVE *Turtur afer*	f	2.5	3.1	2.8	3.0		5.3
273	EMERALD-SPOTTED WOOD DOVE *Turtur chalcospilos*	F			0.7	1.0		
280	AFEP PIGEON *Columba unicincta*	FF					0.6	
281	SPECKLED PIGEON *Columba guinea*	G			0.8	1.0		0.1
283	RED-EYED DOVE *Streptopelia semitorquata*	f	2.8	2.7	4.1	3.0	0.3	3.1
289	LAUGHING DOVE *Streptopelia senegalensis*	G	1.2	1.4	1.3	3.0		4.3
290	GREY PARROT *Psittacus erithacus*	NT,R-			2.9	1.0	1.3	

		NT						
292	BROWN PARROT *Poicephalus meyeri*	p		0.3	0.7	2.0		0.7
293	RED-HEADED LOVEBIRD *Agapornis pullarius*	f			0.3	1.0		0.3
296	GREAT BLUE TURACO *Corythaeola cristata*	F		6.0		1.0	2.0	
297	BLACK-BILLED TURACO *Tauraco schuetti*	FF					0.9	
302	ROSS'S TURACO *Musophaga rossae*	F	0.8	0.8	1.0	3.0		
305	EASTERN GREY PLANTAIN-EATER *Crinifer zonurus*	G	1.4	4.2	3.2	3.0		2.9
306	JACOBIN CUCKOO *Clamator jacobinus*	AM						0.3
309	RED-CHESTED CUCKOO *Cuculus solitarius*	AM,F			0.3	1.0	3.3	
310	BLACK CUCKOO *Cuculus clamosus*	AM, FF					0.3	
312	AFRICAN CUCKOO *Cuculus gularis*	AM			0.5	1.0	0.1	
314	DUSKY LONG-TAILED CUCKOO *Cercococcyx mechowi*	FF					2.3	
317	AFRICAN EMERALD CUCKOO *Chrysococcyx cupreus*	FF					4.2	0.9
319	KLAAS' CUCKOO *Chrysococcyx klaas*	f	2.6	1.7	2.5	3.0	2.8	1.1
320	DIDRERIC CUCKOO *Chrysococcyx caprius*	f		1.8	2.3	2.0		3.4
321	YELLOWBILL *Ceuthmochares aereus*	F			0.7	1.0	0.4	
323	WHITE-BROWED COUCAL *Centropus superciliosus*	G	1.7	2.4	1.5	3.0		3.1
325	SENEGAL COUCAL *Centropus senegalensis*	f						0.4
326	BLUE-HEADED COUCAL *Centropus monachus*	w			0.5	1.0		
356	CASSIN'S SPINETAIL *Neafrapus cassini*	FF					0.2	

357	SCARCE SWIFT *Schoutedenapus myioptilus*	F			1.8	1.0		
358	AFRICAN PALM SWIFT *Cypsiurus parvus*		1.5	1.8	1.6	3.0	0.5	0.7
362	COMMON SWIFT *Apus apus*	PM			0.1	1.0		
369	SPECKLED MOUSEBIRD *Colius striatus*	G	3.1	3.0	2.5	3.0	0.5	3.7
371	NARINA,S TROGON *Apaloderma narina*	F					0.3	
374	BLUE-BREASTED KINGFISHER *Halcyon malimbica*	F			1.0	1.0	0.9	
375	WOODLAND KINGFISHER *Halcyon senegalensis*	AM	1.2	2.5	2.4	3.0		4.7
376	STRIPED KINGFISHER *Halcyon chelicuti*				1.3	1.0		
377	AFRICAN DWARF KINGFISHER *Ceyx lecontei*	FF					0.8	
378	AFRICAN PYGMY KINGFISHER *Ceyx pictus*	f,w	0.4	0.8	1.5	3.0	1.9	0.6
380	MALACHITE KINGFISHER *Alcedo cristata*	W			2.2	1.0		0.7
382	GIANT KINGFISHER *Megaceryle maxima*	R-NT			1.3	1.0		
383	PIED KINGFISHER *Ceryle rudis*	W			2.0	1.0		1.0
385	LITTLE BEE-EATER *Merops pusillus*				0.8	1.0		
390	WHITE-THROATED BEE-EATER *Merops albicollis*	AM	1.9			1.0	0.3	
392	BLUE-CHEEKED BEE-EATER *Merops persicus*	PM,Ae	1.0			1.0		
394	EUROPEAN BEE-EATER *Merops apiaster*	PM		2.4	1.0	2.0	0.7	
401	BROAD-BILLED ROLLER *Eurystomus glaucurus*	AM,f,w	1.1	3.4	1.4	3.0		2.0
403	WHITE-HEADED WOOD-HOOPOE *Phoeniculus bollei*						0.3	
418	AFRICAN PIED HORNBILL *Tockus fasciatus*	F		1.0		1.0	2.3	
419	CROWNED HORNBILL *Tockus alboterminatus*	f	1.2	1.7	1.5	3.0		

420	AFRICAN GREY HORNBILL *Tockus nasutus*				1.3	1.0		
422	BLACK-AND-WHITE CASQUED HORNBILL *Bycanistes subcylindricus*	F		1.2	1.8	2.0	4.0	
425	GREY-THROATED BARBET *Gymnobucco bonapartei*	F					2.1	
426	SPECKLED TINKERBIRD *Pogoniulus scolopaceus*	F		0.3		1.0	5.1	
430	YELLOW-THROATED TINKERBIRD *Pogoniulus subsulphureus*				1.0	1.0	4.7	
431	YELLOW-RUMPED TINKERBIRD *Pogoniulus bilineatus*	F		3.4	0.9	2.0	3.7	
432	RED-FRONTED TINKERBIRD *Pogoniulus pusillus*				0.5	1.0		
433	YELLOW-FRONTED TINKERBIRD *Pogoniulus chrysoconus*	f	2.4	2.9	2.7	3.0		0.4
434	YELLOW-SPOTTED BARBET *Buccanodon duchaillui*	FF					3.3	
435	HAIRY-BREASTED BARBET *Tricholaema hirsuta*	F					2.9	
443	DOUBLE-TOOTHED BARBET *Lybius bidentatus*	f	1.2	0.8	1.6	3.0		
445	YELLOW-BILLED BARBET *Trachyphonus purpuratus*	FF		2.0		1.0	2.3	
449	CASSIN'S HONEYBIRD *Prodotiscus insignis*	R-VU					0.5	
456	LESSER HONEYGUIDE *Indicator minor*	f			1.0	1.0		
465	NUBIAN WOODPECKER *Campethera nubica*				0.5	1.0		
470	BROWN-EARED WOODPECKER *Campethera caroli*	FF					0.3	
477	GREY WOODPECKER *Dendropicos goertae*	f	0.2	3.0	1.3	3.0		0.3
498	WHITE-HEADED SAW-WING *Psalidoprocne albiceps*	R-RR	0.7	1.5	1.3	3.0	1.6	
500	COMMON SAND MARTIN *Riparia riparia*	PM		5.0	2.6	2.0	1.5	

504	MOSQUE SWALLOW *Hirundo senegalensis*				0.3	1.0		1.9
506	RED-RUMPED SWALLOW *Hirundo daurica*							0.3
512	ANGOLA SWALLOW *Hirundo angolensis*	w,Ae	1.2	1.7	1.1	3.0	0.5	
513	BARN SWALLOW *Hirundo rustica*	PM	0.8	2.3	1.7	3.0	0.3	
515	YELLOW WAGTAIL *Motacilla flava*	PM		2.2	1.0	2.0		0.3
520	AFRICAN PIED WAGTAIL *Motacilla aguimp*	w	1.4	0.7	0.9	3.0	0.5	
529	YELLOW-THROATED LONGCLAW *Macronyx croceus*				0.3	1.0		2.1
538	LITTLE GREENBUL *Andropadus virens*	F		3.4	1.5	2.0	3.9	
539	LITTLE GREY GREENBUL *Andropadus gracilis*	R-NT					0.7	
540	PLAIN GREENBUL *Andropadus curvirostris*	FF					1.8	
541	SLENDER-BILLED GREENBUL *Andropadus gracilirostris*	FF					0.5	
542	YELLOW-WHISKERED GREENBUL *Andropadus latirostris*	F			0.8	1.0	2.3	
543	HONEYGUIDE GREENBUL *Baeopogon indicator*	FF					0.2	
547	YELLOW-THROATED GREENBUL *Chlorocichla flavicollis*	FF			1.4	1.0		0.4
551	TORO OLIVE GREENBUL *Phyllastrephus hypochloris*	R-VU					1.7	
556	WHITE-THROATED GREENBUL *Phyllastrephus albigularis*	FF					2.3	
558	RED-TAILED BRISTLEBILL *Bleda syndactylus*	FF					3.3	
561	RED-TAILED GREENBUL *Criniger calurus*	FF					1.3	
562	COMMON BULBUL *Pycnonotus barbatus*	f	6.0	6.0	5.3	3.0	2.1	5.4

563	WESTERN NICATOR *Nicator chloris*	F			0.3	1.0	0.9	
566	FOREST ROBIN *Stiphrornis erythrothorax*	FF					2.1	
575	BLUE-SHOULDERED ROBIN-CHAT *Cossypha cyanocampter*	F					0.8	
576	WHITE-BROWED ROBIN-CHAT *Cossypha heuglini*	f		1.0	0.7	2.0		0.1
577	RED-CAPPED ROBIN-CHAT *Cossypha natalensis*	F					0.6	
578	SNOWY-CROWNED ROBIN-CHAT *Cossypha niveicapilla*	F		2.0	1.4	2.0		
579	FIRE-CRESTED ALETHE *Alethe diademata*	FF					1.2	
581	BROWN-CHESTED ALETHE *Aletthe poliocephala*	FF					0.5	
584	RUFOUS FLYCATCHER-THRUSH *Stizorhina fraseri*	FF					2.3	
588	BROWN-BACKED SCRUB-ROBIN *Cercotrichas hartlaubi*	f			1.2	1.0		
589	WHITE-BROWED SCRUB-ROBIN *Cercotrichas leucophrys*			2.3		1.0		0.7
593	WHINCHAT *Saxicola rubetra*	PM		1.0		1.0		
612	AFRICAN THRUSH *Turdus pelios*	f	0.7	4.0	2.3	3.0	1.8	2.7
621	MOUSTACHED GRASS WARBLER *Melocichla mentalis*	f		2.0	0.8	2.0		1.6
624	SEDGE WARBLER *Acrocephalus schoenobaenus*	PM		2.2	0.8	2.0		
626	AFRICAN REED WARBLER *Acrocephalus baeticatus*	R-NT			1.2	1.0		1.7
628	GREAT REED WARBLER *Acrocephalus arundinaceus*	PM			0.4	1.0		
629	BASRA REED WARBLER *Acrocephalus griseldis*	EN,R-NT			0.3	1.0		
632	AFRICAN YELLOW WARBLER *Chloropeta*						0.5	

	natalensis							
638	RED-FACED CISTICOLA *Cisticola erythrops*	G	4.9	3.2	4.2	3.0		3.9
639	SINGING CISTICOLA *Cisticola cantans*				2.6	1.0		1.6
647	WINDING CISTICOLA *Cisticola galactotes*	w	1.4	2.3	1.2	3.0		5.0
650	CROAKING CISTICOLA *Cisticola natalensis*	G		0.3		1.0		
652	SHORT-WINGED CISTICOLA *Cisticola brachypterus*							1.0
658	TAWNY-FLANKED PRINIA *Prinia subflava*	f	4.5	2.6	4.8	3.0	0.5	5.1
661	WHITE-CHINNED PRINIA *Prinia leucopogon*	F	0.6		1.1	2.0		
667	YELLOW-BREASTED APALIS *Apalis flavida*	f			0.3	1.0		
670	BLACK-THROATED APALIS *Apalis jacksoni*	FF					0.8	
673	BUFF-THROATED APALIS *Apalis rufogularis*	FF					2.3	
675	GREY APALIS *Apalis cinerea*						0.7	
677	GREY-BACKED CAMAROPTERA *Camaroptera brachyura*	f	5.3	5.6	3.8	3.0	0.8	2.0
678	YELLOW-BROWED CAMAROPTERA *Camaroptera superciliaris*						1.6	
679	OLIVE-GREEN CAMAROPTERA *Camaroptera chloronota*						0.4	
690	NORTHERN CROMBEC *Sylvietta brachyura*				0.5	1.0		
691	RED-FACED CROMBEC *Sylvietta whytii*	F	0.2			1.0		
692	GREEN CROMBEC *Sylvietta virens*	F			0.9	1.0	0.9	
695	WILLOW WARBLER *Phylloscopus trochilus*	PM		3.4	2.3	2.0	1.0	0.4
701	GREY-CAPPED WARBLER *Eminia lepida*	R-RR	1.2	1.2	3.3	3.0		3.4

703	GARDEN WARBLER *Sylvia borin*	P,f		2.0		1.0		
704	BLACKCAP *Sylvia atricapilla*	P,F		1.3		1.0		
709	GREEN HYLIA *Hylia prasina*	F					0.6	
713	NORTHERN BLACK FLYCATCHER *Melaenornis edoliodides*		0.2	2.0	1.5	3.0		0.3
719	ASHY FLYCATCHER *Muscicapa caerulescens*	F					1.2	
720	SWAMP FLYCATCHER *Muscicapa aquatica*	W	1.4	0.6	3.2	3.0		0.9
727	GREY-THROATED TIT- FLYCATCHER *Myioparus griseigularis*	FF					1.3	
728	Lead-coloured Flycatcher *Myioparus plumbeus*)	FF			0.3	1.0		
732	AFRICAN BLUE-FLYCATCHER *Elminia longicauda*	f	2.7	2.7	2.6	3.0	0.6	
739	AFRICAN PARADISE-FLYCATCHER *Terpsiphone viridis*	f	0.9	0.9	1.6	3.0	0.3	0.4
740	RED-BELLIED PARADISE-FLYCATCHER *Terpsiphone rufiventer*	F		2.0	0.5	2.0	1.8	
741	SHRIKE FLYCATCHER *Megabyas flammulatus*	R-NT					0.7	
742	BLACK-AND-WHITE FLYCATCHER *Bias musicus*	f		2.0	0.5	2.0	0.5	
743	CHESTNUT WATTLE-EYE *Dyphorophyia castanea*	FF					2.9	
744	JAMESON'S WATTLE-EYE *Dyphorophyia jamesoni*	FF					0.5	
746	BROWN-THROATED WATTLE-EYE *Platysteira cyanea*	f	2.3	3.5	2.3	3.0	1.1	2.1
757	SCALY-BREASTED ILLADOPSIS *Illadopsis albipectus*	FF					1.9	
761	BROWN BABBLER *Turdoides plebejus*			2.7		1.0		
771	WHITE-WINGED BLACK TIT *Parus leucomelas*		0.6	0.5	0.5	3.0		

773	African Penduline Tit *Anthoscopus caroli*	f		1.0	1.0	2.0		
778	GREEN SUNBIRD *Anthreptes rectirostris*	FF					0.3	
779	LITTLE GREEN SUNBIRD *Anthreptes seimundi*	FF					0.3	
780	FRASER,S SUNBIRD *Deleornis fraseri*	FF					0.3	
781	GREEN-HEADED SUNBIRD *Cyanomitra verticalis*	F	0.8	1.5	1.2	3.0	0.3	
782	BLUE-THROATED BROWN SUNBIRD *Cyanomitra cyanolaema*	FF					1.5	
784	WESTERN OLIVE SUNBIRD *Cyanomitra obscura*				0.5	1.0	0.3	
785	GREEN-THROATED SUNBIRD *Chalcomitra rubescens*	F			1.3	1.0		
787	SCARLET-CHESTED SUNBIRD *Chalcomitra senegalensis*	f	2.3	3.3	3.4	3.0	0.8	3.0
790	BRONZE SUNBIRD *Nectarinia kilimensis*	f			1.0	1.0		
794	COLLARED SUNBIRD *Hedydipna collaris*	F			1.7	1.0	0.7	0.9
796	OLIVE-BELLIED SUNBIRD *Cinnyris chloropygius*	F	2.4	1.3	2.0	3.0	0.3	
802	MARICO SUNBIRD *Cinnyris mariquensis*		0.6	1.3	1.4	3.0		1.1
803	RED-CHESTED SUNBIRD *Cinnyris erythrocerca*	R-RR	5.8	5.2	3.4	3.0		5.0
804	PURPLE-BANDED SUNBIRD *Cinnyris bifasciatus*				0.3	1.0		
808	VARIABLE SUNBIRD *Cinnyris venusta*	f		1.5	0.8	2.0		
809	SUPERB SUNBIRD *Cinnyris superba*			0.3		1.0		
810	COPPER SUNBIRD *Cinnyris cupreus*	f,w	0.9	1.2	1.0	3.0		1.3
811	AFRICAN YELLOW WHITE-EYE *Zosterops senegalensis*	f	3.3	3.2	3.0	3.0	3.4	1.6
815	GREY-BACKED FISCAL *Lanius excubitoroides*							1.3

824	GREY-HEADED BUSH-SHRIKE *Malaconotus blanchoti*							0.6
827	BOCAGE'S BUSH-SHRIKE *Telophorus bocagei*						0.4	
831	BROWN-CROWNED TCHAGRA *Tchagra australis*		1.3	0.5	1.4	3.0		2.3
833	BLACK-CROWNED TCHAGRA *Tchagra senegalus*				0.8	1.0		
836	NORTHERN PUFFBACK *Dryoscopus gambensis*	F	1.2	0.7	1.6	3.0		1.3
837	SOOTY BOUBOU *Laniarius leucorhynchus*						0.6	
841	TROPICAL BOUBOU *Laniarius aethiopicus*	f		1.4	1.5	2.0		
843	BLACK-HEADED GONOLEK *Laniarius erythrogaster*	f		0.7	1.8	2.0		5.3
848	WESTERN BLACK-HEADED ORIOLE *Oriolus brachyrhynchus*						0.8	
854	VELVET-MANTLED DRONGO *Dicrurus modestus*						0.2	
855	PIED CROW *Corvus albus*			0.3	2.2	2.0		
858	PIAPIAC *Ptilostomus afer*				1.0	1.0		
866	PURPLE-HEADED STARLING *Lamprotornis purpureiceps*	F			0.8	1.0	0.9	
867	PURPLE STARLING *Lamprotornis purpureus*				1.7	1.0		
871	Splendid Glossy Starling *Lamprotornis splendidus*	F	1.2	2.8	1.2	3.0	0.3	1.4
872	Ruppell,s Long-tailed Starling*Lamprotornis purpuropterus*			1.0	1.1	2.0		1.6
881	NORTHERN GREY-HEADED SPARROW *Passer griseus*		1.0	1.6	2.0	3.0		1.6
893	BAGLAFECHT WEAVER *Ploceus baglafecht*	f		1.5	0.2	2.0		
894	SLENDER-BILLED WEAVER *Ploceus pelzelni*	f,W	3.2	2.7	2.2	3.0		2.3

895	LITTLE WEAVER *Ploceus luteolus*	f		1.7		1.0		
896	BLACK-NECKED WEAVER *Ploceus nigricollis*				0.9	1.0	1.1	0.6
897	SPECTACLED WEAVER *Ploceus ocularis*	f	0.9	1.3	1.0	3.0		3.3
901	ORANGE WEAVER *Ploceus aurantius*				1.0	1.0		
902	NORTHERN BROWN-THROATED WEAVER *Ploceus castanops*	R-RR			2.0	1.0		
907	VIEILLOT'S BLACK WEAVER *Ploceus nigerrimus*	f	0.6	1.8	1.0	3.0	1.0	
908	Village Weaver *Ploceus cucullatus*		3.2		2.8	2.0		2.1
910	YELLOW-BACKED WEAVER *Ploceus melanocephalus*	W	1.0	3.3	1.5	3.0		1.7
911	GOLDEN-BACKED WEAVER *Ploceus jacksoni*	R-RR		1.6	3.0	2.0		1.4
913	YELLOW-MANTLED WEAVER *Ploceus tricolor*						1.5	
924	RED-HEADED QUELEA *Quelea erythrops*	AM		0.5		1.0		
927	BLACK BISHOP *Euplectes gierowii*	w	0.6		1.8	2.0		3.4
928	BLACK-WINGED BISHOP *Euplectes hordeaceus*	w			1.7	1.0		1.4
932	FAN-TAILED WIDOWBIRD *Euplectes axillaris*	w		1.0	1.7	2.0		4.1
937	GROSBEAK WEAVER *Amblyospiza albifrons*	f,W	0.6		1.0	2.0		
939	GREY-HEADED NEGROFINCH *Nigrita canicapillus*	F	0.4		1.0	2.0	0.8	
942	WHITE-BREASTED NEGROFINCH *Nigrita fusconota*	F					1.5	
952	BLACK-BELLIED SEEDCRACKER *Pyrenestes ostrinus*	F			1.0	1.0	0.3	
955	GREEN TWINSPOT *Mandingoa nitidula*	FF					0.4	
959	RED-BILLED FIREFINCH *Lagonosticta senegala*		1.1	1.5	1.2	3.0		

963	AFRICAN FIREFINCH *Lagonosticta rubricata*			1.3	2.2	2.0		
969	COMMON WAXBILL *Estrilda astrild*	w,G		1.7	0.8	2.0		0.4
970	BLACK-CROWNED WAXBILL *Estrilda nonnula*	f	2.9	1.9	2.8	3.0	1.3	
974	RED-CHEEKED CORDON-BLEU *Uraeginthus bengalus*		1.0	1.8	1.9	3.0		3.3
980	BRONZE MANNIKIN *Lonchura cucullata*	f	2.2	3.6	3.6	3.0		4.7
981	BLACK-AND-WHITE MANNIKIN *Lonchura bicolor*	f	2.7	1.1	3.0	3.0	0.1	
982	MAGPIE MANNIKIN *Lonchura fringilloides*	f			0.8	1.0		
984	VILLAGE INDIGOBIRD *Vidua chalybeata*			1.3	1.0	2.0		
985	PIN-TAILED WHYDAH *Vidua macroura*			3.4	1.3	2.0	0.3	1.6
991	AFRICAN CITRIL *Serinus frontalis*	f	2.0	1.6	1.3	3.0		
994	BLACK-THROATED CANARY *Serinus atrogularis*				1.3	1.0		
995	YELLOW-FRONTED CANARY *Serinus mozambicus*		1.0	3.2	3.0	3.0		2.9
997	BRIMSTONE CANARY *Serinus sulphuratus*				1.0	1.0		
1005	GOLDEN-BREASTED BUNTING *Emberiza flaviventris*			0.7	1.0	2.0		
10a	LITTLE BITTERN *Ixobrychus minutus*	PM			0.2	1.0		
	Total species		77.0	120.0	190.0	210.0	112.0	98.0
	Relative abundance		1.6	1.9	1.5		1.2	1.8

Appendix 3.5: Species recorded in the Bujagali Islands during the counts in 1998, 2006 and 2017

Atlas No.	Name	Red data	Buj 1998	Buj 2006	Buj 2017	Count
5	GREATER CORMORANT *Phalacrocorax carbo*	W			1.25	1
6	LONG-TAILED CORMORANT *Phalacrocorax africanus*	W			4	1
7	AFRICAN DARTER *Anhinga rufa*	R-VU			1.85	1
13	BLACK-CROWNED NIGHT HERON *Nycticorax nycticorax*	W			1	1
14	SQUACCO HERON *Ardeola ralloides*	W			2.8	1
17	CATTLE EGRET *Bubulcus ibis*	G	4.4	2	0.85	3
18	STRIATED HERON *Butorides striatus*	R-NT			2.05	1
19	BLACK HERON *Egretta ardesiaca*	R-NT			0.3	1
21	LITTLE EGRET *Egretta garzetta*	W			2.65	1
24	PURPLE HERON *Ardea purpurea*	R-NT			1.2	1
25	GREY HERON *Ardea cinerea*	R-NT			1	1
26	BLACK-HEADED HERON *Ardea melanocephala*	w			2	1
28	HAMERKOP *Scopus umbretta*	w			2	1
30	AFRICAN OPENBILL STORK *Anastomus lamelligerus*	w			3.7	1
36	MARABOU STORK *Leptoptilos crumeniferus*	w			1	1
39	HADADA IBIS *Bostrychia hagedash*	w	1.2	1.7	2.3	3
42	SACRED IBIS *Threskiornis aethiopicus*	W			0.7	1
69	OSPREY *Pandion haliaetus*	PM			1	1
75	BLACK KITE *Milvus migrans*	pA	0.6	3.3	4.25	3
76	AFRICAN FISH EAGLE *Haliaeetus vocifer*	W			1.55	1

77	PALM-NUT VULTURE *Gypohierax angolensis*	G			0.7	1
90	AFRICAN HARRIER HAWK *Polyboroides typus*	f	0.2	3		2
98	AFRICAN GOSHAWK *Accipiter tachiro*	F		2		1
100	SHIKRA *Accipiter badius*	F		2	1	2
109	LIZARD BUZZARD *Kaupifalco monogrammicus*	F	3	3.3	1.5	3
136	EURASIAN HOBBY *Falco subbuteo*	PM			1.8	1
137	AFRICAN HOBBY *Falco cuvieri*	F			0.9	1
142	HELMETED GUINEAFOWL *Numida meleagris*				0.7	1
155	SCALY FRANCOLIN *Francolinus squamatus*	F			0.65	1
178	BLACK CRAKE *Amaurornis flavirostris*	W			3.15	1
193	JACANA *Actophilornis africana*	W			0.8	1
197	BLACK-WINGED STILT *Himantopus himantopus*	pW			0.5	1
201	WATER THICK-KNEE *Burhinus vermiculatus*	W			3.5	1
250	COMMON SANDPIPER *Actitis hypoleucos*	PM			1	1
264	WHITE-WINGED TERN *Chlidonias leucopterus*	PM			1.15	1
268	AFRICAN GREEN-PIGEON *Treron calvus*	F	1.4			1
270	TAMBOURINE DOVE *Turtur tympanistria*	F		2	0.5	2
271	BLUE-SPOTTED WOOD DOVE *Turtur afer*	f	2.8		2.8	2
273	EMERALD-SPOTTED WOOD DOVE *Turtur chalcospilos*	F			0.7	1
281	SPECKLED PIGEON *Columba guinea*	G			0.3	1
283	RED-EYED DOVE *Streptopelia semitorquata*	f	2.6	0.2	4.9	3
290	GREY PARROT *Psittacus erithacus*	NT,R-NT			1.5	1

292	BROWN PARROT *Poicephalus meyeri*	p		0.3	0.3	2
302	ROSS'S TURACO *Musophaga rossae*	F	1.2	0.3	1.3	3
305	EASTERN GREY PLANTAIN-EATER *Crinifer zonurus*	G	0.4	4.7	3.75	3
309	RED-CHESTED CUCKOO *Cuculus solitarius*	AM,F			0.3	1
312	AFRICAN CUCKOO *Cuculus gularis*	AM			0.5	1
319	KLAAS' CUCKOO *Chrysococcyx klaas*	f	2.6			1
320	DIDRERIC CUCKOO *Chrysococcyx caprius*	f			1.7	1
321	YELLOWBILL *Ceuthmochares aereus*	F			0.7	1
323	WHITE-BROWED COUCAL *Centropus superciliosus*	G	2.8		1.9	2
326	BLUE-HEADED COUCAL *Centropus monachus*	w			0.5	1
358	AFRICAN PALM SWIFT *Cypsiurus parvus*			0.7	2.3	2
369	SPECKLED MOUSEBIRD *Colius striatus*	G	3		2.6	2
375	WOODLAND KINGFISHER *Halcyon senegalensis*	AM	1.4		1.5	2
378	AFRICAN PYGMY KINGFISHER *Ceyx pictus*	f,w	0.4		2.8	2
380	MALACHITE KINGFISHER *Alcedo cristata*	W			2.55	1
383	PIED KINGFISHER *Ceryle rudis*	W			3.5	1
390	WHITE-THROATED BEE-EATER *Merops albicollis*	AM	0.4			1
394	EUROPEAN BEE-EATER *Merops apiaster*	PM			0.5	1
401	BROAD-BILLED ROLLER *Eurystomus glaucurus*	AM,f,w	0.4			1
422	BLACK-AND-WHITE CASQUED HORNBILL *Bycanistes subcylindricus*	F		1.3	0.8	2
431	YELLOW-RUMPED TINKERBIRD *Pogoniulus bilineatus*	F		4	0.5	2

433	YELLOW-FRONTED TINKERBIRD *Pogoniulus chrysoconus*	f	3.6	4.7	1.5	3
443	DOUBLE-TOOTHED BARBET *Lybius bidentatus*	f	1.2		1.5	2
456	LESSER HONEYGUIDE *Indicator minor*	f			1	1
498	WHITE-HEADED SAW-WING *Psalidoprocne albiceps*	R-RR	0.4		1.2	2
500	COMMON SAND MARTIN *Riparia riparia*	PM		2.3		1
504	MOSQUE SWALLOW *Hirundo senegalensis*				0.3	1
512	ANGOLA SWALLOW *Hirundo angolensis*	w,Ae		0.7	0.8	2
513	BARN SWALLOW *Hirundo rustica*	PM	0.8		2.35	2
515	YELLOW WAGTAIL *Motacilla flava*	PM			0.5	1
520	AFRICAN PIED WAGTAIL *Motacilla aguimp*	w	1.4		0.2	2
547	YELLOW-THROATED GREENBUL *Chlorocichla flavicollis*	FF			2.2	1
562	COMMON BULBUL *Pycnonotus barbatus*	f	6	6	5.4	3
576	WHITE-BROWED ROBIN-CHAT *Cossypha heuglini*	f		1	0.5	2
578	SNOWY-CROWNED ROBIN-CHAT *Cossypha niveicapilla*	F			1.2	1
612	AFRICAN THRUSH *Turdus pelios*	f	0.6	4.3	2	3
624	SEDGE WARBLER *Acrocephalus schoenobaenus*	PM			0.75	1
626	AFRICAN REED WARBLER *Acrocephalus baeticatus*	R-NT			1.75	1
638	RED-FACED CISTICOLA *Cisticola erythrops*	G	4.8	1.3	4.65	3
639	SINGING CISTICOLA *Cisticola cantans*				1.3	1
647	WINDING CISTICOLA *Cisticola galactotes*	w			0.75	1
658	TAWNY-FLANKED PRINIA *Prinia subflava*	f	4.8	1.3	4.8	3
677	GREY-BACKED CAMAROPTERA *Camaroptera brachyura*	f	5.6	6	4.05	3

690	NORTHERN CROMBEC *Sylvietta brachyura*				0.8	1
691	RED-FACED CROMBEC *Sylvietta whytii*	F	0.2		0.2	2
695	WILLOW WARBLER *Phylloscopus trochilus*	PM		3.3	3.25	2
701	GREY-CAPPED WARBLER *Eminia lepida*	R-RR	2.6		3.9	2
713	NORTHERN BLACK FLYCATCHER *Melaenornis edoliodides*				2	1
720	SWAMP FLYCATCHER *Muscicapa aquatica*	W	2.2		4.8	2
732	AFRICAN BLUE-FLYCATCHER *Elminia longicauda*	f	2.2	5.3	1.5	3
740	RED-BELLIED PARADISE-FLYCATCHER *Terpsiphone rufiventer*	F		0.3	0.5	2
742	BLACK-AND-WHITE FLYCATCHER *Bias musicus*	f		2		1
746	BROWN-THROATED WATTLE-EYE *Platysteira cyanea*	f	3.8	4.3	2	3
771	WHITE-WINGED BLACK TIT *Parus leucomelas*		0.6	0.7		2
773	African Penduline Tit *Anthoscopus caroli*	f			1	1
781	GREEN-HEADED SUNBIRD *Cyanomitra verticalis*	F		2	1.3	2
784	WESTERN OLIVE SUNBIRD *Cyanomitra obscura*				0.5	1
787	SCARLET-CHESTED SUNBIRD *Chalcomitra senegalensis*	f	1.8	4	2.4	3
794	COLLARED SUNBIRD *Hedydipna collaris*	F			0.2	1
796	OLIVE-BELLIED SUNBIRD *Cinnyris chloropygius*	F	0.8	1.7	0.8	3
802	MARICO SUNBIRD *Cinnyris mariquensis*				2.2	1
803	RED-CHESTED SUNBIRD *Cinnyris erythrocerca*	R-RR	5.6	5.7	3.85	3
810	COPPER SUNBIRD *Cinnyris cupreus*	f,w	0.4		0.5	2
811	AFRICAN YELLOW WHITE-EYE *Zosterops senegalensis*	f	4	3.3	3.5	3

831	BROWN-CROWNED TCHAGRA *Tchagra australis*		2		0.3	2
836	NORTHERN PUFFBACK *Dryoscopus gambensis*	F		1	1.8	2
843	BLACK-HEADED GONOLEK *Laniarius erythrogaster*	f			2.6	1
855	PIED CROW *Corvus albus*				1	1
858	PIAPIAC *Ptilostomus afer*				1	1
871	SPLENDID GLOSSY STARLING *Lamprotornis splendidus*	F	1		1.8	2
872	RUPPELL'S LONG-TAILED STARLING *Lamprotornis purpuropterus*				0.75	1
881	NORTHERN GREY-HEADED SPARROW *Passer griseus*			1	0.85	2
893	BAGLAFECHT WEAVER *Ploceus baglafecht*	f			0.2	1
894	SLENDER-BILLED WEAVER *Ploceus pelzelni*	f,W	3.2		2.45	2
896	BLACK-NECKED WEAVER *Ploceus nigricollis*				0.7	1
897	SPECTACLED WEAVER *Ploceus ocularis*	f	0.8	2	1.3	3
907	VIEILLOT'S BLACK WEAVER *Ploceus nigerrimus*	f		1.3	0.5	2
908	VILLAGE WEAVER *Ploceus cucullatus*		2.4		2.25	2
910	YELLOW-BACKED WEAVER *Ploceus melanocephalus*	W			1.65	1
911	GOLDEN-BACKED WEAVER *Ploceus jacksoni*	R-RR		1.3	3.3	2
927	BLACK BISHOP *Euplectes gierowii*	w			1	1
959	RED-BILLED FIREFINCH *Lagonosticta senegala*		0.8	0.7	2.1	3
969	COMMON WAXBILL *Estrilda astrild*	w,G		1.7	0.7	2
970	BLACK-CROWNED WAXBILL *Estrilda nonnula*	f	1.8	1.7	2.95	3
974	RED-CHEEKED CORDON-BLEU *Uraeginthus bengalus*		1	1	1.4	3

980	BRONZE MANNIKIN *Lonchura cucullata*	f	4.2	3.3	2.8	3
981	BLACK-AND-WHITE MANNIKIN *Lonchura bicolor*	f	1			1
982	MAGPIE MANNIKIN *Lonchura fringilloides*	f			0.5	1
985	PIN-TAILED WHYDAH *Vidua macroura*				0.5	1
991	AFRICAN CITRIL *Serinus frontalis*	f	0.8			1
995	YELLOW-FRONTED CANARY *Serinus mozambicus*			3.7	2	2
997	BRIMSTONE CANARY *Serinus sulphuratus*				0.5	1
10a	LITTLE BITTERN *Ixobrychus minutus*	PM			0.2	1
	Total Species		49	46	124	135