



OWABI WILDLIFE SANCTUARY/ RAMSAR SITE

MANAGEMENT PLAN

APRIL 2014



TABLE OF CONTENT

CONTENT	PAGE
PREFACE.....	5
EXECUTIVE SUMMARY	6
ACKNOWLEDGEMENTS	Error! Bookmark not defined.
SECTION ONE - THE NATIONAL AND REGIONAL SETTING.....	9
1.1 Location and General Description	9
1.2 Representation.....	10
1.3 Establishment and Legal Status	10
1.4 Socio Economic Setting	11
1.4.1 Population pressure	12
1.4.2 Landuse	12
1.4.3 Land tenure and rights.....	12
1.4.4 Access to land	13
1.4.5 Administration	14
1.5 Local Economy and Employment.....	14
1.5.1 District Economy	14
1.5.2 Bead Making	14
1.5.3 Fish Farming	15
1.5.4 Irrigation Farming	15
1.5.6 Trade and Commerce	15
1.5.7 Local Services	16
1.5.8 Interventions to Reduce Impacts.....	17
1.5.9 Expected Benefits to Local Community	17
1.6 Resource Utilization.....	17
1.7 Local Perceptions of the Sanctuary	18
1.7.1 Benefits of reserve	18
1.7.2 Areas of conflict.....	19
1.8 Implications of the Socio-Economic Concerns.....	20
1.9 Status of the "Inner Sanctuary.....	23

SECTION TWO - RESERVE STATUS AND GENERAL DESCRIPTION	24
2.1 Biophysical Setting	24
2.1.1 Geology and Soils	24
2.1.2 Climate	24
2.2 Flora	24
2.3 Fauna.....	26
2.3.1 Species of special interest and their status	27
2.3.2 Habitat evaluation	27
2.3.3 Habitat utilization.....	28
2.3.4 Avifauna.....	28
SECTION THREE - CURRENT MANAGEMENT STATUS	29
3.1 Infrastructure.....	29
3.2 Budget.....	30
3.3 Management Actions	30
3.4 Monitoring Programmes	30
SECTION FOUR – GENERAL AND SPECIFIC MANAGEMENT PURPOSES	32
4.1 General Management Objectives	32
4.2 Specific Management Objectives.....	33
4.3 Boundaries of Reserve	34
4.4 Zonation	35
4.4.1 Protected Zone	35
4.4.2 Multiple Use Zone	36
4.4.3 Special Use Zones.....	37
4.4.4 DEVELOPMENT ZONE	39
SECTION FIVE - INTEGRATED MANAGEMENT PROGRAMMES FOR THE OUTER SANCTUARY	40
5.1 Development and Maintenance.....	41
5.2 Administration Programme.....	42
5.3 Resource Management.....	43
5.3.1 <i>Cassia</i> plantations	43
5.3.2 Lake fishing	43
5.3.4 Reintroduction of Dwarf crocodile	44

5.4 Community Involvement	44
5.4.1 Public Liaison	44
5.4.2 Incentives	45
5.5 Public Use	45
5.5.1 Tourism	45
5.5.2 Access	46
5.5.3. Education and research	46
5.5.4 Interpretation	46
5.6 Research and Monitoring	47
5.6.1 Flora	47
5.6.2 Fauna	47
5.6.3 Socio-Economic	48
BIBLIOGRAPHY	49
APPENDICES	50

List of Figures

Figure 1: General location of Owabi Wildlife Sanctuary	Error! Bookmark not defined.
Figure 2: Owabi Wildlife Sanctuary in Relation to Catchment Area	11
Figure 3: Evolution of Owabi Sanctuary Boundary	15
Figure 4: Inner and Outer Sanctuary Areas	16
Figure 5: Vegetation Map of Owabi Wildlife Sanctuary	26

List of Appendix

Appendix 1 : Positive and Negative Impacts by the Owabi Sanctuary, the Catchment Area and the Dam.....	50
Appendix 2: Bird Spp. Observed during the Survey in 2013	51
Appendix 3: Field Observation by Dowsett in 2005	58
Appendix 4: Field Observation by other Observers from 1988 - 2002.....	62
Appendix 5: Individual Bird Species Observations between 1988 - 2013	62
Appendix 6: List of Mammals Recorded during the Survey	71
Appendix 7: Reptiles Recorded During the Survey.....	Error! Bookmark not defined.
Appendix 8: List of Floral Species	75
Appendix 9: Regeneration	77

PREFACE

The management plan of Owabi Wildlife Sanctuary/Ramsar Site is the third plan to have been produced through the technical arrangement between the Wildlife Division (WD) and the Resource Management Support Centre (RMSC) all of the Forestry Commission (FC) with funding support from the Ramsar Small Grants Fund of the Ramsar Convention on Wetlands. It represents the collaborative efforts of an interdisciplinary team composed of Forestry Commission staff together with Communities fringing the Sanctuary/Ramsar Site, Traditional Authorities and Ghana Water Company Limited (GWCL). Owabi Wildlife Sanctuary/Ramsar Site is an attractive haven for resident and migratory birds along with populations of monkeys and has significant appeal to visitors.

The Owabi Sanctuary/Ramsar Site is under severe pressure from densely populated and heavily built up fringe communities and intensive farming. The situation highlights a national dilemma of how to reconcile the increasing demands of rural populations, on scarce natural resources, with conservation of natural resources to sustain the production of ecosystem goods and services.

The particular significance of the Owabi reserve is that it is vital for the supply of water to Kumasi and demonstrates linkages between resource conservation and human wellbeing.

EXECUTIVE SUMMARY

Owabi Wildlife Sanctuary/Ramsar Site covers an area of approximately 13km²; however, only 7km² (designated "inner Sanctuary/Ramsar Site" in this plan) is under effective control. It was established in 1971 and lies 23km northwest of Kumasi. The whole Sanctuary/Ramsar Site is centered on a water reservoir, supplying 1/5 of Kumasi's water needs, which is surrounded by secondary, moist semi-deciduous forest. In 1988, Owabi was designated as a Wetland of International Importance under the Ramsar Convention.

This management plan is based on studies relating to the Reserves physical and biological features, the local socio-economic context and Wildlife Division policy and management objectives for Wildlife Sanctuaries. The plan avoids elaborating management prescriptions for the Reserve, as these may become redundant if not implemented in a timely manner. Instead it lays out a broad development strategy for both the "inner" and "outer" Sanctuary/Ramsar Site areas.

The plan is presented in 6 sections. Section 1 outlines the regional setting of the reserve and the local socio-economic context. Section 2 describes the current biological status. Section 3 details the reserves present management situation and Section 4 and 5 proposes prescriptions for an integrated management plan. Section 6 is the list of tables and appendices.

Major findings

Flora

The vegetation of Owabi Wildlife Sanctuary/Ramsar Site is highly disturbed. About 13% of the area is covered by a plantation of exotic species- *Cassia siamea*. The rest of the reserve consists of secondary vegetation.

Fauna

The reserve's large mammal fauna is impoverished in terms of diversity and population levels due mainly to the reserve's small size and (effectively an island) surrounded by heavily built up area. Nonetheless the Sanctuary/Ramsar Site has rich avifauna diversity.

Socio-economic

Many socio-economic issues have arisen out of the establishment of the reserve as several communities were resettled as a consequence the creation of the dam. Population growth, land use practices and local development are exerting increasing pressure on the reserve and the dwindling resource base of the surrounding area.

There is an immediate conflict of land use within the catchment area between the landowners and the Ghana Water Company Limited (GWCL) on the nonpayment of compensation to the land owners by GWCL. This has encouraged the land owners to illegally allocate land for construction of houses within the catchment area. This is affecting the security of the Sanctuary/Ramsar Site since large areas of the outer portion of the catchment have been encroached.

The Sanctuary/Ramsar Site with its natural attractions and habitat for endangered flora and fauna species has the potential for ecotourism development. It has a fascinating serene environment for hiking, suitable for picnics, meetings and camping.

There are a number of stakeholders who could be involved in the management and protection of the Sanctuary/Ramsar Site; notable among them are the landowners, the Atwima Nwabiagya District Assembly, Forestry Commission, and Ghana Tourism Development Authority amongst others.

Significance of the reserve

The development of Owabi Wildlife Sanctuary/Ramsar Site is of particular significance as it offers an opportunity to explicitly demonstrate the links between conservation and the generation of life sustaining processes and benefits. Therefore the environmental problems caused by the increasing demands of the communities fringing the Sanctuary/Ramsar Site on natural resources must be resolved to ensure its long term viability and ultimately meet the needs of the people themselves.

Major Recommendations

1. Establish five management zones in the Sanctuary/Ramsar Site to enhance conservation and regulate development; exploit the potential for education, tourism and recreation.
2. Utilize the *Cassia* plantations to supply fuel wood to local people and link access to the resource with the establishment of woodlots on communal lands.
3. Institute a multi-agency committee or board for the integrated development of the "outer Sanctuary/Ramsar Site" area with the aim of protecting the immediate catchment area of the reservoir through regulating land use, to benefit the local people and to reduce pressure on the reserve. The programme could serve as a model for watershed protection in other reservoir areas such as Barekese Reservoir.

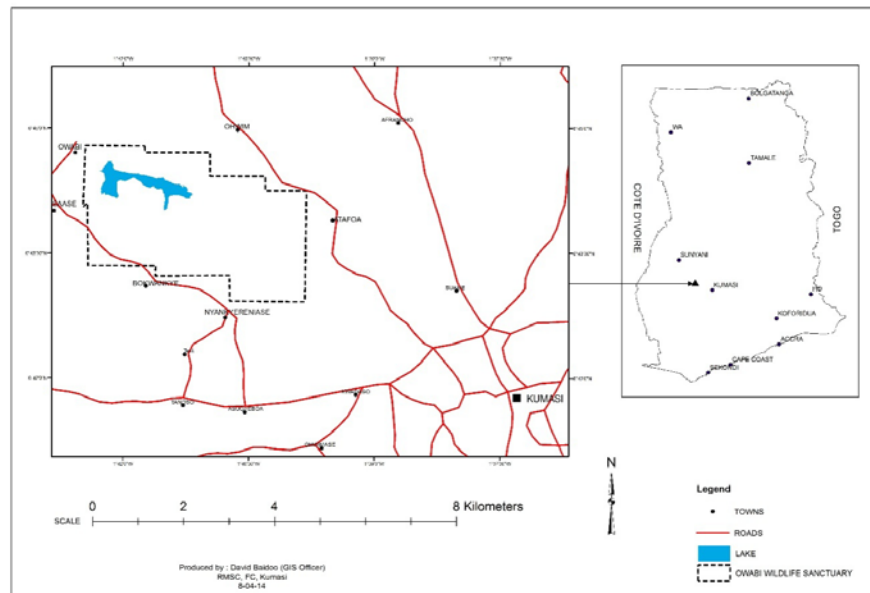


Figure 1: General location of Owabi Wildlife Sanctuary/Ramsar Site

SECTION ONE -THE NATIONAL AND REGIONAL SETTING

This section outlines the socio-economic context of the area immediately surrounding Owabi Wildlife Sanctuary/Ramsar Site.

1.1 Location and General Description

Owabi Wildlife Sanctuary/Ramsar Site covers an area of about 13km². It is located on longitude 6°44'50"N and latitude 1°42'W. It lies approximately 23 km north-west of Kumasi, Ghana's second largest city, in the Ashanti region (see figure 1).

The Sanctuary/Ramsar Site encloses an artificial lake surrounded by secondary moist semi-deciduous forest and *Cassia* plantation. The lake was formed after the construction of a dam across the Owabi River in 1928 to supply Kumasi with potable water. Since the 1970s, the bulk of the water supplied to Kumasi has come from the larger dam at Barekese with supplementary provision of 12 million liters/day (about 1/5th of the demand) from the Owabi dam. Though small, Owabi is a highly significant site for WD as it can be used to explicitly demonstrate the fundamental linkages between conservation and the preservation of vital ecological processes such as water generation.

Owabi is one of only two Wildlife Sanctuaries in Ghana, and was one of the first six protected areas to be established by the WD. It is the smallest WD protected area declared to date. In 1988 Owabi was designated by the Government of Ghana as a wetland of international importance under the Ramsar Convention.

It has one third of the area consisting of an open area and inlets covered by aquatic weeds and plants, such as *Pistia*, *Nymphaea* and encroaching weeds, ferns and marsh plants.

Currently, the forest also serves as a haven for different bird species among them are turacos, raucous pied, pygmy goose, purple heron, giant blue plantain eaters, hornbills and a variety of migratory birds' species. One hundred and ninety nine species of vascular plants have been identified. These include 91 tree, 19 shrub, 40 herb, 14 grass, 1 parasite, 6 ferns, and 29 climber species. The avifauna is relatively rich with indigenous birds and some migrants. One hundred and sixty one birds consisting of 29 families have been recorded 13 of which are listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The Sanctuary/Ramsar Site also protects the surrounding pristine forest. It also serves as an opportunity for environmentalists, schools and colleges as well as researchers to explore the area for scientific research and socio-ecological studies.

1.2 Representation

The Owabi Wildlife Sanctuary/Ramsar Site is made up of secondary "Moist Semi-Deciduous Forest" remnants and is one of the three WD protected areas in the Ashanti Region.

1.3 Establishment and Legal Status

The area surrounding the lake and associated waterworks was appropriated and declared a forest reserve in 1928, with the hydrological catchment area of the Owabi River, (see figure 2), under the management of the then Forestry Department in order to protect the immediate "catchment" area of the dam. At the same time an area of 700 hectares was planted with *Cassia siamea* to provide fuel wood for the steam driven pumps. In 1962, the Owabi Waterworks became a Game Reserve (L.I. 171 under the Wild Animals Preservation ACT 43 of 1962). In 1971 it was expanded and gazetted as Owabi Wildlife Sanctuary/Ramsar Site (L.I. 710) under the management authority of WD (see Figure3).

There is considerable misunderstanding about who has management responsibility for the southern section of the Sanctuary/Ramsar Site which is commonly referred to in the area as the "catchment area" but hereafter will be referred to as the "outer Sanctuary/Ramsar Site". The real situation of the outer Sanctuary/Ramsar Site has until now not been clarified and so the field staffs of the WD do not consider it as part of the Sanctuary/Ramsar Site and therefore they do not patrol there. Though land use restrictions were originally prescribed to control erosion in the outer Sanctuary/Ramsar Site, with particular restrictions on growing of annual crops, many farms now are found there. Responsibility for the water body itself, dam and associated waterworks rests with the Ghana Water and Sewerage Corporation (GWSC).

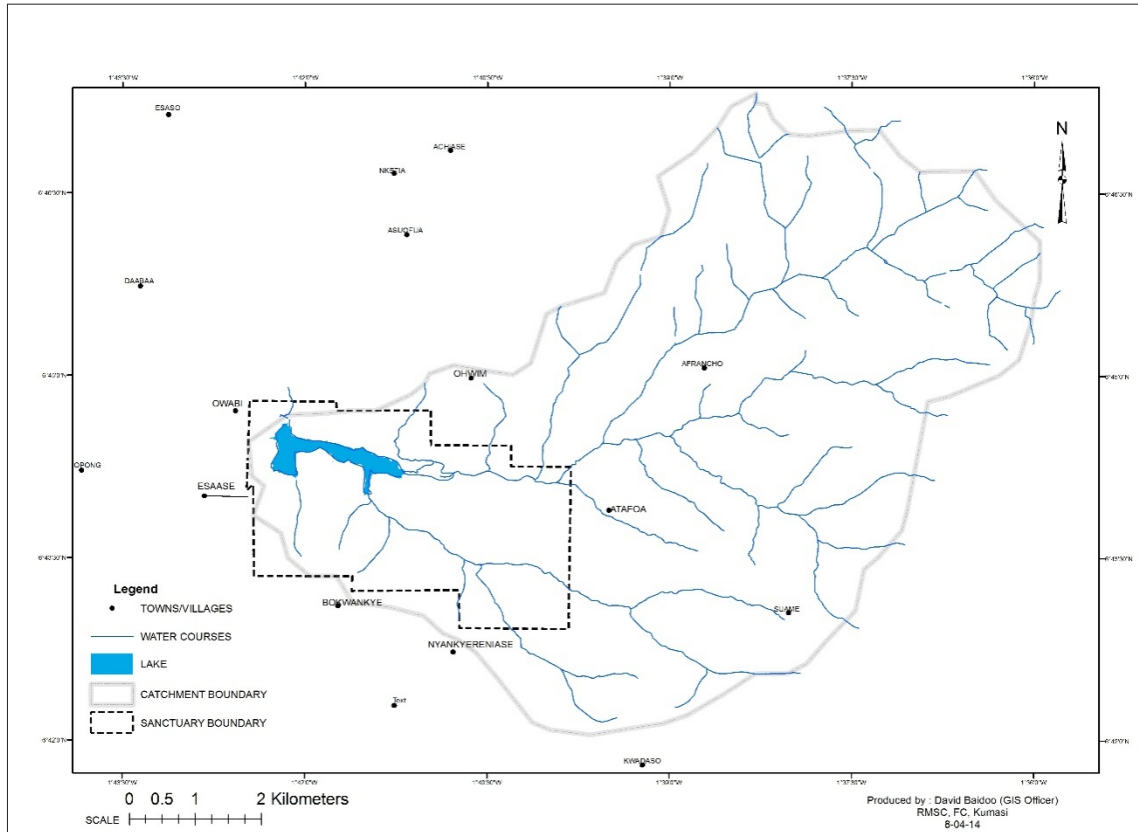


Figure 2: Owabi Wildlife Sanctuary/Ramsar Site in Relation to Catchment Area

1.4 Socio Economic Setting

Many socio-economic issues have arisen from the circumstances surrounding the creation of the Sanctuary/Ramsar Site. The interrelated issues of population pressure, land tenure, land use practices and local development will inevitably have a direct bearing on any management plan which seeks to both conserve wildlife and ensure a sustained supply of water.

There is an immediate conflict of land use of the Owabi water catchment area between the landowning communities and the Ghana Water Company Limited (GWCL) as a result of farm lands being used for housing development. This is affecting security of the Sanctuary/Ramsar Site as large areas of the outer portion of the catchment area have been encroached. The non - payment of compensation to landowners by GWCL has encouraged the former to illegally allocate land for construction of houses.

The Sanctuary/Ramsar Site with its natural attractions and habitat for endangered flora and fauna species has potential for ecotourism development. It has a fascinating serene environment for hiking, picnics, meetings and camping.

1.4.1 Population pressure

Eleven settlements were resettled in the 1930's as a result of the construction of the Owabi dam and appropriation of the surrounding land. These communities now constitute the immediate population around the reserve. The communities are typical Ashanti villages of cluster settlements; some are an amalgam of smaller communities which settled together.

The total population of the local communities at the inception of the protected area was 830 but is currently estimated at about 11400 from a population growth rate of 4.1% per annum. The population growth and attendant demand to meet domestic needs cause considerable pressure on the resources in the Sanctuary/Ramsar Site. The situation is compounded by its proximity to Kumasi which exposes it to further urban based pressure. Land scarcity, partly caused by traditional farming practices, has resulted in agitation for resettlement by some of the communities that were resettled to establish the Sanctuary/Ramsar Site.

1.4.2 Land use

Subsistence crop farming, mainly of maize, cassava, plantain, and cocoyam is the predominant land-use. The people of Amanfrom cultivate cassava on commercial basis and transport to Kumasi. Cocoa farming was a major land use but this activity has declined due partly to the loss of farms to the Sanctuary/Ramsar Site and as a result of poor tree maintenance and frequent bush fires.

The farming practice is slash and burn and, bush fallow. Continuous use of the land without fertilization and the frequent fires has resulted in land degradation and invasion by the 'Acheampong' weed (*Chromolaena odorata*). Some farmers use poultry manure from the commercial poultry farms in the area to fertilize their farms.

1.4.3 Land tenure and rights

The land tenure system is complex. The ultimate custodian of all lands in Ashanti is the Ashantehene. However, various paramount and divisional chiefs oversee the land. Different clans

and families, who directly work the land, more or less 'own' it by inheritance. In the immediate area around the Sanctuary/Ramsar Site the land tenure is further complicated by the fact that the different communities fall under different divisional chiefs in the Kumasi Traditional Council.

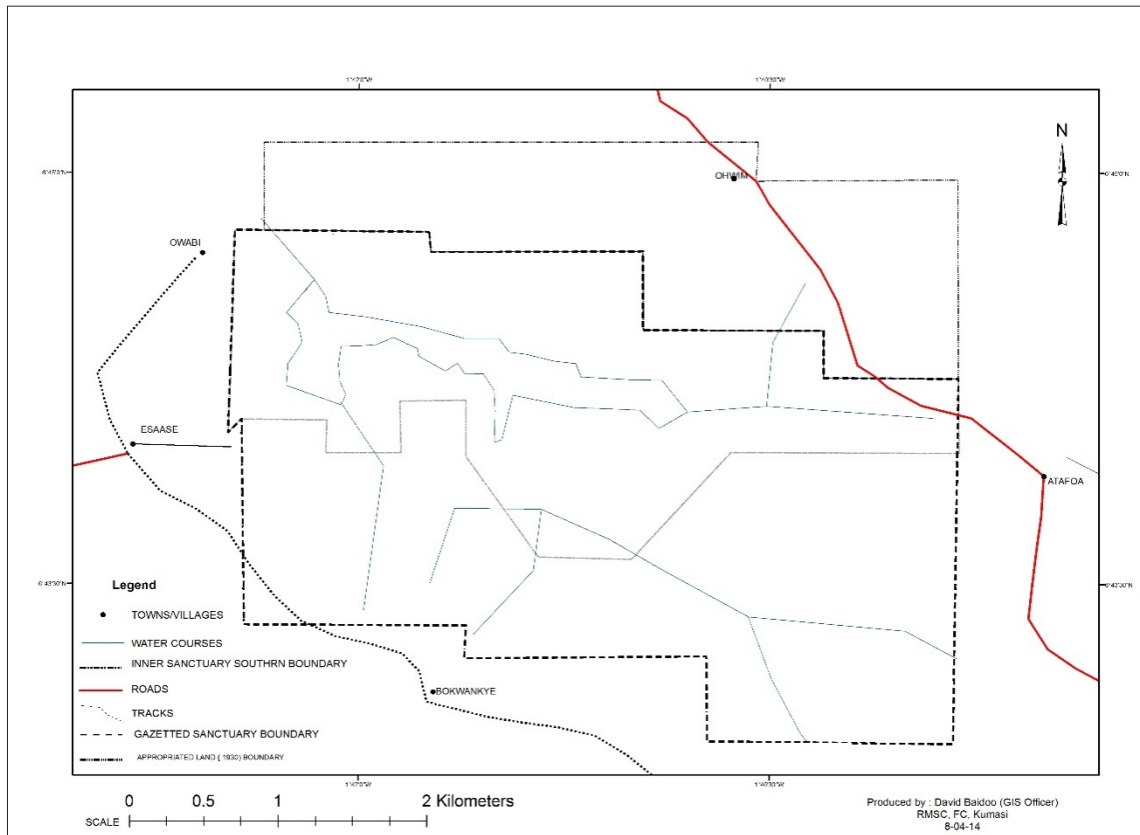


Figure 3: Evolution of Owabi Sanctuary/Ramsar Site Boundary

1.4.4 Access to land

The creation of the dam and appropriation of the land around it and the subsequent resettlement of villages, have caused problems of access to farm lands. The people from Esaase village farm in the "outer Sanctuary/Ramsar Site". Owabi, Atafua and Ampabame lost most of their land to the Sanctuary/Ramsar Site at the time of gazettment. The present legal status of the area to the north of the Sanctuary/Ramsar Site, which was also appropriated in the 1930s but was not gazetted under LI 710 as part of the Sanctuary/Ramsar Site is not clear. The people of Ohwim, who were resettled in the north of the Sanctuary/Ramsar Site, maintain that the land is government-owned and so they understand that they have no legal rights to it.

1.4.5 Administration

The area around the Sanctuary/Ramsar Site falls under two District Assemblies; the Atwima Nwabiagya and the Kumasi Metropolitan Assembly. The whole area falls in the Kumasi statutory planning zone. Various local organizations including the Town Development Committees etc., operate in the area and are responsible for execution of development activities in their respective communities.

Traditionally, the Kumasi Traditional Council administers the Owabi catchment area though the communities fall under different Divisional Chiefs. In addition, each of these communities has its own chief or 'Odikro' who is highly respected and is the highest traditional authority in each village. They owe allegiance to respective divisional chiefs in the Kumasi Traditional Council and ultimately to the Asantehene.

1.5 Local Economy and Employment

Many of the people, especially the women commute daily from the local communities to Kumasi to trade assorted items. In Ampabame community petty trading is prominent among the people than farming. Several poultry farms in the vicinity employ local labour.

1.5.1 District Economy

The economy of the District has been analyzed under four broad categories namely agriculture, industry, trading and services. In spite of the peri-urban nature of the district, agriculture remains the dominant sector and employs about 50.76% of the labour force.

The main types of agricultural activities in the district are small scale crop farming and livestock rearing. Few people are engaged in commercial farming. Some cocoyam, ginger, oil palm, rice, citrus, cocoa and plantain are the main commercially grown crops. Vegetables like tomatoes, garden eggs, cabbage, carrots, cucumber, green pepper and okra are relatively cultivated on a large scale.

1.5.2 Bead making

Kapro, Dabaah and Ohwim communities are noted for ornamental bead making. The activity is labour intensive with about 90 people engaged in Ohwim only. Most households depend on

fuelwood for their domestic needs. The degradation of fallow lands in the area has resulted in reduced tree cover and fuelwood shortage. Considerable time is spent on firewood collection by women and children. Many households buy firewood or charcoal. The average price per headload (25 kg) of firewood is GH¢ 40 and the average household uses approximately 100kg a week. Bead making also requires large amounts of wood for the kilns. It is estimated that 144 tonnes of wood (195m³) is used annually by bead makers alone at Ohwim.

1.5.3 Fish Farming

The Owabi dam serves as the only source for fishing in the area. Interested community members are given quota by the GWCL to the lake for fishing.

1.5.4 Irrigation Farming

Irrigation farming is gradually gaining grounds in the district. Some farmers are responding to the effort by the District Department of Agriculture to promote irrigation farming.

1.5.6 Trade and Commerce

The working population both formal and informal within the district are engaged in activities including trading in: foodstuffs, 'provisions', spare parts, alcoholic and soft drinks, building materials, cooked foods, wood/ wood products, plastic products, chemicals fuel products and lubricants. Most of the traders are small size retailers, and apart from a few who trade in defined market places, most trading activities are still located along roads, water ways and residential neighborhoods, thus creating some environmental sanitation problems.

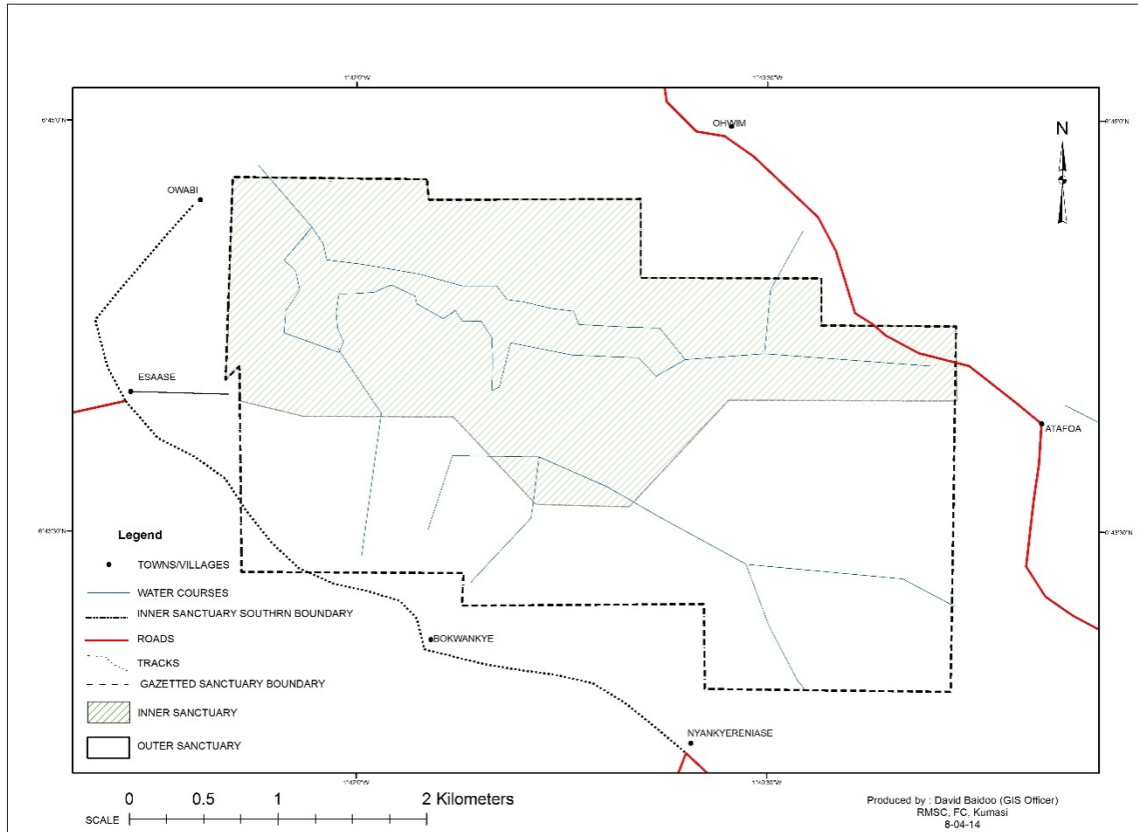


Figure 4: Inner and Outer Sanctuary/Ramsar Site Areas

1.5.7 Local services

The local services available to eight of the resettled communities are given in the report of Danso and Agyare, 1992. Of particular note is the availability of piped potable water to communities. Of the resettled communities only two, Esaase and Owabi, have benefited directly through pipe-borne water from the GWCL. The main sources of water supply for domestic use in the district are boreholes and pipe systems. The district potable water supply coverage has increased from 81.0% in 2006 to 95.37% in 2009. However, flow of water from the pipe is still irregular. Local health facilities are rudimentary and most people obtain health services in Kumasi. The dam was indicated to have been built in 1927 and is believed to have outlived its usefulness as its structures have reached expiration period. There are reports from the communities that the dam was created to have a lifespan of seventy (70) years.

1.5.8 Interventions to Reduce Impacts

Interventions are necessary to reduce the level of perceived impacts on the catchment area, the Sanctuary/Ramsar Site and the dam. There are proposals that these areas can be preserved as follows:

- Empower local authorities and chiefs to impose fines as punishment for offenders
- Job opportunities for local communities' members should be created
- Engage information services to educate communities on their rights and responsibilities.
- Fence or wall entire reserve
- Extend community land for development by reducing water catchment area
- Pay compensations to landowners
- Provide community developmental projects such as public stand pipes and running water in homes, schools, toilets, etc.
- Permit communities to enter and collect NTFPs from the Sanctuary/Ramsar Site
- Plant trees around the forest
- Encourage hunters to report encroachment to WD

1.5.9 Expected Benefits to Local Community

The GWCL has built school at Esaase. In addition they provide portable water for some communities, and give fishing quotas to interested people in the communities. The Communities expect benefits such as employment of locals by GWCL and WD to support monitoring and patrolling with payment of allowances. Other expected benefits include infrastructural development facilities such as toilets and schools.

1.6 Resource Utilization

Bush meat is the most valued wildlife resource, though large game is scarce in the area. Hunting is largely restricted to rodents (squirrels and grass cutter). Poaching with snares and guns does occur in the Sanctuary/Ramsar Site. There are two distinctive areas where forest products are found. The Sanctuary/Ramsar Site which is within the Owabi water catchment area is a protection forest reserve where there are entry restrictions for forest products. Hunting is also prohibited in the Sanctuary/Ramsar Site. By implication, the protection strategy has increased the quantities of

NTFPs in the Sanctuary/Ramsar Site. Due to the designation of the Sanctuary/Ramsar Site as a Ramsar Site extraction of forest products is strictly not permitted.

The Sanctuary/Ramsar Site also serves as a tourist site, provides good air, congenial micro-climate, trees that serve as wind breaks, and drinking water sources. A number of rivers and streams drain into the dam.

At present fish species such as Tilapia are harvested from the dam. The possibilities of introducing other species to improve fishing prospects, both artisanal and sport, should be explored.

1.7 Local Perceptions of the Sanctuary/Ramsar Site

In general, no distinction is made between the dam and the wildlife Sanctuary/Ramsar Site and there appears to be a significant awareness and acceptance of the role of the Sanctuary/Ramsar Site in protecting the lake and providing water to Kumasi. Traditionally people protected vegetation along all water bodies to prevent them from. However, surrounding communities are requesting for the release of some land within the Sanctuary/Ramsar Site for farming. Hence the rationale for conserving wildlife within the Sanctuary/Ramsar Site is probably not appreciated widely.

Besides these general perceptions the various communities appear to have different attitudes towards the Sanctuary/Ramsar Site. The people of Ohwim for instance, regard the Sanctuary/Ramsar Site as a potential supply of firewood, whereas the Esaase inhabitants who farm the "outer Sanctuary/Ramsar Site" want the area to be legally released to them.

1.7.1 Benefits of reserve

The local people generally do not realize any direct benefit from the reserve but suggest that in exchange for real benefits they are prepared to respect conservation laws and to make local edicts to protect the Sanctuary/Ramsar Site. Permission to fish, gather *Marantaceae* leaves and dead wood were mentioned as possible benefits.

Some communities said they were prepared to support patrolling of the Sanctuary/Ramsar Site if they see it as protecting their benefits.

1.7.2 Areas of conflict

1. Poaching

There is considerable poaching pressure on the Sanctuary/Ramsar Site as evident from the snares, used shotgun cartridges and used carbide found in the Sanctuary/Ramsar Site. Snares are laid along the edges of the "inner Sanctuary/Ramsar Site" ostensibly to protect cultivated crops from wildlife depredation; the removal of these snares by the game scouts was a common source of complaint. Interviews reveal that bushmeat trade is thriving in the area. Some chop-bar owners admitted receiving carcasses of duikers and other ungulates from hunters within the villages around the reserve. It is possible some of them may have originated from the reserve; others were probably hunted from the fallow areas and secondary thickets.

2. Tree cutting

Cutting of fuel wood and poaching of timber trees also occurs in the Sanctuary/Ramsar Site.

3. Access

Access into the reserve is relatively easy via footpaths which traverse the reserve linking villages to the surrounding farms. WD staff regards the ease of access as seriously limiting their effectiveness.

4. Staff attitudes

The WD staff has maintained reasonable goodwill among the people as they have not dealt with issues in a high-handed manner, but have resolved such issues through dialogue rather than prosecution.

5. Responsibilities

The rights and responsibilities of the WD and the GWCL are outlined in an agreement reached between the two organizations with regards to the management of the Sanctuary/Ramsar Site (attached to plan). Part 2, Section A (iii) of the agreement precludes fishing by the personnel of the Corporation; however permits are issued to individuals to fish on the lake, in contravention of subsection (iv) of the same agreement.

The Director of the Owabi Waterworks Treatment Plant was not aware of such an agreement. He suggested however that there was too many fish in the lake and die-offs cause a problem for water treatment. The Corporation's encouragement of fishing without the approval of the personnel of the WD creates a problem as to the control of the resources of the lake and highlights the lack of clear definition and understanding of the two agencies' roles and responsibilities at the site.

6. Conflicts in Land Use between Landowning Communities, GWCL and WD

Land use conflicts between landowning communities and Ghana Water Company Limited exist. Portions of community lands acquired for Owabi water catchment area have not been compensated by the Government.

1.8 IMPLICATIONS OF THE SOCIO-ECONOMIC CONCERNS

1. Water supply

The supply of water is inexorably linked to the creation of the Sanctuary/Ramsar Site so supplying potable water to resettled villages will be crucial to winning local support for effective management of the Sanctuary/Ramsar Site.

2. Compensation

Records on compensation payments to the local people are incomplete and there is a great deal of uncertainty and misunderstanding concerning this issue. This urgently needs to be resolved by the Lands Commission. The Ghana Water Company Limited has not paid compensation for land acquired as Owabi water catchment area. As the landowning communities are expanding with its proximity to Kumasi, there is competition for land for construction of houses and agricultural activities. Landowners have taken advantage of non-payment of compensation and are willfully and illegally allocating the land to prospective lessees. There is therefore the need for grants and other financial support to pay the compensation to preserve and protect the area. It is also imperative that a compensation dialogue platform is set in place to ensure that landowning claimants are appropriately compensated to stem this conflict. Some of the compensation funds if secured invested into an annual development fund.

3. Fuel wood

There is a critical shortage of fuel wood in the area for domestic purposes and for bead making. Sustainable supplies of fuel wood from plantations need to be made available to take pressure off the remnant forest areas and the Sanctuary/Ramsar Site.

4. Resettlement

The people of Owabi are seeking relocation due to periodic flooding and risks associated with the dam wall breaking. The Ohwim village was resettled within an area which was part of the appropriated lands but which is not gazetted as part of the Sanctuary/Ramsar Site. The legal status of the area, commonly referred to as the "catchment area", is neither clear to GWSC, WD nor the villagers but the people understand that they have no title deed to buildings and farms. Though resettlement took place over 60 years ago some of the communities are still awaiting the fulfillment of commitments made at the time. The 'dependency syndrome' associated with resettlement (Diaw and Schmidt-Kallert 1990), which stifles community self-confidence, self-reliance and lowers community initiative is evident among some of the communities. Initiating any programme in the area will require major efforts to re-galvanize community initiative and enthusiasm.

5. Land scarcity

The availability of land for farming is gradually being reduced in favour of housing facilities. This has led to encroachment on Owabi water catchment area which may further affect the Sanctuary/Ramsar Site. The increasing demands for land have also exerted pressure and illegal allocation of land by the landowning communities. This is affecting security of the Sanctuary/Ramsar Site as large areas of the outer portion of the catchment have been encroached. It is therefore important to introduce sustainable land use and modern methods of farming to improve on agricultural productivity.

6. Employment

Generally, there is lack of formal employment avenues in all the communities. GhanaWater Company Limited and Wildlife Division have not employed any members from the communities. There is the need to improve general economic condition of the people as they are constrained by opportunities for livelihoods.

7. Collaboration

Protection of Sanctuary/Ramsar Site requires a foundation of good collaboration between landowning communities, WD, District Assembly and GWCL. There should be a formation of Owabi water catchment area conservation planning committee. Community protection committee can also be constituted to provide critical linkages among the land owners and users and conservation of the natural capital of the area.

8. Ecotourism

The Owabi wildlife Sanctuary/Ramsar Site as a Ramsar and Important Bird Area (IBA) site makes it unique among the forest reserves in the country. The Sanctuary/Ramsar Site represents an array of natural habitat that exists to provide safe haven for flora and fauna. The reserve is reputed to be the only wildlife reserve very close to Kumasi. The WD should ensure that it continues to monitor and patrol the Sanctuary/Ramsar Site in order to protect it from encroachments. The reserve has potential to be developed as ecotourism site with natural attractions and habitat for endangered flora and fauna species. It has fascinating serene environment for forest walk and is suitable for picnics, meetings and camping,

9. Stakeholder Participation

The survey revealed a number of stakeholders who could be involved in the management and protection of the reserve, notable among them is the Atwima Nwabiagya District Assembly. It is expected that the Atwima Nwabiagya District Assembly should support the Ghana Wildlife Company Limited and Wildlife Division to build strong institutions and collaboration to effectively protect the catchment area from encroachment.

10. Maintenance of the Dam

Since the construction of dam in the early 1920's it has not been renovated and has outlived its lifespan. It is important to assess the safety status of the dam and take proactive action to prevent a catastrophe.

11. Infrastructure and Services

The social infrastructures in the communities are woefully inadequate and the existing ones are in a deplorable state. These include school, sanitation, and health facilities, potable water, feeder roads in some communities, marketing centres, etc. The major ones which were frequently mentioned in

all the communities are school and sanitation facilities. There is an urgent need to improve on social infrastructure in the community in order to contribute to improved living standards.

Generally, sanitation in the study area is in deplorable state which calls for special zoning with provision of waste management equipment and personnel to salvage the situation.

There are inadequate consultations to resolve the non-payment of compensation of the Owabi water catchment area. Landowning communities complain that they have consulted GWCL on several occasions but have not resulted in any fruitful resolutions. There should thus be the creation of compensation dialogue platform to ensure that landowning claimants are appropriately compensated for to avoid conflicts.

12. Proposed Release of Owabi Water Catchment Area

The aggrieved landowning communities are of the view that government should release the catchment area since no compensation has been paid. This has come as a result of pressure on land and its associate proximity to Kumasi. Good agricultural lands in the communities also are gradually being lost to settlement development. The demands for land in these communities have necessitated the need to illegally rely on the Owabi water catchment area as the only land for development of houses.

1.9 Status of the "Inner Sanctuary/Ramsar Site

The "outer Sanctuary/Ramsar Site" operationally has not been considered by the WD as part of the Sanctuary/Ramsar Site. On their part, the local people also understand the area to be outside the Sanctuary/Ramsar Site but regard it as the 'catchment area' of the dam to which they are allowed access to farm and carry out other activities by the GWSC. The true status of the "outer Sanctuary/Ramsar Site" is therefore not apparent to any of the parties involved in the area.

SECTION TWO -RESERVE STATUS AND GENERAL DESCRIPTION

This section briefly outlines the physical and biological characteristic of the Sanctuary/Ramsar Site.

2.1 Biophysical Setting

2.1.1 Geology and Soils

The rocks in the area are phyllites, schists, tuffs and greywackes of the Birimian System, (Middle Precambrian c. 2000 million years) (Geological Survey Bulletin 26, 1962, Kesse 1985). The soils are Forest Ochrosols.

2.1.2 Climate

The nearest station at Kumasi indicates a mean annual rainfall of 1402mm (1961 to 1991 date) with a marked rainy season from March to October and a dry period from December to February. Mean monthly temperature varies little (24.6°C-27.8°C), while the diurnal range is up to 9.1°C.

2.2 Flora

To date the forest in Owabi area has been classified as 'Moist semi-deciduous north-west subtype' (Hall and Swaine 1976) and according to the dominant species 'Moist semi-deciduous forest *Celtis-Triplochiton* association' (Taylor 1952) and 'Moist semi-deciduous forest *Celtis-Triolochiton* associated dry facies' (Mooney 1961).

In a full account of the vegetation of the Sanctuary/Ramsar Site by Schmitt and Adu-Nsiah (1992) four main plant communities have been distinguished: Secondary *Celtis-Triplochiton* forest, Cassia plantation, Riverine forest and Aquatic vegetation.

Most of the area (> 60%) is covered by highly disturbed secondary forest which was and still is heavily encroached through firewood collection and cutting. Nearly 13% of the area is covered by a plantation of an exotic species- *Cassia siamea*- established in 1928. Only small areas are covered by riverine forest and aquatic vegetation. See Figure 5.

The flora does not include any species of high conservation value, however, some economically valuable species which are threatened illegal felling are found in the Sanctuary/Ramsar Site. To

date 193 species of vascular plants have been identified. They include 91 trees, 18 shrubs, 37 herbs and 14 grass species, 1 epiphyte, 6 ferns and 26 climbers.

A species list based on sampling carried out in August and September 1992 and on the trees and aquatic plants listed by Dei-Amoah (1988) is appended to the report of Schmitt and Adu-Nsiah (1992). Ten relevés were sampled using the Zürich-Montpellier method (Braun-Blanquet 1964); their analysis revealed two plant communities. In addition one community (riverine forest), two sub-communities and 5 aquatic plant communities were described on the basis of field observations alone.

The secondary *Celtis zenkeri*- *Triplochiton scleroxylon* forest (up to 40m high) consists of a mosaic of remnants of the former moist semi-deciduous forest north-west subtype and secondary regrowth developing on abandoned farms. Dense clumps of bamboo are found on moist sites. The shrub layer is very patchy. The herb layer is dominated by broad-leaved species and often covers up to 40%, the rest of the forest floor is covered by leaf litter. The *Pterygota macrocarpa* subcommunity, a more disturbed type of forest with fewer tree remnants and a denser bush layer, is confined to a small area south-east of the lake.

The *Cassia siamea* plantation is dominated by dense and uniform stands of this exotic tree (25-35m high) with scattered remnants of the original forest. The shrub layer is up to 5m high and the undergrowth is very similar to that of the secondary forest.

Narrow bands of up to 30m high riverine forest are found along the banks of the Owabi River and of some of the seasonal streams in the reserve. Characteristic trees are *Carapa procera*, *Cleistopholis patens* and *Bosqueia angplense*. The dense undergrowth is dominated by broad-leaved species, mainly monocotyledons. There is less leaf litter than in the adjacent secondary forest. Bamboo clumps (up to 10m high) and *Raphia vinifera* (up to 3m high) form dense stands in very moist, seasonally waterlogged sites.

Of the aquatic plant communities, which are widespread and remarkably similar throughout tropical West Africa, the following were found on the Owabi Lake: *Lemneto-Pistietum*, *Nymphaeetum loti*, *Ceratophyllum demersi* and *Polygonetum senegalense*. Another community is dominated by fern(s): *Cyclosorus dentatus/ striatus*.

The forest is subject to illegal cutting and felling of trees for fuel and timber which threaten the regenerative processes.

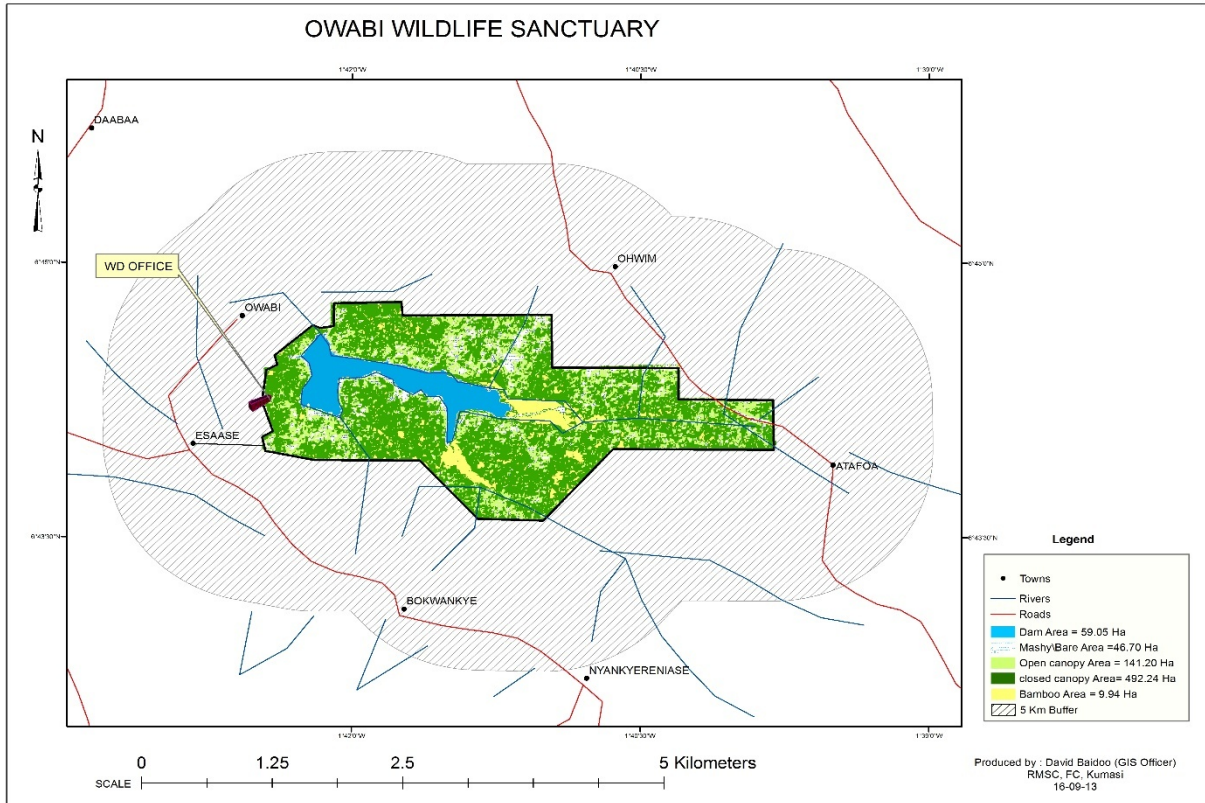


Figure 5: Vegetation Map of Owabi Wildlife Sanctuary/Ramsar Site

2.3 Fauna

Direct observation of all species in the Sanctuary/Ramsar Site is precluded by the dense forest cover and the habits of most of the animals present. Indirect methods for establishing species presence and habitat utilization were used.

The "inner Sanctuary/Ramsar Site" boundaries, existing trails and paths within and around the Sanctuary/Ramsar Site were used as transects and sightings, droppings, tracks, feeding activities and calls of animals were recorded. Interviews were conducted in the villages around the Sanctuary/Ramsar Site regarding bush meat trade, hunting, farming and other human activities related to wildlife conservation.

2.3.1 Species of special interest and their status

Though quantitative data are not available, past faunal survey records indicate that almost all the animals recorded in this survey and were commonly sighted in the past especially primates are still present in the area. Their numbers have increased significantly.

Nonetheless, spot-nose and green monkeys were first recorded in 1988 but were not seen in this survey. The Mona appears to be the most adaptable of all the forest monkey species to the development of thicket vegetation devoid of big trees.

Though footprints and tracks of wild animals are not reliable in determining species densities they provide a means of assessing distribution and relative abundance. Since the footprints and tracks of the Bushbuck (*Tragelaphus scriptus*) were observed to be distributed throughout the Sanctuary/Ramsar Site it is an indication of the fact that it is the most abundant among the ungulates

2.3.2 Habitat evaluation

The distribution and abundance of fruiting trees favoured by many wildlife species has been adversely affected by earlier logging activities and the establishment of the *Cassia* plantation in the Sanctuary/Ramsar Site. Even though the resultant shrubs and herbs abound in the thickets they are of limited food value as they only favour a few browsers such as the Bushbuck (*Tragelaphus scriptus*). The abandoned isolated farms still have remnants of food crops such as plantain, banana and cassava. The observed feeding activities suggests that they are frequented by the Mona monkey (*Cercopithecus mona*), Bushbuck and Black duiker. The maintenance of old farms for a diverse food supply could prove an important management activity.

The present available habitat does not favour a greater diversification of the major wildlife species such as the primates and ungulates. Management strategies to increase plant species of food value to the major faunal species will be necessary if the Sanctuary/Ramsar Site is to support a greater diversity of wildlife.

2.3.3 Habitat Utilization

The tracks of all resident ungulates and that of the Brush-tailed Porcupine (*Artherurus africanus*) were observed more frequently on the boundary line than within the Sanctuary/Ramsar Site itself. This suggests that these species of animals often leave the Sanctuary/Ramsar Site to forage on neighboring farms. The farms could therefore be providing more reliable or diverse sources of food than are available within the Sanctuary/Ramsar Site. The parts of some crops such as the leaves of cocoyam were reported by farmers to have been browsed in farms adjacent to the Sanctuary/Ramsar Site. Numerous tracks and feeding activities of the Cane Rat (*Thryonomys swinderanus*) were observed in the portions of the reserve where grasses thrive in the thickets.

2.3.4 Avifauna

The reserve has a relatively rich indigenous avifauna and also receives migrants. The list of birds recorded has been indicated in Appendix 1. Currently 3 of them are listed as Schedule one species in Ghana. The diversity of bird population makes the area suitable for bird watching.

SECTION THREE-CURRENT MANAGEMENT STATUS

During the early 1970's sound approaches to management were introduced; systematic biological monitoring using permanent transects was initiated and preliminary work plans and development proposals were drawn up.

The Ghana Water Company Limited (GWCL) allows the communities to fish in the dam. The use of chemicals for fishing is prohibited.

3.1 Infrastructure

General facilities: The Ghana Water Company Limited maintains a water treatment plant, a training school for technicians and staff housing and offices within the Sanctuary/Ramsar Site. Wildlife Division has no facilities however five of WD Staff are accommodated in Ghana Water Company Limited facilities while the others live in Esaase. At the entrance Ghana Water Company Limited have a manned gatehouse.

Equipment: There are special equipment i.e. guns, flash lights and binoculars for patrols and monitoring.

Transport: There are three motorbikes and a vehicle for administrative and law enforcement. No boats are available to WD staff.

Trails: Two trails for visitors and patrols have been established through the *Cassia* plantations though they are not signposted or marked. There are a number of footpaths used by locals to access farm lands and the Electricity Corporation of Ghana keep the power line corridor free of vegetation.

Visitor facilities: There is a visitor facility.

Visitor information: There is useful information on the Sanctuary/Ramsar Site for visitors.

Signs: There are Wildlife Division signs to and within the Sanctuary/Ramsar Site.

ADMINISTRATIVE STAFF

Presently 9 staffs are posted at Owabi. The staff consists of one Professional, 5 Senior Technical Assistants, and 3 wildlife guards. Previously and until 1989 there were 21 staffs located at Owabi,

but these were re-deployed. The present staff complements represent a theoretical coverage of 1 staff/1.625km² compared to a national average of 1/33km². However the configuration of the Sanctuary/Ramsar Site gives it a disproportionately long boundary to patrol (ca. 13kms) especially as the dam prevents ready access across the reserve. It was reported that illegal activities were "non-existent" in the reserve in 1988 when there were 21 field staff responsible for the protection of the reserve.

3.2 Budget

Budget and Expenditure ratios: not separately available as they are combined with Kumasi vote.

Locally generated revenue: Generated from tour-guiding.

Visitors: Records available.

3.3 Management Actions

At present management actions at Owabi concentrate on;

- 1) Patrolling the "inner Sanctuary/Ramsar Site" to intercept poachers and prevent illegal fishing and to remove snares.
- 2) Cleaning the "inner boundary" line.

Maintenance schedules: boundary cleaning.

Management constraints:

1. Absence of clear policy guidelines and agreed management objectives for the reserve.
2. Ignorance of true boundary limits for Sanctuary/Ramsar Site
3. Absence of clear cut demarcation of responsibilities between Wildlife Division and Ghana Water Company Limited with relation to the reservoir and the "outer Sanctuary/Ramsar Site".

3.4 Monitoring Programmes

Though Owabi is a Ramsar site on which detailed records should be kept, no systematic data are assembled on waterfowl. Previously, transect monitoring of mammal populations took place in 1970s but the transect lines are now overgrown. Monthly checklists of birds were also compiled at this time but there was no contemporary list of birds at the time of this survey. Staff would need training in census techniques and bird identification.

Research: Students from FRNR have carried out a number of research dissertations on Owabi.

SECTION FOUR – GENERAL AND SPECIFIC MANAGEMENT PURPOSES

This section presents general and specific management proposals for Owabi and represents the functional part of the plan.

4.1 General Management Objectives

The formulation of management objectives should be governed primarily by the 2012 Forest and Wildlife Policy Statement

The criteria and general conservation objectives for areas presently known as Wildlife Sanctuaries have been provisionally laid out as follows;

- 1) To assure the maintenance of conditions necessary to conserve significant species, groups of species or communities.
- 2) To protect from disturbance the breeding, migration or feeding sites for those species so as to encourage their propagation.
- 3) To facilitate the public appreciation of the area through providing facilities to visitors for educational, scientific, recreational or touristic reasons.

In general, Wildlife Sanctuaries should have open public access for cultural, touristic, educational, scientific, spiritual or inspirational reasons. Forms of traditional landuse which are compatible with and contribute to the site's conservation objectives are to be encouraged.

The conservation objectives of the reserve will allow for the realization of benefits to the local communities to win support for the Sanctuary/Ramsar Site and to help offset real and perceived costs resulting from its establishment.

Owabi will continue to be categorized as a Wildlife Sanctuary/Ramsar Site.

4.2 Specific Management Objectives

In accordance with the stated policy and in the light of the results obtained from the biological inventories and socio-economic survey it is proposed that the management of Owabi Wildlife Sanctuary/Ramsar Site will be guided by the following specific objectives:

- 1) Ensuring the protection and conservation of the water body and associated vegetation for sustained water supply by;
 - a. Actively protecting the integrity of the site from negative boundary alterations, inappropriate development, exploitation and pollution.
 - b. Demarcating appropriate management zones within the reserve to provide proper recognition and facilitate protection of the reserve's resources.
- 2) The maintenance of ecological processes by;
 - a. Actively protecting the characteristic plant communities, particularly the relict riverine forest from cutting and fire.
- 3) The maintenance of populations and habitats of resident and migratory species particularly waterfowl by:
 - a. Conserving areas of aquatic vegetation which are important waterfowl feeding and nesting sites.
 - b. Restoring the secondary *Celtis triplochiton* forest through protection and enrichment planting.
 - c. Maintaining and restoring if appropriate, populations levels of native animal species of particular conservation and viewing interest.
- 4) Integrating the development of the reserve with that of the local community through:
 - a. Encouraging local participation in reserve management processes.
 - b. Promoting opportunities for local communities to benefit directly from the reserve, through revenue sharing, employment and access to the sustainable harvest of reserve products ie fuel wood from *Cassia* plantations and fish from the lake.
 - c. Instituting sustainable land-use practices in the "outer Sanctuary/Ramsar Site" to help protect the reservoir and expand economic options.

- 5) Realizing and exploiting the potential of Owabi as a venue for education, tourism and recreation by:
 - a. Upgrading and installing trails and developing suitable visitor facilities.
 - b. Encouraging visits by schools and promoting Owabi as a venue for research.
 - c. Encouraging the development of facilities, by local people, for regulated leisure activities such as boating and fishing.

It is recommended that these general management objectives are reviewed within three years of their acceptance to determine if revisions to policy or management strategy are required.

4.3 Boundaries of Reserve

The present boundaries of Owabi were legally established in 1971. However, WD has never exercised operational control over the "outer Sanctuary/Ramsar Site". It should be the intention of the Wildlife Division to maintain the boundary of the whole Sanctuary/Ramsar Site and that any change to its status will only be contemplated if it is of clear and lasting benefit to the objectives of the reserve.

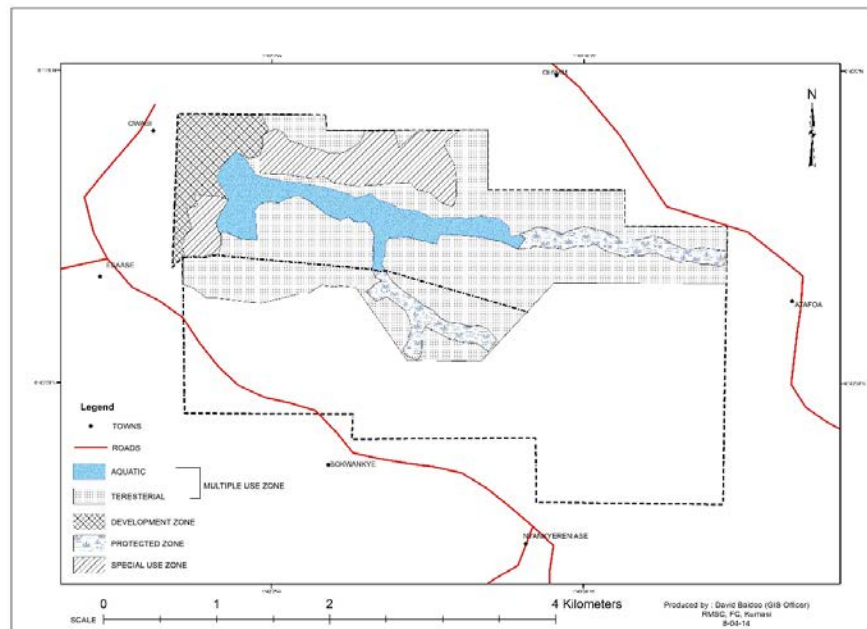


Figure 6: Management Zones of Wildlife Sanctuary/Ramsar Site

4.4 Zonation

A system of management zones has been proposed for Ghana's protected areas to which reference should be made (see Zone plan, WD 1992). Zoning the reserve is a basic step in management planning as it divides the assets of the protected area and schematically outlines the type of management regime and development activity appropriate for each zone. WD

Owabi has been zoned into Five management categories namely: Aquatic, terrestrial zone (multiple use zones), core (protected) zone, special use zone and the development zone. (See Figure 6)

4.4.1 Protected Zone

Description: This category has been least affected by anthropogenic activities and are relatively intact and thus merits special protection.

Extent: The protected zone encompasses the riverine and swampy forest which is largely restricted to the water courses on the eastern side. The area covers less than 1% of the entire Sanctuary/Ramsar Site.

Management aims and prescriptions:

This includes the environmental services objectives as well as payment for ecosystem services. The Sanctuary/Ramsar Site will be managed to ensure that the water catchment, swamps, riverine forests to conserve the biodiversity of the Sanctuary/Ramsar Site.

In this plan management interventions aim to harness the ecotourism potential of the Sanctuary/Ramsar Site. The strategies to promote ecotourism shall be built on the foundation that ecotourism is primarily an activity to yield economic benefit for the well-being of the fringe communities. The aims of the protective zone are

1. To preserve remnant riverine forest habitat for biodiversity through conservation and education.
2. To provide opportunities for low impact tourism.

Prescriptions:

1. Establish an effective protection mechanism
2. Maintain the protective function of the Sanctuary/Ramsar Site to provide suitable conditions for the sustenance of the dam.
3. Restore significant natural forest cover along all permanent streams (30-50m on each bank) in the Sanctuary/Ramsar Site.
4. promote research in forest dynamics
5. Conduct regular boundary patrol to prevent or detect encroachment and other illicit activities
6. Sensitize local communities on the need to prevent human activities within 50 meters' along the river banks
7. Develop strategies for habitat and species management
8. Develop a communication strategy for awareness creation on the importance of the Sanctuary/Ramsar Site
9. Develop strategies to promote ecotourism
10. Use ecotourism to engender support for biodiversity conservation

4.4.2 Multiple Use Zone

Description: This zone includes ecosystems where the ecology has been significantly altered but afford the best available habitat for resident primates and ungulates and if protected would eventually revert to a climax state and those areas of aquatic vegetation which are important for waterfowl. The area would be managed to ensure long term sustained production of desired resources and minimal infrastructural development. Habitat conditions in the zone would be manipulated to favor natural processes.

Extent: The areas constituting the Multiple Use zones are the *Celtis – Triplochiton* secondary forest area and the water body.

The Multiple Use Zones cover approximately 65% of the Sanctuary/Ramsar Site.

Management aims and prescription:

Aims:

1. To protect, rehabilitate and restore prime habitat conditions for the relict wildlife populations in forest areas
2. To protect and maintain feeding and breeding sites for waterfowl.
3. To promote education, tourism and recreational activities based on birdwatching, animal viewing and recreational fishing.
4. To develop the fishing resource of the reservoir and introduce sustainable fishing practices to benefit the local people.

Prescriptions: A variety of management prescriptions will be required including

1. Undertake enrichment planting,
2. Protect seed trees
3. Establish trails and hides,
4. Erect sign and observation post
5. Develop visitor center,
6. Introduce appropriate fishing technology to local people etc.

4.4.3 Special Use Zones

Description: The areas designated as Special Use Zones are those which support land-use practices not normally associated with protected area management or where a particular programme activity related to the reserve is concentrated. At Owabi WS, Special Use Zones are to be established to serve two distinct functions and are differentiated as the Special Use (Restoration) Zone and the Special Use (Buffer) Zone.

Rare migratory birds use the aquatic vegetation on the lake shores and in the densely vegetated bays for feeding and breeding and these sites need absolute protection. In this situation, however, "absolute protection" requires focused intervention to interrupt natural succession processes.

Measures taken by the Ghana Water Company Limited to control the spread of weeds in the lake should be restricted to areas of open water and to the western shore so as not to interfere with critical bird sites.

Succession within the waterfowl habitat should be monitored and measures taken to prevent the development of terrestrial vegetation.

4.4.3.1 Special Use (Restoration) Zone

Extent: The two *Cassia siamea* plantations, originally established to supply fuel wood, are proposed as Special Use Zones to cover about 13% of the reserve. The two plantations would be managed with different aims i.e. the smaller plantation on the western side being exploited on a sustainable basis (eg coppicing) while sections comprising the greater area of the larger plantation on the northern side are cleared to allow restoration of the original forest. Details are given in Section 5.3.1.

Management aims and prescriptions:

Aims:

- 1) To exploit the plantation as a source of fuel wood to meet local demands
- 2) to promote woodlot establishment as an alternative livelihood to encourage communities to establish their own fuel lots .
- 3) To restore original forest vegetation to increase the available habitat for the resident and migratory fauna

Prescriptions: A number of management prescriptions will need to be developed including;

1. Engage the Forest Services Division to develop harvesting plans for the plantations
2. Devise enrichment planting strategies aimed at restoring the original forest,
3. Encourage and train local communities to establish woodlots outside the Sanctuary/Ramsar Site etc.

4.4.3.2 SPECIAL USE (BUFFER) ZONE

Extent: The Special Use (Buffer) Zonation will be applied to the whole of the "outer Sanctuary/Ramsar Site", an area of approximately 6km² lying on the southern sector of the Sanctuary/Ramsar Site.

Management aims and prescriptions:

Aims:

1. To act as an effective management buffer for the "inner Sanctuary/Ramsar Site".
2. To develop the zones as a model of integrated sustainable land-use planning for water catchment areas
3. To institute sustainable land use practices such as tree crops, woodlots, honey production etc.

Prescriptions: A number of management prescriptions will be required.

1. Institute eco-friendly land use systems.
2. Undertake boundary planting within the outer Sanctuary/Ramsar Site.
3. Promote alternative livelihood enterprises.

4.4.4 DEVELOPMENT ZONE

Description: This zone category is for areas within the reserve boundaries which are set aside for visitor services, reserve administration facilities, employee housing and maintenance facilities.

Extent: The proposed Development Zone would extend over the area where Water and Sewerage facilities are already established approximately 12% of the reserve.

Aim: 1) to provide restricted areas for administration buildings and visitor support services and to minimize impacts on other parts of the reserve.

SECTION FIVE -INTEGRATED MANAGEMENT PROGRAMMES FOR THE OUTER SANCTUARY/RAMSAR SITE

This section briefly outlines the type of integrated programme needed to attain the overall management objectives for the Sanctuary/Ramsar Site and indicates ways of incorporating the reserves development with that of the surrounding area.

The long term objective of the development plan will be the protection of the Owabi water catchment as a whole. The development of an integrated approach in the Special Use (Buffer) Zone at the Owabi site may serve as a useful model for the development of the proposed Barekese Dam reserve and for the management of water catchments elsewhere.

Outline of objectives:

The plan should have the overall objectives of:

1. Protecting the immediate catchment area of the dam and guarantee the sustained water supply for the area;
2. Improving the quality of life for local communities (e.g. through supplying basic municipal services such as piped water);
3. Introducing benevolent land use practices for both catchment protection (i.e. erosion control) and local benefits (i.e. fuelwood, cash crops etc.)
4. Reducing pressure on the biological resources of the Sanctuary/Ramsar Site (e.g. exploiting plantations, farming grasscutter etc.)

Any integrated plan to accomplish these objectives for the catchment area and the Sanctuary/Ramsar Site will have to be with the active support and involvement of a consortium of government agencies, local community groups and possibly interested NGOs.

Members of the consortium should include: Kumasi Metropolitan Assembly, Atwima Nwabiagya District Assembly, the Ministry of Agriculture, Health, Dept. of Community Development, the Ghana Water and Sewerage Corporation, Forestry Commission local chiefs and sub-chiefs and local development agencies.

The integrated development plan should focus on resolving the following key issues:

1. Determining legal status of the commonly named "catchment" area and inter and intra-agency responsibilities in the "outer Sanctuary/Ramsar Site".
2. Requests for re-settlement by communities.
3. Compensation of communities for the initial re-settlement.
4. Legal tenure of land and property in the catchment area.
5. Supply of piped water to local communities.
6. Developing and enforcing land-use codes for the catchment area.
7. Introduction of agro-forest systems.
8. Introduction of tree and perennial cash crops.
9. Establishment of community woodlots.
10. Development of small scale industries and crafts including bee-keeping.
11. Improved cooking stoves for greater fuel efficiency.
12. Family planning and health programmes.
13. Introducing appropriate fishing technology.
14. Extension of the programmes to the whole Owabi water catchment.
15. Extension of the programmes to Barekese dam and other river and dam catchments.

The development of the catchment area plan should be done in tandem with the implementation of the management plan for the Sanctuary/Ramsar Site.

Sources of funding and technical assistance such as the European Commission, the International Development Bank, WaterAid, Overseas Development Administration (ODA), the Danish International Development Agency (DANIDA), GTZ, among others should be approached with the proposal.

5.1 Development and Maintenance

Range camp: The Kumasi Metropolitan Assembly is constructing a range camp at Atafua near Ohwim to protect the northern side of the reserve

Trails: Two major trails with signage have been constructed within the Sanctuary/Ramsar Site. During the plan period these trails would be maintained.

- a. one trail leads to the *Cassia* plantation north of the lake. An observation hide along the banks of the lake would be constructed during the plan period.
- b. a second trail leads to the eastern end of the lake through the riverine forest. This trail would be maintained. Access to the aquatic vegetation at the inflow of the Owabi River would be restricted during the breeding season of the waterfowl.

Accommodation for WD staff: Once the KMA completes the WD staff accommodation, staff presence would be enhanced and visitor facilities would be considered during the plan period.

5.2 Administration Programme

Staffing: The WD would maintain a minimum of 6 staff at the site to ensure adequate patrol and enforcement procedures, maintenance, monitoring of wildlife population and visitor support. Two of the staff would be professional officers who would assist with interpretation and monitoring duties.

Patrol Equipment: At least one WD issued firearm would be available on the site. High powered flash lights are provided for night patrols and monitoring.

Transport: One motor bike would be provided for local needs and a small aluminum boat with 10 HP engine to permit access across and around lake for patrols and monitoring purposes.

Communications: A radio or telephone link with Kumasi office would be established.

Liaison with Water and Sewerage: The 1975 letter of agreement between Water and Sewerage Corporation (Kumasi) and WD regarding the dam's management would be revived (or in the light of this plan re-negotiated) as there is no knowledge of its existence by present operational staff from either agency.

5.3 Resource Management

5.3.1 *Cassia* plantations

The *Cassia* plantations in the reserve were established originally to provide yield fuelwood and were harvested in 1970. The plantations would be utilized for this same purpose. During the planning period the communities would be encouraged to establish woodlots outside the Sanctuary/Ramsar Site. The 120 ha *Cassia* plantation west of the lake with its easy road access would be used as initially to supply fuel wood to local people on a sustainable basis. The plantations would be managed in consultation with the Forest Services Division

Access to the plantation would be regulated by a permit system. Subsequently sections of the 700 ha *Cassia* plantation on the north of the reserve should be cut with the intention of removing the *Cassia* from these sections and encouraging indigenous species to regenerate. A fringe of *Cassia* of 100m width should be left along the lake shore for scenic and protective reasons. The management of the plantation should be guided by the Forestry Department.

Revenue generated by license fee should be retained for the reserve. Monitoring of subsequent forest regeneration and succession would be essential and may provide the information needed to permit long term transformation of the plantation into a climax forest.

5.3.2 Lake fishing

A survey of potential sustainable fishing yield should be conducted by the Institute of Aquatic Biology. At present two fish species are known from the lake; *Tilapia nilotica* and *hetro branchus* spp. The possibilities of introducing other species to improve fishing prospects, both artisanal and sport, would be explored.

Alternative Livelihood Intervention

Alternative Livelihood schemes will be developed and implemented as part of the overall national poverty reduction strategy. This it is believed will improve the general living standard of the people and thereby help to reduce the pressure being exerted by the forest fringe communities on the forest resources.

Management prescriptions for alternative livelihood intervention include the following:

- i. Review past alternative livelihood interventions implemented within the fringe communities.
- ii. Implement appropriate livelihood interventions based on the reviewed report.
- iii. Establish framework for the implementation of livelihood interventions.
- iv. Strengthen capacity of forest fringe communities to adopt and implement livelihood interventions.
- v. Encourage District Assemblies to support livelihood interventions as part of the poverty reduction strategy.

5.3.4 Reintroduction of Dwarf crocodile

The dwarf crocodile was originally reported from the reserve but no signs were seen during the management survey. The habitat is ideal for this species and serious consideration should be given to introducing individuals from either captive or wild caught stock.

5.4 Community Involvement

The central theme of this plan has been the need for the involvement of the local community in the management of the reserve and catchment area and integrating the reserve into local development schemes.

Community involvement and integration will depend ultimately on establishing lines of communication to gain support and using incentives to strengthen that support. At the same time the community will have to be made aware of the responsibilities and accountability they will have to assume with regard to the reserve and of their rights as well.

5.4.1 Public Liaison

There is no channel of communication between the reserve and the local people so it is proposed that;

- 1) Village level conservation committees be established with local chiefs and others (resource user should be represented) from the various communities. The Wildlife Division officer in charge at Owabi should attend committee meetings to establish a formal line of communication on local conservation issues.

- 2) A Protected Area Management Advisory Board for Owabi would be constituted with representatives from the various conservation committees; the function of the Board would be to assist with the implementation of the plan.
- 3) The WD staff need to be trained in collaborative resource management strategies to enable them effectively involve stakeholders in the implementation of the plan.

5.4.2 Incentives

Economic and other incentives should be provided to encourage community support and involvement in protected area management. Incentives for fringe communities could be in the form of: granting negotiated access rights to local people for fuel wood collection and fishing.

- 1) Sharing of revenue accruing from gate fees from tourists and visitors.
- 2) Employment as WD staff

Incentive

Provision of incentives are to generate support for the protection of the wildlife Sanctuary/Ramsar Site, the water catchment area and the dam as it would provide clear reasons and justifications for local involvement. Suggested incentives include:

- Payment of compensation to landowning communities
- Resource utilization rights to local people for fuelwood and other NTFPs collection
- Local employment as WD staff and GWCL field workers
- Provision of irrigation materials and water tanks to farmers to encourage them to move further away from the dam.

5.5 Public Use

5.5.1 Tourism

The aesthetic nature of the Sanctuary/Ramsar Site, the potential for bird-watching and the chances to observe monkeys in the forest give the site distinct touristic appeal. This could be enhanced through education programmes, construction of nature trails, establishment of hides and observation

platforms at strategic locations. There is also enormous potential for hiring out boats and recreational fishing and this must be explored.

Ecotourism Potential

The Sanctuary/Ramsar Site has a scenic appeal, potential for picnicking and bird watching, the chances to observe monkeys in the forest, the potential for boating and recreational fishing give the reserve a distinct touristic value. It again provides an excellent facility for educational tours, ecological studies and enjoyment of a guided walk to the waterworks and treatment process.

Walking through the fascinating serene environment of Owabi provides an attractive forest walk. One of such walks is trekking through the thick undergrowth mix rain forest with the long ago created elephant trails, about two hours in the east and west directions. The surrounding environment of the reserve is also suitable for arranging picnics, meetings, setting of camps among other social gatherings. There is also an opportunity to harvest fish species such as Tilapia, cat fish, star fish as part of sport fishing especially when one decides to go fishing in the dam.

5.5.2 Access

At present communities use footpaths to cross the reserve. With the exception of the eastern section of the reserve continued access should be allowed to locals during the hours of daylight. Infringement could involve loss of community benefits.

5.5.3. Education and research

The reserve has excellent educational and research potential, which should be promoted.

5.5.4 Interpretation

The interpretative programme for the reserve should be designed specifically to orientate visitors towards the natural and economic values of the reserve but should also explain the value of biodiversity conservation generally for continued human development. An interpretative centre should eventually be built but in the meantime the meeting room at the site may be used.

The centre should include:

- A display outlining the work of WD, the location and type of reserve and the national importance of wildlife conservation;
- Photographs of fauna and flora;
- Well mounted taxidermic specimens;
- A display showing bird migration routes and the importance of wetlands;
- Information on the Ramsar Convention;
- A plaster relief map of the reserve showing points of interest;
- A display of useful wildlife species and their products e.g. medicinal plants, dyes, foodstuffs and the importance of these to local culture;
- A display of the water cycle and the importance of watershed protection;
- Visitor guide books and maps of the reserve etc.

Where possible local names should be used in displays and visitor guides in the Akan language as well as English should be developed.

5.6 Research and Monitoring

As a designated Ramsar site, monitoring and research are essential in the following areas

5.6.1 Flora

1. A detailed study of the aquatic vegetation on the lake should be performed to study succession patterns and implications for management.
2. Further study of the regeneration of the forest and the impact of wood cutting and the removal of saplings and fallen trees on the structure and dynamics of the forest is needed.
3. A study of optimal monkey habitats and preferred food plants to determine whether some protection of secondary forest stages would be required
4. The vegetation succession and diversity arising out of the elimination of *Cassia* plantation and potential impacts on water quality.

5.6.2 Fauna

1. Seasonal monitoring of bird species both resident and migratory.
2. Routine monitoring of fauna along previously established transects.

3. Determination of species richness, diversity and distribution of the butterflies and birds of the reserve as indicator species.
4. Determination of fish stocks in the Owabi Dam and their sustainable harvest levels for artisanal and recreational fishing.
5. Potential for captive breeding of grasscutter in the Owabi Wildlife Sanctuary/Ramsar Site.

5.6.3 Socio-Economic

1. An investigation into the energy use in the bead industry and prospects for improved products quality.

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APPENDICES

Appendix 1 : Positive and Negative Impacts by the Owabi Sanctuary, the Catchment Area and the Dam

Area	Positive Impact
Owabi dam	<ul style="list-style-type: none"> • Provides portable water • Contributes to fishing • Helps in the fertility of the soil for farming
Sanctuary	<ul style="list-style-type: none"> • Protection of trees, animals and dam • Tourist attraction sites e.g. wildlife sanctuary and Owabi dam • Trees serving as wind breaks
Water catchment area	<ul style="list-style-type: none"> • Land for farming and building
	Negative Impact
Community land	<ul style="list-style-type: none"> • Unavailability of land for affected landowning communities for development such as cemeteries, space for houses, schools • Closeness of catchment to the communities such as Esaase, Ohwim, Bokankye and Nwabi
Compensation	<ul style="list-style-type: none"> • Land acquired as Owabi Water Catchment area have not been compensated for by the Government
Livelihood	<ul style="list-style-type: none"> • Reduction in farm lands
NTFPs collection	<ul style="list-style-type: none"> • Restrictions on collection of fuelwood and other NTFPs
Fishing from the dam	<ul style="list-style-type: none"> • Community members have little or no fishing skills but being taken advantages by migrants from other regions
Monkeys in the forest	<ul style="list-style-type: none"> • Food Crops are attacked by monkeys on farms
Diseases	<ul style="list-style-type: none"> • The dam breeds mosquitoes and flies which infect with diseases • Lack of support for supply of drugs to the affected communities even when reported to GWCL • Air pollution - bad smells affecting breathing
Unemployment	<ul style="list-style-type: none"> • No employment of locals into GWCL and WD
Flooding	<ul style="list-style-type: none"> • Occasional flooding of the dam affects property of individuals including houses, farms and sometimes life is also lost
Criminal activities	<ul style="list-style-type: none"> • Inadequate security as armed robbers seek shelter in the catchment area to operate • People drop dead bodies in the forest
Relocation	<ul style="list-style-type: none"> • Relocation houses have not been built
Pipe-borne water	<ul style="list-style-type: none"> • No pipe-borne water in some communities
Payment of bill	<ul style="list-style-type: none"> • In spite of the acquisition of land for the dam and non-payment of compensation, there is still payment for the use of water by landowning communities where pipe-borne water have been provided

Source: RMSC Field Survey data, December 2013.

Appendix 2: Bird Spp. Observed during the Survey in 2013

Species Name	Scientific Name
African Emerald Cuckoo	<i>Chrysococcyx cupreus</i>
African Goshawk	<i>Accipiter tatchiro</i>
African Green Pigeon	<i>Treron calvus</i>
African Hobby	<i>Falco cuvieri</i>
African Jacana	<i>Actophilornis africana</i>
African Mustached Warbler	<i>Melocichla mentalis</i>
African Palm Swift	<i>Cypsiurus parvus</i>
African Paradise Flycatcher	<i>Terpsiphone viridis</i>
African Pied Wagtail	<i>Motacilla aguimp</i>
African Pigmy Goose	<i>Nettapus auritus</i>
African Pigmy Kingfisher	<i>Ceyx pictus</i>
Ahanta Francolin	<i>Francolinus ahantensis</i>
Bar-breasted Firefinch	<i>Lagonosticta rufopicta</i>
Barn Owl	<i>Tyto alba</i>
Bat Hawk	<i>Macheiramphus alcinus</i>
Black Crake	<i>Amaurormis flavirosta</i>
Black Cuckoo	<i>Cuculus clamosus</i>
Black Kite	<i>Milvus migrans</i>
Black-and-white Flycatcher	<i>Bias musicus</i>
Black-and-White Manikin	<i>Spermestes fusconotus</i>
Black-capped Apalis	<i>Apalis nigriceps</i>
Black-crowned Tchagra	<i>Tchaagra senegalus</i>
Black-headed Oriole	<i>Oriolus brachyrhynchus</i>
Black-necked Weaver	<i>Ploceus nigricollis</i>
Black-shouldered Kite	<i>Elumo caeruleus</i>

Black-throated Coucal	<i>Centropus leucogaster</i>
Black-winged Bishop	<i>Euplectes hordeaceus</i>
Black-winged Oriole	<i>Oriolus nigripennis</i>
Blue-billed Malimbe	<i>Malimbus nitens</i>
Blue-breasted Kingfisher	<i>Halcyon malimbus</i>
Blue-headed Wood Dove	<i>Turtur brehmeri</i>
Blue-spotted Wood Dove	<i>Turtur afer</i>
Blue-throated Brown Sunbird	<i>Cyanomitra cyanolaemus</i>
Broad-billed Roller	<i>Euystomus glaucurus</i>
Bronze Manikin	<i>Spermestes cuculatus</i>
Brown Illadopsis	<i>Illadopsis fulvescens</i>
Brown Sunbird	<i>Anthreptes gabonicus</i>
Brown-crowned Tchagra	<i>Tchagra australis</i>
Buff-spotted Woodpecker	<i>Campethera nivosa</i>
Buff-throated Sunbird	<i>Chalcomitra adelberti</i>
Cattle Egret	<i>Bubulcus ibis</i>
Chestnut Wattle-eye	<i>Dyaphorophya castanea</i>
Chestnut-breasted Negrofinch	<i>Nigrita bicolor</i>
Collared Sunbird	<i>Hedydipna collaris</i>
Common Fiscal Shrike	<i>Lanius collaris</i>
Common Garden Bulbul	<i>Pycnonotus barbatus</i>
Common House Martin	<i>Delichon urbicum</i>
Common Moorhen	<i>Gallinula chloropus</i>
Common Swift	<i>Apus apus</i>
Common Wattle-eye	<i>Platysteira cyanea</i>
Copper Sunbird	<i>Cinnyris cupreus</i>
Copper-tailed Glossy Starling	<i>Lamprotormis cupreocauda</i>

Croaking Cisticola	<i>Cisticola natalensis</i>
Didric Cuckoo	<i>Chrysococcyx cuprius</i>
Dusky Tit	<i>Parus funerus</i>
Dusky-blue Flycatcher	<i>Muscicapa comitata</i>
Fire-bellied Woodpecker	<i>Dendropicus pyrrhogaster</i>
Forest Robin	<i>Stiphromis erythrothorax</i>
Forest Scrub Robin	<i>Cercatrichus leucosticta</i>
Fraser's Forest Flycatcher	<i>Fraseria ocreata</i>
Fraser's Sunbird	<i>Deleornis fraseri</i>
Gabon Woodpecker	<i>Dendropicus gabonensis</i>
Giant Kingfisher	<i>Megaceryle maxima</i>
Great-spotted Cuckoo	<i>Clamator glandarius</i>
Green Crombec	<i>Sylvietta virens</i>
Green Hylia	<i>Hylia prasina</i>
Green Sunbird	<i>Anthreptes rectirostris</i>
Green Turaco	<i>Tauraco persa</i>
Green-backed Heron	<i>Butorides striata</i>
Green-headed Sunbird	<i>Cyanomitra verticalis</i>
Grey Heron	<i>Ardea cinerea</i>
Grey Longbill	<i>Macrosphermus concolor</i>
Grey-backed Camaroptera	<i>Camaroptera brachyura</i>
Grey-crowned Negrofinch	<i>Nigrita canicapillus</i>
Grey-headed Bristlebill	<i>Bleda canicapillus</i>
Grey-headed Sparrow	<i>Passer griseus</i>
Hairy-breasted Barbet	<i>Trachilaemus hirsuta</i>
Honeyguide Greenbul	<i>Baeopogon indicator</i>
Icterine Greenbul	<i>Phyllostrephus albigularis</i>

Kemp Longbill	<i>Macrosphenus kempii</i>
Klaas Cuckoo	<i>Chrysococcyx klaas</i>
Latham's Forest Francolin	<i>Francolinus lathamii</i>
Laughing Dove	<i>Streptopelia senegalensis</i>
Leaflove	<i>Pyrrhurus scandens</i>
Lesser-striped Swallow	<i>Cecropis albyssinica</i>
Levaillant's Cuckoo	<i>Oxylophus levaillantii</i>
Little Bittern	<i>Ixobrychus minutus</i>
Little Egret	<i>Egretta garzetta</i>
Little Grebe	<i>Tachybaptus ruficollis</i>
Little Greenbul	<i>Andropadus virens</i>
Lizard Buzzard	<i>Kaupifalco monogrammicus</i>
Long-tailed Comorant	<i>Phalacrocorax africanus</i>
Malachite Kingfisher	<i>Alcedo cristata</i>
Mosque Swallow	<i>Cecropis senegalensis</i>
Naked-faced Barbet	<i>Gymnobucco calvus</i>
Narina's Trogon	<i>Apoloderma narina</i>
Northern Puffback	<i>Dryoscopus gambensis</i>
Northern Red Bishop	<i>Euplectes franciscanus</i>
Olive Sunbird	<i>Cyanomitra olivacea</i>
Olive-bellied Sunbird	<i>Cinnyris chloropygius</i>
Olive-green Camaroptera	<i>Camaroptera chloronota</i>
Orange-cheeked Waxbill	<i>Estrilda melpoda</i>
Oriole Warbler	<i>Hypergerus atriceps</i>
Pale Flycatcher	<i>Melaenornis pallidus</i>
Pale-breasted Illadopsis	<i>Illadopsis rufipennis</i>
Pied Hornbill	<i>Tockus fasciatus</i>

Pied Kingfisher	<i>Ceryle rudis</i>
Purple Heron	<i>Ardea purpurea</i>
Purple Swamphen	<i>Porphyrio porphyrio</i>
Red-bellied Paradise Flycatcher	<i>Terpsiphone rufiventer</i>
Red-billed Helmetshrike	<i>Prionops canicaps</i>
Red-chested Cuckoo	<i>Cuculus solitarius</i>
Red-eyed Dove	<i>Streptopelia semitorquata</i>
Red-faced Cisticola	<i>Cisticola erythrops</i>
Red-fronted Parrot	<i>Poicephalus gulielmi</i>
Red-rumped Tinkerbird	<i>Pogoniulus atroflavus</i>
Red-thighed Sparrowhawk	<i>Accipiter erythropus</i>
Rufous-chested Swallow	<i>Cecropis semirufa</i>
Rufous-crowned Eremomela	<i>Eremomela bradiceps</i>
Rufous-sided Broadbill	<i>Smithornis rufolatoralis</i>
Sabine's Puffback	<i>Dryoscopus sabini</i>
Senegal Coucal	<i>Centropus senegalensis</i>
Sharpe's Apalis	<i>Apalis sharpii</i>
Shining Drongo	<i>Dicrurus atripennis</i>
Shining-blue Kingfisher	<i>Alcedo quadibrachys</i>
Simple Leaflove	<i>Chlorocichla simplex</i>
Singing Cisticola	<i>Cisticola cantans</i>
Slender-billed Greenbul	<i>Andropadus gracilirostris</i>
Snowy-crowned Robin Chat	<i>Cossypha niveicapilla</i>
Speckled Tinkerbird	<i>Pogoniulus scolopaceus</i>
Splendid Glossy Starling	<i>Lamprotormis splendidus</i>
Splendid Sunbird	<i>Cinnyris coccinigastrus</i>
Squacco Heron	<i>Ardeola ralloides</i>

Superb Sunbird	<i>Cinnyris superbus</i>
Swamp Palm Bulbul	<i>Thescelocichla leucopleura</i>
Tambourine Dove	<i>Turtur tympanistria</i>
Tawny-flanked Prinia	<i>Prinia subflava</i>
Tit Hylia	<i>Pholichornis rushiae</i>
Ussher's Flycatcher	<i>Muscicapa usheri</i>
Velvet-mantled Drongo	<i>Dicrurus modestus</i>
Vieillot's Black Weaver	<i>Ploceus nigerrimus</i>
Village Weaver	<i>Ploceus cuculatus</i>
Vinaceous Dove	<i>Streptopelia vinacea</i>
Violet Turaco	<i>Musophaga violacea</i>
Western Bearded Greenbul	<i>Criniger barbatus</i>
Western Bronze-naped Pigeon	<i>Columba iriditorques</i>
Western Nicator	<i>Nicator chloris</i>
White-breasted Negrofinch	<i>Nigrita fusconotus</i>
White-crested Hornbill	<i>Tropicranus albocristatus</i>
White-crested Tiger Heron	<i>Tigriornis leucolapha</i>
White-faced Whistling Duck	<i>Dendrocygna viduata</i>
White-spotted Flufftail	<i>Scrothrura pulchra</i>
White-tailed Alethe	<i>Alethe diademata</i>
White-throated Bee-eater	<i>Merops albicollis</i>
Woodland Kingfisher	<i>Halcyon senegalensis</i>
Yellow Wagtail	<i>Motacila flava</i>
Yellow White-eye	<i>Zosterops senegalensis</i>
Yellowbill	<i>Ceuthmochares aereus</i>
Yellow-billed Barbet	<i>Trachilaemus purpuratus</i>
Yellow-billed Kite	<i>Milvus migrans parasitus</i>

Yellow-billed Shrike	<i>Corvinella corvina</i>
Yellow-browed Camaroptera	<i>Camaroptera superciliaris</i>
Yellow-crowned Bishop	<i>Euplectes afer</i>
Yellow-mantled Weaver	<i>Ploceus tricolor</i>
Yellow-rumped Tinkerbird	<i>Pogoniulus subsulphureus</i>
Yellow-whiskered Greenbul	<i>Andropadus latirostris</i>

Appendix 3: Field Observation by Dowsett and Dowsett in 2005

Species Name	Scientific Name
African Green Pigeon	<i>Treron calvus</i>
African Jacana	<i>Actophilornis africana</i>
African Paradise Flycatcher	<i>Terpsiphone viridis</i>
African Pied Wagtail	<i>Motacilla aguimp</i>
Ahanta Francolin	<i>Francolinus achantensis</i>
Bam owl	<i>Tyto alba</i>
Barn Swallow	<i>Hirundo rustica</i>
Bat Hawk	<i>Macheiramphus alcinus</i>
Black Crake	<i>Amaurornis flavirostra</i>
Black-and-white Flycatcher	<i>Bias musicus</i>
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>
Black-necked Weaver	<i>Ploceus nigerrimus</i>
Black-throated Coucal	<i>Centropus leucogaster</i>
Black-winged Oriole	<i>Oriolus nigripennis</i>
Blue-breasted Kingfisher	<i>Halcyon malimbica</i>
Blue-headed Coucal	<i>Centropus monachus</i>
Blue-headed Roller	<i>Eurystomus gularis</i>
Blue-headed Wood Dove	<i>Turtur brehmeri</i>
Blue-spotted Wood Dove	<i>Turtur afer</i>
Blue-throated Brown Sunbird	<i>Nectarinia cyanolaema</i>
Bronze Mannikin	<i>Spermestes cucullata</i>
Brown Illadopsis	<i>Illadopsis fulvescens</i>
Buff-spotted Woodpecker	<i>Campethera nivosa</i>

Cameroon Sombre Greenbul	<i>Andropadus curvirostris</i>
Chestnut Wattle-eye	<i>Dyaphorophya castanea</i>
Chestnut-breasted Negrofinch	<i>Nigrita bicolor</i>
Collared Sunbird	<i>Anthreptes collaris</i>
Common Bulbul	<i>Pycnonotus barbatus</i>
Common Sandpiper	<i>Actitis hypoleucis</i>
Emerald Cuckoo	<i>Chrysococcyx cupreus</i>
Finsch's Flycatcher Thrush	<i>Stizorhina fraseri finschi</i>
Fire-crested Alethe	<i>Alethe diademata</i>
Fired-bellied Woodpecker	<i>Thriaspis pyrrhogaster</i>
Giant Kingfisher	<i>Megaceryle maxima</i>
Great Egret	<i>Egretta alba</i>
Green Crombee	<i>Sylvietta virens</i>
Green Hylia	<i>Hylia prasina</i>
Green-backed Heron	<i>Butorides striata</i>
Grey Heron	<i>Ardea cinera</i>
Grey-backed Camaroptera	<i>Camaroptera brachyuran</i>
Grey-crowned Negrofinch	<i>Nigrita canicapillus</i>
Grey-headed Bristlebill	<i>Bleda canicapillus</i>
Honeyguide Greenbul	<i>Baeopogon indicator</i>
Hooded Vulture	<i>Necrosyrtes monachus</i>
Latham's Forest Francolin	<i>Francolinus lathamii</i>
Lesser Honeyguide	<i>Indicator minor</i>
Lesser Striped Swallow	<i>Hirundi abyssinica</i>
Little Egret	<i>Egretta garzetta</i>

Little Greenbul	<i>Andropadus virens</i>
Little Grey Greenbul	<i>Andropadus gracilis</i>
Little Rush Warbler	<i>Bradypterus baboecala</i>
Lizard Buzzard	<i>Kaupifalco monogrammicus</i>
Long-tailed (Reed) Cormorant	<i>Phalacrocorax africanus</i>
Malachite Kingfisher	<i>Alcedo crsitata</i>
Marsh Tchagra	<i>Tchagra minutes</i>
Naked-faced Barbet	<i>Gymnobucco calvus</i>
Olive Sunbird	<i>Nectarinia olivacea</i>
Olive-bellied Sunbird	<i>Nectarinia chloropygia</i>
Olive-green Camaroptera	<i>Camaroptera chloronota</i>
Pied Crow	<i>Corvus albus</i>
Pied Hornbill	<i>Tockus fasciatus</i>
Purple Heron	<i>Ardea purpurea</i>
Purple Swamphen	<i>Porphyrio porphyrio</i>
Puvel's Illadopsis	<i>Illadopsis puveli</i>
Red-bellied Paradise Flycatcher	<i>Terpsiphone rufiventer</i>
Red-chested Owlet	<i>Glaucidium tephronotum</i>
Red-eyed Dove	<i>Streptopelia semitorquata</i>
Red-faced Cisticola	<i>Cisticola erythrops</i>
Red-rumped Tinkerbird	<i>Pogoniulus atroflavaus</i>
Shinning-blue Kingfisher	<i>Alcedo quadribrachys</i>
Simple Greenbul	<i>Chlorrocichla simplex</i>
Slender-billed Greenbul	<i>Andropadus gracilirostris</i>
Speckled Tinkerbird	<i>Porgoniulus scolopaceus</i>

Splendid Glossy Starling	<i>Lamprotornis splendidus</i>
Spotted Honeyguide	<i>Indicator maculatus</i>
Superb Sunbird	<i>Nectarinia superb</i>
Swamp Palm Bulbul	<i>Thescelocichla leucopleura</i>
Tambourine Dove	<i>Turtur tympanistrial</i>
Tit-hylia	<i>Pholidornis rushiae</i>
Velvet-mantled Drongo	<i>Dicrurus adsimilis</i>
Vieillot's Barbet	<i>Lybius vieilloti</i>
Western Bluebill	<i>Spermophaga haematina</i>
Western Nicator	<i>Nicator chloris</i>
Whistling Cisticola	<i>Cisticola lateralis</i>
White-crested Hornbill	<i>Tropicramus albocristatus</i>
White-faced Whistling Duck	<i>Dendrocygna viduata</i>
White-spotted Flufftail	<i>Sarothurara pulchra</i>
White-throated Bee-eater	<i>Merops albicollis</i>
White-troated Greenbul	<i>Phyllastrephus albigularis</i>
Woodland (Senegal) Kingfisher	<i>Halcyon senegalensis</i>
Yellowbill (Green Coucal)	<i>Ceuthmochares aereus</i>
Yellow-billed Kite	<i>Milvus migrans</i>
Yellow-billed Turaco	<i>Tauraco macrorhynchus</i>
Yellow-throated Thinkerbird	<i>Pogoniulus subsulphureus</i>
Yellow-whiskered Greenbull	<i>Andropadus latirostris</i>

Appendix 4: Field Observation by other Observers from 1988 - 2002

Species Name	Scientific Name
African Cuckoo Hawk	<i>Aviceda cuculoides</i>
African Finfoot	<i>Podica senegalensis</i>
African Harrier Hawk	<i>Polyboroides typus</i>
African Pygmy Goose	<i>Nettapus auristus</i>
Black-and-white Mannikin	<i>Spermestes bicolor</i>
Black-bellied Seedcracker	<i>Pyrenestes ostrinus</i>
Blue-headed Crested Flycatcher	<i>Trochocercus nitens</i>
Forest Robin	<i>Stiphornis erythrothorax</i>
Forest Scrub Robin	<i>Erythropygia leucosticte</i>
Great Blue Turaco	<i>Corythaeola cristata</i>
Grey Longhill	<i>Macrosphenus concolor</i>
Grey Parrot	<i>Psittacus erithacus</i>
N. Red-billed Helmet Shrike	<i>Prionops caniceps</i>
Nkulengu Rail	<i>Himantornis haematopus</i>
Palm-nut Vulture	<i>gypohierax angolensis</i>
Pied Kingfisher	<i>Ceryle rudis</i>
Piping Hornbill	<i>Bycanistes fistulator</i>
Rafous-chested Swallow	<i>Hirundo semirufa</i>
Red-tailed Greenbul	<i>Criniger calurus</i>
Squacco Heron	<i>Ardeola ralloides</i>
W. Bearded Greenbul	<i>Criniger barbatus</i>
White-crested Tiger heron	<i>Tigriornis leucolopha</i>

Appendix 5: Individual Bird Species Observations between 1988 - 2013

	1988	1990	1994	1995	2001	2002	2005	2013	Grand Total
African Cuckoo Hawk					1				1
African Emerald Cuckoo								1	1
African Finfoot						1			1
African Goshawk								1	1
African Green Pigeon							1	1	2
African Harrier Hawk		1							1
African Hobby								1	1
African Jacana							1	1	2
African Mustached Warbler								1	1
African Palm Swift								1	1
African Paradise Flycatcher							1	1	2
African Pied Wagtail							1	1	2
African Pigmy Goose		1						1	2
African Pigmy Kingfisher								1	1
Ahanta Francolin							1	1	2
Barn owl							1	1	2
Bar-breasted Firefinch								1	1
Barn Swallow							1		1
Bat Hawk							1	1	2
Black Crake							1	1	2
Black Cuckoo								1	1
Black Kite								1	1
Black-and-white Flycatcher							1	1	2
Black-and-White Manikin						1		1	2
Black-bellied Seed Cracker		1							1

Black-capped Apalis								1	1	
Black-crowned Night Heron								1	1	
Black-crowned Tchagra								1	1	
Black-headed Oriole								1	1	
Black-necked Weaver								1	1	2
Black-shouldered Kite								1	1	
Black-throated Coucal								1	1	2
Black-winged Bishop								1	1	
Black-winged Oriole								1	1	2
Blue-billed Malimbe								1	1	
Blue-breasted Kingfisher								1	1	2
Blue-headed Coucal								1		1
Blue-headed Crested Flycatcher							1			1
Blue-headed Roller								1		1
Blue-headed Wood Dove								1	1	2
Blue-spotted Wood Dove								1	1	2
Blue-throated Brown Sunbird								1	1	2
Broad-billed Roller									1	1
Bronze Manikin								1	1	2
Brown Illadopsis								1	1	2
Brown Sunbird									1	1
Brown-crowned Tchagra									1	1
Buff-spotted Woodpecker								1	1	2
Buff-throated Sunbird									1	1
Cameroon Sombre Greenbul								1		1
Cattle Egret									1	1
Chestnut Wattle-eye								1	1	2

Chestnut-breasted Negrofinch							1	1	2
Collared Sunbird							1	1	2
Common Bulbul							1		1
Common Fiscal Shrike								1	1
Common Garden Bulbul								1	1
Common House Martin								1	1
Common Moorhen								1	1
Common Sandpiper							1		1
Common Swift								1	1
Common Wattle-eye								1	1
Copper Sunbird								1	1
Copper-tailed Glossy Starling								1	1
Croaking Cisticola								1	1
Didric Cuckoo								1	1
Dusky Tit								1	1
Dusky-blue Flycatcher								1	1
Emerald Cuckoo							1		1
Finsch's Flycatcher Thrush							1		1
Fire-bellied Woodpecker								1	1
Fire-crested Alethe							1		1
Fired-bellied Woodpecker							1		1
Forest Robin						1		1	2
Forest Scrub Robin				1				1	2
Fraser's Forest Flycatcher								1	1
Fraser's Sunbird								1	1
Gabon Woodpecker								1	1
Giant Kingfisher							1	1	2

Great Blue Turaco						1			1
Great Egret							1		1
Great-spotted Cuckoo								1	1
Green Crombec							1	1	2
Green Hylia							1	1	2
Green Sunbird								1	1
Green Turaco								1	1
Green-backed Heron							1	1	2
Green-headed Sunbird								1	1
Grey Heron							1	1	2
Grey Longbill						1		1	2
Grey Parrot	1								1
Grey-backed Camaroptera							1	1	2
Grey-crowned Negrofinch							1	1	2
Grey-headed Bristlebill							1	1	2
Grey-headed Sparrow								1	1
Hairy-breasted Barbet								1	1
Honeyguide Greenbul							1	1	2
Hooded Vulture							1		1
Icterine Greenbul								1	1
Kemp Longbill								1	1
Klaas Cuckoo								1	1
Latham's Forest Francolin							1	1	2
Laughing Dove								1	1
Leaflove								1	1
Lesser Honeyguide							1		1
Lesser Striped Swallow							1	1	2

Levaillant's Cuckoo								1	1
Little Bittern								1	1
Little Egret							1	1	2
Little Grebe								1	1
Little Greenbul							1	1	2
Little Grey Greenbul							1		1
Little Rush Warbler							1		1
Lizard Buzzard							1	1	2
Long-tailed (Reed) Cormorant							1	1	2
Malachite Kingfisher							1	1	2
Marsh Tchagra							1		1
Mosque Swallow								1	1
N. Red-billed Helmet Shrike						1			1
Naked-faced Barbet							1	1	2
Narina's Trogon								1	1
Nkulengu Rail						1			1
Northern Puffback								1	1
Northern Red Bishop								1	1
Olive Sunbird							1	1	2
Olive-bellied Sunbird							1	1	2
Olive-green Camaroptera							1	1	2
Orange-cheeked Waxbill								1	1
Oriole Warbler								1	1
Pale Flycatcher								1	1
Pale-breasted Illadopsis								1	1
Palm-nut Vulture		1							1
Pied Crow								1	1

Pied Hornbill							1	1	2
Pied Kingfisher						1		1	2
Piping Hornbill	1								1
Purple Heron							1	1	2
Purple Swampphen							1	1	2
Puvel's Illadopsis							1		1
Rafous-chested Swallow					1				1
Red-bellied Paradise Flycatcher							1	1	2
Red-billed Helmetshrike								1	1
Red-chested Cuckoo								1	1
Red-chested Owlet							1		1
Red-eyed Dove							1	1	2
Red-faced Cisticola							1	1	2
Red-fronted Parrot								1	1
Red-rumped Tinkerbird							1	1	2
Red-tailed Greenbul						1			1
Red-thighed Sparrowhawk								1	1
Rufous-chested Swallow								1	1
Rufous-crowned Eremomela								1	1
Rufous-sided Broadbill								1	1
Sabine's Puffback								1	1
Senegal Coucal								1	1
Sharpe's Apalis								1	1
Shining Drongo								1	1
Shining-blue Kingfisher							1	1	2
Simple Greenbul							1		1
Simple Leaflove								1	1

Singing Cisticola								1	1
Slender-billed Greenbul							1	1	2
Snowy-crowned Robin Chat								1	1
Speckled Tinkerbird							1	1	2
Splendid Glossy Starling							1	1	2
Splendid Sunbird								1	1
Spotted Honeyguide							1		1
Squacco Heron			1					1	2
Superb Sunbird							1	1	2
Swamp Palm Bulbul							1	1	2
Tambourine Dove							1	1	2
Tawny-flanked Prinia								1	1
Tit Hylia							1	1	2
Ussher's Flycatcher								1	1
Velvet-mantled Drongo							1	1	2
Vieillot's Barbet							1		1
Vieillot's Black Weaver								1	1
Village Weaver								1	1
Vinaceous Dove								1	1
Violet Turaco								1	1
Western Bearded Greenbul						1		1	2
Western Bluebill							1		1
Western Bronze-naped Pigeon								1	1
Western Nicator							1	1	2
Whistling Cisticola							1		1
White-breasted Negrofinch								1	1
White-crested Hornbill							1	1	2

White-crested Tiger Heron			1					1	2
White-faced Whistling Duck							1	1	2
White-spotted Flufftail							1	1	2
White-tailed Alethe								1	1
White-throated Bee-eater							1	1	2
White-throated Greenbul							1		1
Woodland Kingfisher							1	1	2
Yellow Wagtail								1	1
Yellow White-eye								1	1
Yellowbill							1	1	2
Yellow-billed Barbet								1	1
Yellow-billed Kite							1	1	2
Yellow-billed Shrike								1	1
Yellow-billed Turaco							1		1
Yellow-browed Camaroptera								1	1
Yellow-crowned Bishop								1	1
Yellow-mantled Weaver								1	1
Yellow-rumped Tinkerbird								1	1
Yellow-throated Thinkerbird							1		1
Yellow-whiskered Greenbul							1	1	2
Grand Total	2	4	2	1	2	11	95	166	283

Appendix 6: List of Mammals Recorded during the Survey

COMMON NAME	SCIENTIFIC NAME
Mona Monkey	<i>Cercopithecus mona lowei</i>
Bushbuck	<i>Tragelaprus scriptus</i>
Black Duiker	<i>Cephalophus niger</i>
Maxwell's Duiker	<i>Cephalophus maxwelli</i>
Bay Duiker	<i>Cephalophus dorsalis</i>
Royal Antelope	<i>Neotragus pygmaeus</i>
Tree Hyrax	<i>Dendrohyrax arboreus</i>
Brush-tailed Porcupine	<i>Artherurus africanus</i>
Giant Pouched Rat	<i>Cricetomys gambianus</i>
Giant Forest Squirrel	<i>Protoxerus stangeri</i>
Grasscutter	<i>Thryonomys swinderianus</i>
Tree Pangolin	<i>Manis tricuspis</i>
African Civet	<i>Civettictis civetta</i>
Palm Civet	<i>Nandinia binotata</i>
Cusimanse Mongoose	<i>Crossarchus obscurus</i>
Marsh Mongoose	<i>Artilax paludinosus</i>

Appendix 7: Reptiles Recorded

Python	<i>Python sebae</i>
Common Hinged Tortoise	<i>Kinixys spp.</i>

Appendix 8: List of Floral Species identified during the Field Survey

<i>Scientific Name</i>	Local Name	Family	Star Rating	Guild	Habit	Frequency
<i>Acacia pentagona</i>	Nwene	Mimosaceae	Green	NPLD	Liana	2
<i>Afromomum stanfieldii</i>	Sensam	Zmigeraceae	Blue	Pioneer	Herb	3
<i>Alafia bartarai</i>		Apocynaceae	Green	NPLD	Climber	4
<i>Albizia adianthifolia</i>	Pampena	Mimosaceae	Green	NPLD	Tree	7
<i>Albizia ferruginea</i>	Awiemfosamina	Mimosaceae	Scarlet	NPLD	Tree	3
<i>Albizia zygia</i>	Okoro/ Okorosante	Mimosaceae	Green	NPLD	Tree	34
<i>Alchornea cordifolia</i>	Gyama				Shrub	4
<i>Alstonia boonei</i>	Nyamedua/ Sinuro	Apocynaceae	Green	Pioneer	Tree	20
<i>Amphimas pterocarpoides</i>	Yaya	Caesalpiniaceae	Green	NPLD	Tree	8
<i>Anchomanis deformis</i>	Ope				Herb	1
<i>Aningeria altissima</i>	Asamfena-Bere	Sapotaceae	Green	NPLD	Tree	2
<i>Anthonotha macrophylla</i>	Totoro	Caesalpiniaceae	Blue	Shade bearing	Tree	9
<i>Antiaris toxicaria</i>	Kyenkyen	Moraceae	Red	NPLD	Tree	16
<i>Ataenodea conterta</i>	Ntentrema	Annonaceae	Green	Pioneer	Grass	11
<i>Bambusa vulgaris</i>	Mpampro	Graminae	Green	Swamp	Tree	6
<i>Baphia nitida</i>	Odwen	Papilionaceae	Green	Shade bearing	Tree	61
<i>Baphia pubescens</i>	Odwen-kobiri	Papilionaceae	Green	Pioneer	Tree	3
<i>Blighia sapida</i>	Akye	Sapindaceae	Green	NPLD	Tree	23
<i>Blighia welwitschii</i>	Akyekobiri	Sapindaceae	Green	NPLD	Tree	1
<i>Bombax buonopoze</i>	Akata	Bombacaceae	Green	Pioneer	Tree	2
<i>Bridelia atroviridis</i>	Opamkotokrodu	Euphorbiaceae	Green	Pioneer	Tree	1
<i>Bussea occidentalis</i>	Kotoprepre	Legumimoceae	Green	NPLD	Tree	3
<i>Calpocalyx brevibracteatus</i>	Atotre	Legumimoceae	Green	Shade bearing	Tree	3
<i>Calycobolus africanus</i>	Mutwo	Convolvulaceae	Green		Liana	4
<i>Carapa procera</i>	Kwakuobese	Meliaceae	Green	Shade bearing	Tree	3
<i>Carpolobia lutea</i>	Ofewa	Polygalaceae	Green	Shade bearing	shrub	1
<i>Cassia siamea</i>	Cassia	Legumimoceae	Green		Tree	58

<i>Cedrella odorata</i>	Cedrella	Meliaceae	Green	Non Forest	Tree	64
<i>Ceiba pentadra</i>	Onyina	Bombacaceae	Red	Pioneer	Tree	17
<i>Ceiba pentandra</i>	Onyina	Mimosaceae	Green	NPLD	Tree	1
<i>Celtis mildbraedii</i>	Esa	Ulmaceae	Pink	Shade bearing	Tree	24
<i>Celtis zenkeri</i>	Esakokoo	Ulmaceae	Pink	NPLD	Tree	2
<i>Cercestis afzelii</i>	Matatwene	Araceae	Green	Shade bearing		6
<i>Chromolina odorata</i>	Acheampong				Herb	3
<i>Chrysophyllum pruniforme</i>	Duatadwe	Sapotaceae	Pink	Shade bearing	Tree	1
<i>Cleistopholis patens</i>	Ngonenkyene	Annonaceae	Green	Pioneer	Tree	2
<i>Cola caricifolia</i>	Ananseaya	Sterculiaceae	Green	Pioneer	Tree	11
<i>Cola gigantea</i>	Watapuo	Sterculiaceae	Green	NPLD	Tree	16
<i>Cola nitida</i>	Bese	Sterculiaceae	Pink	Shade bearing	Tree	2
<i>Combretodendron macrocarpum</i>		Lecythidaceae	Green			18
<i>Combretum bipnideuse</i>	Esum ne hyen	Combretaceae	Blue		Liana	1
<i>Combretum spp</i>	Hweremo	Combretaceae	Green		climber	3
<i>Culcasia angolensis</i>		Araceae	Green	NPLD	Herb	5
<i>Dalbergia lactea</i>	Homakyem	Papilionaceae	Green	NPLD	Liana	4
<i>Daniella ogea</i>	Hyedua	Caesalpiniaceae	Red	Pioneer	Tree	1
<i>Daniella thurifera</i>	Sopi	Leguminoceae	Red	Pioneer	Tree	2
<i>Dioclea reflexa</i>	Toasohoma	Papilionaceae	Green	Pioneer	climber	26
<i>Dioscoreophyllum cumminsii</i>	Ahabayere	Menispermaceae	Pink		climber	2
<i>Discoglyprena caloneura</i>	fetefre	Euphorbiaceae	Green	NPLD	Tree	3
<i>Distemonanthus benthamianus</i>	Bonsamdua	Caesalpiniaceae	Red	NPLD	Tree	1
<i>Dombeya buettneri</i>	MFo				Shrub	2
<i>Dracaena mannii</i>	Kesene	Agavaceae			shrub	1
<i>Elaeis guineensis</i>	Abe	Palmae	Pink	Pioneer	Tree	63
<i>Emtandrophragma utile</i>	Efrobodedwo	Meliaceae	Scarlet	NPLD	Tree	1
<i>Entandrophragma angolense</i>	Edinam	Meliaceae	Scarlet	NPLD	Tree	11
<i>Eremospatha hookeri</i>	Mfea	Palmae	Pink		Liana	2
<i>Euphorbia heterophyllo</i>	Adankomilk				Herb	1

<i>Ficus exasperata</i>	Nyankyerenee	Moraceae	Green	Shade bearing	Tree	12
<i>Funtumia elastica</i>	Funtum	Apocynaceae	Others	Shade bearing	Tree	53
<i>Glyphaea brevis</i>	Foto	Malvaceae	Green			3
<i>Gmelina arborea</i>	Gmelina	Verbenaceae	Green	Non-Forest Tree	Tree	1
<i>Griffonia simplicifolia</i>	Kagya	Caesalpiniaceae	Green	NPLD	shrub	45
<i>Hannoa klaineana</i>	Fotie	Simoroubaceae	Green	Pioneer	Tree	2
<i>Heinsia crinta</i>	Dwindwiraa	Sapindaceae	Green	Shade bearing	Tree	2
<i>Holarrhena floribunda</i>	Sese	Apocynaceae	Green	Pioneer	Tree	2
<i>Holeptera grandis</i>	Nakwa	Ulmaceae	Green	Pioneer	Tree	1
<i>Hymenostegia afzelii</i>	Takorowa	Caesalpiniaceae				1
<i>Hypoetas velicillars</i>					Shrub	1
<i>Imperata cylindrica</i>	Aberewasekan				Grass	1
<i>Iodes liberiea</i>					Climber	1
<i>Kigelia africana</i>	Nufuten	Bignoniaceae	Green	NPLD	Tree	10
<i>Lacosperma opacum</i>	Eyie	Palmae	Pink	NPLD	climber	3
<i>Landolphia hirsute</i>	Agyamaa	Apocynaceae	Green	NPLD	Climber	3
<i>Lannea welwitschii</i>	Kumanini	Anacardiaceae	Green	Pioneer	Tree	7
<i>Lcacalna manii</i>					Climber	1
<i>Lecaniodiscus cupanioides</i>	Dwindwiraa	Sapindaceae	Green	Shade bearing	Tree	4
<i>Lonchocarpus sericus</i>	Sante	Papilionaceae	Green	NPLD	Tree	5
<i>Maesopsis eminii</i>	Owamdua	Rhamnaceae	Green	Pioneer	Tree	2
<i>Mallotus oppositifolius</i>	Nyananforawa	Euphorbiaceae	Green	Shade-bearing	Shrub	6
<i>Mallotus oppositifolus</i>	Anyanyanforowa	Euphorbiaceae	Green	Shade bearing	Tree	1
<i>Maniophyton fulvum</i>	Nhuwuhawu	Euphorbiaceae	Green	NPLD	Herb	2
<i>Maramtochloa congensis</i>	Nkonkon sibire	Maranthaceae	Green	Pioneer	Shrub	4
<i>Maramtochloa leucantha</i>	Sibire				Herb	6
<i>Maranlochloa congensis</i>	Konkonsibire	Marantaceae	Green	Pioneer		1
<i>Maranthochloa leucantha</i>	Sibire	Bignoniaceae	Green	Pioneer	Tree	2
<i>Mareya micrantha</i>	Dubrafo	Euphorbiaceae	Green	Shade bearing	Tree	2
<i>Margaritaria discoidea</i>	Papea	Euphorbiaceae	Green	Pioneer	Tree	3

<i>Massularia acuminata</i>	Pobe	Myristicaceae	Pink	NPLD	Tree	2
<i>Microdesmis puberula</i>	Ofema	Papilionaceae	Green	Shade bearing	Tree	7
<i>Miiletia chrysophylla</i>	Sahoma	Mimosaceae	Green	NPLD	climber	20
<i>Milicia excelsa</i>	Odum	Moraceae	Scarlet	Pioneer	Tree	10
<i>Morinda lucida</i>	Konkroma	Rubiaceae	Green	Pioneer	Tree	1
<i>Morus mesozygia</i>	Wonton	Rubiaceae	Green	Pioneer	Tree	4
<i>Musanga cecropiodes</i>	Odwuma	Cecropiaceae	Green	Pioneer	Tree	3
<i>Myrianthus arboreus</i>	Nyankoma	Moraceae	Green	Shade bearing	Tree	13
<i>Napoleonaea vogelii</i>	Obuaa	Lecythidaceae	Green	Shade bearing	Tree	2
<i>Nauclea diderrichii</i>	Kusia	Rubiaceae	Scarlet	Pioneer	Tree	2
<i>Nesogordonia papaver</i>	Danta	Sterculiaceae	Pink	Shade bearing	Tree	1
<i>Nesogordonia papaverifera</i>	Danta	Sterculiaceae	Pink	Shade bearing	Tree	3
<i>Newbouldia laevis</i>	Sesemasa	Bignoniaceae	Green	Pioneer	Tree	7
<i>Ocimum caruam</i>	Numum				Herb	1
<i>Olyra latifolia</i>	Droben	Graminae	Green	Shade bearing	climber	10
<i>Paullina pinnata</i>	Toantini	Meliaceae	Green	NPLD	climber	10
<i>Paullinia Piñata</i>	Twentini	Sapindaceae	Green	Pioneer	Climber	3
<i>Penianthus spp</i>	Kramankote	Memispermaceae	Green	Shade bearing	shrub	8
<i>Petersianthus macrocarpum</i>	Esia	Lecythidaceae	Red	Pioneer	Tree	2
<i>Phyllanthus muellerianus</i>	Awobe/Babadua	Euphorbiaceae	Green	Pioneer	climber	7
<i>Piper guineensis</i>	Surowisa	Bignoniaceae	Green	Pioneer	Tree	5
<i>Piper umbellatum</i>	Amumuahan	Piperaceae	Green	Climber	Herb	5
<i>Piptadeniastrum africanum</i>	Dahoma	Mimosaceae	Pink	NPLD	Tree	41
<i>Pissonia aculeata</i>	Akobowire	Nyctaginaceae	Green	Pioneer	Liana	1
<i>Portulaca quadrifida</i>	Nyamenwuansanam				Herb	7
<i>Pouteria aningeria</i>	Asanfena	Sapotaceae	Red		Tree	1
<i>Pseudospondias microcarpa</i>	Akatawani	Anacardiaceae	Green	Swamp	Tree	20
<i>Psydrax subcorda</i>	Tetiadupon	Rubiaceae	Green	Pioneer	Tree	1
<i>Pterygota macrocarpa</i>	kyeree/Koto	Sterculiaceae	Scarlet	NPLD	Tree	7
<i>Pycnanthus angolensis</i>	Otie	Myristicaceae	Red	NPLD	Tree	37

<i>Pycnocomma macrophylla</i>	Akobowire	Nyctaginaceae	Green	Pioneer	Liana	2
<i>Raphia hookeri</i>	Adobe	Palmae	Green	Swamp	Tree	7
<i>Rauvolfia vomitoria</i>	Kakapenpen	Apocynaceae	Green	Pioneer	Tree	1
<i>Ricinodendron heudelotii</i>	Wama	Euphorbiaceae	Green	Pioneer	Tree	2
<i>Rionrea spp</i>	Aposee	Violaceae	Green	Shade-bearing	Shrub	7
<i>Rottbeellia exaltata</i>	Nkyenkyemaa				Grass	2
<i>Salacia africana</i>	Nnoto	Annonaceae	Green	Pioneer	Grass	4
<i>Salacia spp</i>	Ntwea	Celastraceae				3
<i>Salanum nigum</i>	Konsusua				Herb	3
<i>Sarcophrynuim dracystachys</i>	Anwononionua	Maranthaceae	Green	Shade-bearing	Herb	2
<i>Secamone afzilea</i>	Kwatemaa	Asclepiadaceae	Green	Shade-bearing	Climber	1
<i>Sida acuta</i>	Tweta				Herb	8
<i>Smilax krassiana</i>	Kokora	Smilacaceae	Green	Pioneer	climber	17
<i>Sphenocentrum jollyanum</i>	Kramankote	Violaceae	Green	Shade-bearing	Shrub	2
<i>Sterculia tragacantha</i>	Sofo	Sterculiaceae	Green	Pioneer	Tree	10
<i>Strychnos aculeate</i>	Panwe	Loganiaceae	Green	Pioneer	Climber	2
<i>Terminalia ivorensis</i>	Emire	Combretaceae	Pink	Pioneer	Tree	11
<i>Terminalia superba</i>	Ofram	Combretaceae	Red	Pioneer	Tree	31
<i>Tetrapleura tetraptera</i>	Prekese	Legumimoceae	Green	Pioneer	Tree	1
<i>Tetrochiduiim didynonstemon</i>	Anenedua	Euphorbiaceae	Green	Pioneer	Tree	1
<i>Thaumatococcus daniellii</i>	Awonomoo	Marantaceae	Red	Pioneer	Herb	8
<i>Trichilia monadelpha</i>	Tanuro	Meliaceae	Pink	NPLD	Tree	48
<i>Trichilia priureana</i>	Kakadukro	Meliaceae	Green	NPLD	Tree	4
<i>Trilepisium madagascariense</i>	Okure	Moraceae	Green	NPLD	Tree	10
<i>Triplochiton scleroxylon</i>	Wawa	Sterculiaceae	Scarlet	Pioneer	Tree	54
<i>Vitex grandifolia</i>	Dinsinkro	Verbenaceae	Blue	Shade bearing	Tree	1
<i>xylia evansii</i>	Samantawa	Mimosaceae	Blue	NPLD	Tree	2
Total						1261

Appendix 9: Regeneration

Species	Local Name	Family	Star Rating	Species Guild	Frequency
<i>Albizia adianthifolia</i>	Pampena	Mimosaceae	Green	NPLD	1
<i>Albizia ferruginea</i>	Awiefosamina	Mimosaceae	scarlet	NPLD	2
<i>Albizia zygia</i>	Okoro	Mimosaceae	Green	NPLD	9
<i>Alstonia boonei</i>	Nyamedua	Apocynaceae	Green	Pioneer	7
<i>Amphimas</i>	Yaya	Caesalpiniaceae	Green	NPLD	1
<i>Antiaris toxicaria</i>	Kyenkyen	Moraceae	Red	NPLD	1
<i>Baphia nitida</i>	Odwene	Papilionaceae	Green	Shade bearing	5
<i>Baphia pubescens</i>	Odwen-kobiri	Legumimoceae	Green	Pioneer	1
<i>Blighia sapida</i>	Akye	Sapindaceae	Green	NPLD	6
<i>Cassia siamea</i>	Cassia	Legumimoceae	Green	Unknown	17
<i>Cedrella odorata</i>	Cedrella	Meliaceae	Green	Unknown	5
<i>Ceiba pentadra</i>	Onyina	Bombacaceae	Red	Pioneer	2
<i>Celtis mildbraedii</i>	Esa	Ulmaceae	Pink	Shade bearing	2
<i>Celtis zenkeri</i>	Esakokoo	Ulmaceae	Pink	NPLD	1
<i>Cola caricifolia</i>	Ananseaya	Sterculiaceae	Green	Pioneer	1
<i>Cola gingatea</i>	Watapuo	Sterculiaceae	Green	NPLD	3
<i>Combretodendron</i>	Asia	Lecythidaceae	Green	Unknown	7
<i>Discoglyprena</i>	fetefre	Euphorbiaceae	Green	NPLD	2
<i>Distemonanthus</i>	Bonsamdua	Caesalpiniaceae	Pink	NPLD	1
<i>Elaeise guineensis</i>	Abe	Palmae	Pink	Pioneer	34
<i>Entandrophragma angolense</i>	Edinam	Meliaceae	Red	NPLD	1
<i>Ficus exasperata</i>	Nyankomanini	Moraceae	Green	Shade bearing	2
<i>Funtumia elastica</i>	Funtum	Apocynaceae	Others	Unknown	10
<i>Glyphaea brevis</i>	Foto	Malvaceae	Green	Unknown	1
<i>Heinsia crinta</i>	Dwindwiraa	Sapindaceae	Green	Shade bearing	2
<i>Holarrhena floribunda</i>	Sese	Apocynaceae	Green	Pioneer	2
<i>Lonchocarpus sericus</i>	Sante	Papilionaceae	Green	NPLD	2
<i>Maesopsis eminii</i>	Owamdua	Rhamnaceae	Green	Pioneer	2
<i>Margaritaria discoidea</i>	Papea	Euphorbiaceae	Green	Pioneer	1
<i>Milicia excelsa</i>	Odum	Moraceae	scarlet	Pioneer	2
<i>Morinda lucida</i>	Konkroma	Rubiaceae	Green	Pioneer	1
<i>Nauclea diderrichii</i>	Kusia	Rubiaceae	scarlet	Pioneer	1
<i>Nesogordonia papaver</i>	Danta	Sterculiaceae	Pink	Shadebearing	1
<i>Piptadeniastrum african</i>	Dahoma	Mimosaceae	Pink	NPLD	5
<i>Pouteria aningeria</i>	Asanfena	Sapotaceae	Red	Unknown	1
<i>Pseudospondias micro</i>	Akatawani	Anacardiaceae	Green	Swamp	3
<i>Psydrax subcorda</i>	Tetiadupon	Rubiaceae	Green	Pioneer	1
<i>Pycnanthus angolensis</i>	Otie	Myristicaceae	Pink	NPLD	2

Ricinodendron heudelotii	Wama	Euphorbiaceae	Green	Pioneer	2
Sterculia tragacantha	sofo	Sterculiaceae	Green	Pioneer	1
Terminalia ivorensis	Emire	Combretaceae	Pink	Pioneer	1
Terminalia superba	Ofram	Combretaceae	Pink	Pioneer	2
Trichilia monadelpha	Tanuro	Meliaceae	Pink	NPLD	10
Trilepisium	Okure	Moraceae	Green	NPLD	2
Triplochiton scleroxylon	Wawa	Sterculiaceae	scarlet	Pioneer	6
Total					172