Barina Swamp Conservation Action Plan

(Draft)

Compiled by Moses Odhiambo and Martha Mutiso

March 2017

List of acronyms

APTDC: African Pro-poor Tourism Development Centre

CEPA: Communications, Education and Public Awareness

EMCA: Environmental Management and Coordination Act

GIS: Geographical Information System

NEMA: National Environmental Management Authority

NMK: National Museums of Kenya

RSG: Rufford Small Grants for Nature Conservation

UNESCO: United Nations Educational, Scientific and Cultural Organization

WCK: Wildlife Clubs of Kenya

Foreword

Sawaiti (Barina swamp; Majani mingi swamp) is a series of wetlands found in Mogotio town, North Rift of Kenya. The wetland covers an area of 320 acres and borders the protected Lake Bogoria National Reserve, a World Heritage site by the United Nations Educational, Scientific and Cultural Organization (UNESCO). It therefore plays a role as a refuge and corridor for migrants and other species from Lake Bogoria and is also a buffer zone for the larger protected wetland. The wetland faces a myriad of environmental challenges from anthropogenic activities and climatic conditions. Land fragmentation, change of land use, over grazing, pollution and climate change owing to the Ecosystem services it provides. These services are under threat as there is more pressure from the community due to perception and negative attitude of wetlands as "wastelands" leading to a disregard of the ecological and socio-economic benefits. After working around the wetland for over five years, the community is moving in the right direction in terms of sustainable conservation and ecotourism activities around the wetland. What lacks is an official protection of the wetland. This wetland action plan proposes potential conservation strategies which will aid in identifying, understanding, managing and enjoying one of the most versatile natural heritages of Mogotio. It also offers a comprehensive look at the wetland and the future conservation needs. The plan identifies issues that are unresolved and the limitations on wetland data and science.

Table of Content

EXECUTIVE SUMMARY

INTRODUCTION

Barina's comprehensive wetland conservation plan provides focused strategy for identifying, understanding, managing and enjoying one of the most versatile natural heritages of Mogotio. The conservation plan offers a comprehensive look at Barina Wetland and the future conservation needs. The plan identifies issues that are unresolved and the limitations on wetland data and science.

The need for a site plan strategy lies in the recognition that Barina wetland conservation and management are a shared responsibilities among local, county and regional agencies as well as conservation organizations, private corporations, land owners, and other interest groups. Individually no agency or group has been given either the exclusive mandate or resources adequate enough to protect the wetland. The conservation and management of Barina will be accomplished only through cooperative and contained efforts of all these groups and individuals.

The plan emphasizes that through discussion, information exchange, cooperation and sharing of resources, a coordinated approach to wetland management can be accomplished. The plan recognizes that without willingness and cooperation from private land owners there is little hope of long term success for the wetland protection. The plan promotes a voluntary approach to wetland management that uses education, technical assistance and incentives to bring the private sector into wetland management as a willing partner.

"The goal of the Mogotio community is to conserve, enhance and restore the quantity and biological diversity of the wetland".

The importance and functions of Barina wetland management planning process

To identify the objectives of site management

This is the single most important function of the planning process. It is essential that management objectives be defined for each important feature of the ecological character of the site and for all other important features related to the functions and values of the site, including socio-economic, cultural and educational values. In other words, those responsible for developing the management plan must be clear about what they are trying to achieve.

To identify the factors that affect, or may affect the features

The ability to achieve wise use and conservation objectives for wetlands will always be influenced to some extent by a number of factors, including trends, constraints and obligations, in fact anything that has influenced, is influencing, or may influence the features of the site for which objectives are set. It is essential that all the important factors should be identified, and that their impact on the site, particularly on the features of its ecological character, be considered. For the most significant factors, it may be necessary to undertake Environmental Impact Assessments (EIA) as part of the planning process.

To resolve conflicts

On most sites, there will be some conflicts of interest and difficulty in identifying priorities. It is essential that the planning process should be recognized as a forum for resolving conflicts and establishing commitments for the future.

To define the monitoring requirements

A function of monitoring, in the context of management planning, is to measure the effectiveness of management. It is essential to know, and to be able to demonstrate to others, that the objectives are being achieved. Thus, monitoring must be recognized as an integral component of management and planning. It should be designed to identify and manage change in ecological character of the site

To identify and describe the management required to achieve the objectives

In most cases where habitats or species require safeguarding, some action, i.e. management, will be necessary. Having established that a plan identifies the objectives of management, it follows that it must also identify, describe, and estimate the cost of the action required.

To maintain continuity of effective management

Continuity of effective management and monitoring is essential. Management processes must be adapted to meet a wide range of varying factors. Although management will change as circumstances require, the purpose of management should remain more or less constant. This is why continuity of effective management must be maintained, and not simply the continuity of any specified process. Continuity of monitoring is as important as is continuity of management.

To enable communication within and between sites, organizations and stakeholders

Communication is essential within organizations, and also between organizations and individuals. Management plans and the management planning process are a means of presenting information in a structured and accessible format that will inform others about the site, the aims of management, and the management processes. Planning and management for the maintenance of ecological character are largely dependent on the availability of information. It is also important that those responsible for developing the plan should be aware of management techniques and procedures developed or improved elsewhere. The communications, education and public awareness (CEPA) components of the plan from its inception to full implementation should be clearly defined.

Stakeholders, including local communities and indigenous people

Wetland management, and particularly the planning process, should be as inclusive as possible. Legitimate stakeholders, particularly local communities and indigenous people, should be strongly encouraged to take an active role in planning and in the joint management of sites. It is highly desirable that positive steps be taken to ensure that gender issues, including women and their interests, are fully taken into account at all stages in the process. If necessary, appropriate incentives to ensure full stakeholder participation should be identified and applied.

A ‘stakeholder’ is taken to mean any individual, group or community living within the influence of the site, and any individual, group or community likely to influence the management of the site. This will obviously include all those dependent on the site for their livelihood. Stakeholder interests can have considerable implications for site management, and will place significant obligations on managers. Public interest, at all levels, must be taken into account. Wetland managers must recognize that other people may have different, and

sometimes opposing, interests in the site. It is essential that these interests be safeguarded wherever possible, but this must not be to the detriment of the features of the ecological character of the site. Any use of the site must ultimately meet the test of compatibility with the wise use and conservation purpose and objectives, and this is of added significance where the site has been designated as a Wetland of International Importance.

The involvement and understanding of local communities and indigenous peoples in the management of wetlands is of particular importance where the wetland is under private ownership or in customary tenure, since then the local communities are themselves the custodians and managers of the site, and in these circumstances it is vital that the management planning process is not seen as one imposed from outside upon those who depend on the wetland for their livelihoods.

Consultation with and participation by stakeholders

It is particularly important that stakeholders be informed at the earliest possible stage about an intention to produce a management plan, but at this stage this should not be confused with formal negotiation. The most important early message is that everyone will be consulted and involved and that all interests will be given proper consideration. Management planners must convey the message that they are open-minded and will deal as objectively as possible with all issues. Relevant stakeholders should include not only local communities but also local government (including all sectors whose decisions can affect the management planning process and its objectives) and the private sector.

ASSESSMENT OF WETLAND ISSUES

Definition of wetlands

The plan recognizes that there are many definitions of wetland but most are fundamentally alike and generally address the elements of hydrology, hydrophytic vegetation and hydric soils. For general purposes we therefore recommend the definition of wetlands as given by Ramsar convention on wetlands (1971).

"areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres".

Five major wetland types are generally recognized by Ramsar:

- marine (coastal wetlands including coastal lagoons, rocky shores, and coral reefs);
- estuarine (including deltas, tidal marshes, and mangrove swamps);
- lacustrine (wetlands associated with lakes);
- riverine (wetlands along rivers and streams); and
- palustrine (meaning "marshy" - marshes, swamps and bogs).

The action plan recognizes the rich diversity of Barina wetland types and lists them as riparian wetlands, bogs, marshes and rivers.

Functional uses of wetlands

Barina wetland is a valuable natural resource that if maintained and properly managed, can provide important benefits to the public and the environment. Wetland functions are directly beneficial to people and the integrity of the environment where they are found. The functions associated with Barina wetland are: water quality enhancement, reduction of flood impacts, biological productivity, groundwater influences, recreation, education, timber production and agricultural production. The plan recommends a consistence program to evaluate the quality and functions of wetlands and to monitor their condition.

Inventory of wetlands

The plan recommends that the County develops a complete inventory of all wetlands for multiple needs. The County should pursue a cooperative effort with all stakeholders to record

soils, hydrology, and wetland data on a standardized base map that can be maintained in a Geographical Information System (GIS).

Evaluation of wetland protection measures

To achieve the level of wetland management consistent with the Ministry of Environment's goals, 12 objectives have been identified.

Objective 1: To promote the coordination of wetlands management in Barina through discussion, information exchange, cooperation and the sharing of resources.

Objective 2: To establish a net gain wetlands policy for community land so as to encourage the restoration, enhancement and creation of wetlands.

Objective 3: To integrate wetlands management with other related resource issues on wetland unit base.

Objective 4: To characterize the wetlands resource more completely and identify critical functions of the Barina wetland.

Objective 5: To adopt a classification system and water quality standards to identify and protect wetland functions and values.

Objective 6: To provide technical assistance and other initiative to community members implementing management practices that conserve, enhance and restore wetlands.

Objective 7: To develop information/education programs on Barina wetland's resources.

Objective 8: To identify and prioritize unique or scarce wetland biodiversity and sites for special protection.

Objective 9: To identify wetland sites in Barina for restoration and enhancement by identifying and developing funding sources to accomplish this work.

Objective 10: To integrate Barina wetland conservation with Kenya's wetland management program and help in creating more wetlands and riparian areas.

Objective 11: To establish a comprehensive County wetlands mapping program.

Objective 12: Research and develop techniques for protecting, and enhancing wetlands for biodiversity protection. Developed techniques will be implemented to maximize beneficial uses of wetland in biodiversity protection.

Some of the key action items associated with these objectives are:

- The establishment of a technical working group made up of representatives from different stakeholders around Barina.
- Incorporate a wetlands component into the overall County environmental plan.
- Develop a recognition/award program for community members undertaking excellent wetlands conservation projects.
- Prepare a brochure/information sheet on potential economic uses of wetlands.
- Monitor water quality enhancement and biological productivity in Sawaiti wetland.

Strategy of implementation

The plan gives a positive direction for meaningful wetland management. Action items found in the plan are only building blocks for a successful wetland strategy. The action items have several mechanisms for implementation. Some can be accomplished through a County directive, some can be completed through a memorandum of agreement between agencies, and some need to be implemented through the legislative process, undergoing full debates in the County Assembly. Some part of the strategy involve agencies taking the initiative to pursue an item that is good for the resource and the County. The success of the strategy ultimately lies in the belief by both the public and the public servant that their efforts have a positive effect on the resource.

CHAPTER 1

INTRODUCTION

While this plan offers a comprehensive look at Barina wetland and future conservation needs, it is clear that there are many unresolved issues and many limitations on wetlands data and science. Consequently, there are gaps in the plan that are identified and recommendations are made to fill those gaps. During the course of the planning process, wetlands policy has been a much-debated natural resource issue both locally and nationally.

The national wetland policy has gone through a number of challenges. Currently the national wetland policy is still being reviewed. With so much confusion and change in the national wetlands policy and regulations, it is difficult to develop a County comprehensive wetland plan which is consistent with the national government's efforts. Nevertheless, wetlands are an important component of Mogotio's natural resources. As the importance of wetlands continues to be demonstrated, the time has come to look at how to manage this resource. The technical workgroup therefore hopes that this plan will serve as a starting point for providing a more comprehensive approach to wetlands management.

GUIDING PRINCIPLES

The technical work group has developed a number of policies to provide the overall framework for the plan. The policies are listed below;

1. Wetlands are an important component of the natural resource of the County.
2. Barina wetland should be conserved and managed carefully.
3. The voluntary approach to wetlands management on community areas using education, technical assistance, and incentives as the preferred method of conserving the wetland.
4. Barina wetland should not be managed in isolation, but rather integrated with other related resources issues such as water quality, flood control, recreation and wildlife.

CHAPTER 2
OVERVIEW OF WETLAND PROGRAMS AND AGENCIES

The project owes its continued progress and success to various supporters (both individuals and organizations) who have offered both financial and technical support. Through these partnerships and support, the project site has been put on global map as a hotspot for scientific research, birdwatching and general ecotourism activities. Below are some of the organizations that the project has partnered with.

Rufford Foundation

The Rufford Foundation is a charity established specifically for the development of Rufford Small Grants for Nature Conservation (RSGs). The project was made possible by financial support from the Foundation.

County Government of Baringo

The County Government of Baringo aims to protect and improve the environment and natural resources for the people of Baringo County and Kenya, through environmental awareness, execution of laws and regulations, social contribution and strengthening initiatives for sustainable environmental and natural resources management. The County government continues to support the project through provision of information and local awareness programs for the community living around the wetland.

County Government of Nakuru

The County Government of Nakuru's aim is to Protect, Conserve and Promote Environmental and Natural Resources Management for Sustainable National Development in the County. It also works towards the management of the County's Environmental, Natural Resources, Energy and Water issues. The County continues to support the project's capacity building work and public awareness activities.

Mid Rift Tourism and Wildlife Centre (Equator Crossing)

The Mid Rift Tourism and wildlife Centre provides visitors with information on the tourist attractions and facilities in the Mid Rift region of Kenya. The Equator crossing is also situated at the Information Centre.

Friends of Sawaiti Wetland Conservancy

The Friends of Sawaiti is a local community group that was formed in the year 2013 after the local community saw the importance of protecting the Barina Wetland ecosystem. The local community group endeavours to educate local community members about the importance of sustainable use of the wetland and its resources. The group has also come up with income generating activities around the wetland; they include birdwatching, guiding and general ecotourism.

BirdLife Africa Partnership Secretariat

BirdLife International is a global partnership of non-governmental organizations that strive to conserve birds, their habitats and global biodiversity, working with people towards the sustainable use of natural resources. BirdLife's work in Africa is aligned to the four pillars of the BirdLife strategy; Species, Sites and Habitats, Ecological Sustainability and People. Within this framework the BirdLife Africa Partnership emphasizes on developing positive linkages between birds, biodiversity and the livelihoods of people.

Balanites Africa

Balanites Africa is a non-profit organization that works with local communities in promoting sustainable natural resource use and biodiversity conservation.

Egerton University, Faculty of Environment and Resource Development

The Faculty of Environment and Resource Development creates learning environments that are challenging, collaborative, interdisciplinary, and skill-based. Their goal is to educate and train the next generation of professional leaders in the domains of environmental science and natural resource management.

University of Dar Es Salaam, Department of Zoology

The University of Dar es Salaam offers Programmes, to students from Tanzania and throughout the world.

Earth Ministry

Earth Ministry is a U.S.A based organization that promotes environmental stewardship and advocacy. Through education, outreach, organizing, and training, Earth Ministry builds a

powerful moral constituency of people taking action for the health of local communities and the environment.

African Pro-poor Tourism Development Centre

African Pro-poor Tourism Development Centre (APTDC) is a non-profit that seeks to promote the utilization of tourism as a strategic tool to alleviate poverty. The Centre was the first of its kind in the East African Travel & Tourism Industry and until it was founded, tourism was not being used as strategic tools towards addressing the various social problems such as unemployment, poverty and gender inequality.

Kenya Wildlife Service, Kabarnet

The Kenya Wildlife Service's mission is to sustainably conserve, manage, and enhance Kenya's wildlife, its habitats, and provide a wide range of public uses in collaboration with stakeholders for posterity.

National Museums of Kenya, Zoology Department

The National Museums of Kenya (NMK) is a multi-disciplinary institution whose role is to collect, preserve, study, document and present Kenya's past and present cultural and natural heritage. This is for the purposes of enhancing knowledge, appreciation, respect and sustainable utilization of these resources for the benefit of Kenya and the world, for now and posterity. NMK's mutual concern for the welfare of mankind and the conservation of the biological diversity of the East African region and that of the entire planet demands success in such efforts.

Insect Committee of Nature Kenya

The Insect Committee is a working group of Nature Kenya, the *East Africa Natural History Society* whose aim is to promote general public interest in insects. The group also creates awareness of the importance of invertebrate conservation and works with local communities to promote public knowledge about the importance of invertebrates in the ecosystem.

Wildlife Clubs of Kenya

The Wildlife Clubs of Kenya (WCK) aims to provide conservation education to the youths and support wildlife clubs through training, information sharing and advocacy. Its objectives include spreading interest and knowledge about wildlife and the environment among the

people of Kenya in particular and East Africa in general and developing a better understanding of the need to conserve national resources for the benefit of the nation and its people.

Giraffe Centre, the African Fund for Endangered Wildlife

The Giraffe Centre is a Non-Profit making organization whose main objective is to provide conservation education for school children and the youth of Kenya.

CHAPTER 3
GOALS AND OBJECTIVES

GOALS

The goals of Barina community is to conserve, enhance and restore the quantity, quality and biological diversity of all wetlands in the County. These are challenging goals. The cooperation and involvement of many diverse interests and individual points of view will be required to reach these goals. There must be a long-term commitment to these goals by all parties, and much will depend on expanding knowledge and understanding of wetlands and their functions in the ecosystem. Currently not all the answers necessary to manage wetlands are available, but by establishing these goals and setting out the objectives in this chapter, all parties can begin taking actions to better conserve this resource.

Accomplishing these goals will require a continuing partnership between the County and national governments. The primary County role will be to carry out an effective regulatory program. The national governments' role will be to provide the education, research, technical assistance, and incentives to improve the wetland conservation and management. Community members must be active partners with the county since most riparian biodiversity especially birds occur in community land.

The County must improve its knowledge of wetlands. Data collection and analysis, as well as long term monitoring, of wetlands trends are critical. Improved inventories, mapping and characterization of Barina wetland are essential. This will require improved communication and cooperation among the various resource management agencies.

A strong cooperative partnership between the public and private sectors also must be forged. To date, wetlands management can be categorized as fragmented, confusing and often inconsistent. It has been difficult for the private sector to understand and fully support the public policy towards wetlands. By clearly setting these goals and outlining objectives to reach the goal, this plan and strategy can serve as the framework for promoting improved wetlands conservation in the County.

OBJECTIVES

To achieve the wetlands goals, these objectives are recommended;

To promote the coordination of wetlands management in Barina through discussion, information exchange, cooperation and the sharing of resources.

The ability to meet the long-term demands of a wide spectrum of wetlands habitats is the result of sound wetland management. It is understandable that management decisions to meet the long-term demands of wetlands will be made by the government agencies, individuals and private corporations. Through discussion and exchange of information in making management decisions, cooperative attitudes will make full use of the county's resources for the protection of Barina wetland.

To establish a net gain wetlands policy for county lands.

Before the county can expect its citizens to improve their wetlands conservation practices, it should ensure that it is doing the best possible job of wetland management. This objective would require the county agencies to replace any wetlands converted or destroyed as a result of encroachment or other unsustainable projects.

To integrate wetlands with other related resources issues on wetland unit basis.

Wetlands should not be managed as a separate resources. Wetlands are linked directly with water quality, water quantity, flood control and wildlife management issues. The most effective approach to wetlands management is on a watershed unit basis where wetlands management is integrated with other related programs.

To characterize the wetlands resource more completely and identify the critical functions of Barina.

While much is known about the characteristics of Barina wetland much more is needed particularly concerning wetlands functions. A better understanding of wetlands functions will provide resource managers an indicator of critical areas and sites. It will also give the general public a better understanding of the importance of wetlands as a source.

To provide technical assistance and other incentives to community members implementing management practices that conserve, enhance and restore the wetland.

Since a majority of Barina wetland is in private ownership, it is important to sustain and enhance the benefits of wetlands ownership and management. This can be best achieved by providing community members with quality technical assistance, sound information and the incentives.

To develop information/education programs on Barina wetland resources.

There is a need for developing information on Barina wetlands resource for a variety of audiences. Much confusion exists about the importance of wetlands in the ecosystem. Educating citizens and providing a better understanding of the functions and values of wetlands will be the best way to ensure the long-term conservation of the wetlands resources.

To integrate wetlands conservation with other natural resource management programs and create a more wetland greenbelt.

Water and soil management are closely linked to wetland management. Opportunities to restore natural habitats to their natural conditions should be pursued where possible. Incorporating wetlands enhancement, riparian zones and storm water management systems is greatly encouraged.

To establish a comprehensive wetland mapping program

As work proceeds on wetlands use classification and further refinement of wetlands delineation occurs, a mapping effort on wetlands is needed. The mapping should be accomplished utilizing geographic information system technology.

Research and develop techniques, enhancing and constructing wetlands for biodiversity protection.

As knowledge is gained about wetlands functions, uses and their ability to act as natural habitat, techniques can be developed to maximize those uses.

CHAPTER 4

ASSESSMENT OF WETLANDS ISSUES

Definition of wetlands

The plan recognizes that there are many definitions of wetland but most are fundamentally alike and generally address the elements of hydrology, hydrophytic vegetation and hydric soils. For general purposes we therefore recommend the definition of wetlands as given by Ramsar convention on wetlands (1971).

"areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres".

FUNCTIONAL USES OF WETLANDS

Traditionally, wetlands were considered to be wastelands that should be drained as soon as possible for farming or for residential or industrial purposes. Wetlands were not considered valuable resources, and their complex ecological and hydrological functions were for most part unrecognized. However, recently wetlands have been recognized as valuable natural resources that if maintained and properly managed can provide important benefits to the public and the environment. For instance wetlands can protect or enhance water supplies, improve water quality, reduce flooding, provide valuable habitat for wildlife, and contribute to the biological diversity and stability of the ecosystems upon which we all depend.

Environmental benefits

Wetland functions are directly beneficial to people and to the integrity of the environment where they are found. Not every wetland will perform all of the possible functions, and not all functions are performed equally well in every wetland. The degree to which a wetland performs a function is related to, and defined by, a complex web of interrelations among the wetland's characteristics and its landscape setting, upstream contribution, downstream receivers and biotic interactions.

The functions of the Barina wetland are;

Water Quality Enhancement. Wetlands have a limited capacity to enhance the physical and chemical conditions of water from a base condition by;

Sediment/ toxic substance retention. Reducing the concentration of suspended and bed-load sediment, and attendant toxicant load, through energy dissipation, precipitation, ionization and biotic bonding.

Nutrient removal/ transformation. Reducing the concentration or modifying the form of nitrogen, phosphorous and potassium ions through oxidation, reduction, assimilation or other biochemical processes.

Reduction of Flood Impacts. Wetlands reduce the volume and physical energy of water below a base condition, through;

Flood Peak Reduction. Wetlands influence regional water-flow regimes by intercepting storm runoff and temporarily storing excess surface waters, thereby reducing storm runoff peak discharges by storing and slowly releasing runoff over a longer period of time.

Erosion Potential Reduction. Wetlands in natural state are usually vegetated. This vegetation reduces the velocity of flood waters and wave action, thereby lessening the potential for erosion on farmlands. The root systems of wetlands vegetation bind the floodplain soils to further resist erosive forces.

Biological Productivity. Wetlands provide habitat, including food, water, cover and reproductive features that support a diverse array of wetland-dependent or indicative species and populations.

Examples include;

Aquatic species: Vertebrate and invertebrate species that complete their life cycles in water

Resident species: That typically spends all life stages in an area or habitat of analogues physical conditions.

Transient species: That typically moves in response to challenging habitat conditions and/or with specific life stage requirements.

Semiaquatic species: Vertebrate and invertebrate species that spend certain life stages in water.

Wetland wildlife Species: Vertebrate species, typically mammals, birds, amphibians and reptiles that spend most or all of their life stages above the water's surface, but are heavily dependent on aquatic or wetland conditions to fulfill basic needs.

> ***Resident-*** Species whose annual requirements are met within a single home range.
>
> ***Migratory-*** Species whose annual life stage requirements are met by a series of distant ranges accessed by predictable relocation.

Vegetation: Species of plants typically adapted to periodically anaerobic soil conditions

Food chain support: Providing primary and secondary productivity that support faunal communities within the wetland and in adjacent and downstream water bodies.

Groundwater Influences. Wetlands significantly influences shallow water aquifers within their vicinity by:

Ground water Recharge. Retaining water and allowing for its percolation into the underlying aquifer.

Low Flow Augmentation. Releasing water to adjacent streams or water bodies during dry periods of the year and during drought.

Groundwater Discharge Buffering. Enhancing the quality of groundwater discharge by providing a biochemical water treatment system.

Direct Human Benefits

In addition to the societal benefits provided by normal wetlands functions, several direct human benefits can be derived from wetlands and their functions through managed use. Opportunities for human uses compatible with sustained wetlands conditions include:

Recreation: Use for play, amusement, relaxation, and/or physical and mental refreshment.

Education: Use for training and developing knowledge and skills.

Agricultural Production: Providing the potential for agricultural resource management consistence with sustained wetland conditions.

STANDARDS FOR BENEFICIAL USES AND WETLAND

The wetlands in Kenya are also protected through the water quality standards. The environmental statutes do not specifically address wetlands. However, within the definition of water in Kenya the marshlands receive special mention as do all other bodies or accumulations of water.

Highlights of Water Quality Regulations 2006 (Legal notice No. 121)

- Water Quality Regulations apply to water used for domestic, industrial, agricultural, and recreational purposes; water used for fisheries and wildlife purposes, and water used for any other purposes. Different standards apply to different modes of usage. These regulations provide for the protection of lakes, rivers, streams, springs, wells and other water sources.
- The objective of the regulations is to protect human health and the environment. The effective enforcement of the water quality regulations will lead to a marked reduction of water-borne diseases and hence a reduction in the health budget.
- The regulations also provide guidelines and standards for the discharge of poisons, toxins, noxious, radioactive waste or other pollutants into the aquatic environment in line with the Third Schedule of the regulations. The regulations have standards for discharge of effluent into the sewer and aquatic environment. While it is the responsibility of the sewerage service providers to regulate discharges into sewer lines based on the given specifications, NEMA regulates discharge of all effluent into the aquatic environment.
- The regulations provide for the creation of a buffer zone for irrigation schemes of at least fifty (50) metres in width between the irrigation scheme and the natural water body. Standards for irrigation water are given in schedule nine of the regulations.
- All firms or persons discharging effluent into the aquatic environment are required to submit quarterly discharge monitoring records to NEMA based on prescribed procedures of sampling and analysis.
- Everyone is required to refrain from any actions, which directly or indirectly cause water pollution, whether or not the water resource was polluted before the enactment of the Environmental Management and Coordination Act (EMCA) gazetted in 1999. It is an offence to contravene the provisions of these regulations with a fine not exceeding five hundred thousand shillings.

CHAPTER 5

WETLANDS MANAGEMENT STRATEGY AND IMPLEMENTATION PLAN

This chapter outlines recommendations for ensuring the protection of community areas and property rights and measures to mitigate wetlands loses. The final section recommends measures to protect wetlands and includes proposed action items to meet the ten objectives of the plan.

MEASURES TO ENSURE PROTECTION OF PROPERTY RIGHTS OF COMMUNITY

Land

Land is a key resource in Kenya and is the basis of livelihood for vast majority and a foundation of economic development. Land resources are finite, fragile and non-renewable and are considered a capital and asset that provides the essential services for the development and human well-being. Consequently, the demand and pressure on land is ever increasing. The main driving force leading to pressure on land resources is the increasing rate of population growth, hence demand for more food and shelter.

The unsustainable use of land in urban and rural areas remains a major challenge to all Kenyans due to the serious impacts on the environment. Activities contributing to land degradation include unsustainable agricultural land use, poor soil and water management practices, deforestation and overgrazing. Natural disasters, including droughts, floods and landslides also contribute to land degradation.

National Environmental Policy statement 2003 on land

The government will:

1. Ensure implementation of the constitution and the National Land Policy in a way that will take into account sustainable conservation and management of the environment.
2. Promote and enhance best practices for optimal and sustainable land use.
3. Promote sustainable urban and peri-urban land uses
4. Promote land restoration policies
5. Involve and empower communities in land utilization and management.

National Environmental policy statement 2003 on Freshwater and Wetlands

The government will:

1. Develop and implement integrated freshwater and wetland resources management strategies and action plans.
2. Promote and institutionalize payment for environmental service scheme to support catchment protection and conservation.
3. Promote sustainable use of freshwater and wetland resources and the conservation of river and lake ecosystems through development and implementation of river basin management plans.
4. Develop and implement a national wetland policy and regulations.
5. Develop and implement catchment based wetland management plans for all Ramsar sites through a participatory process.
6. Ensure rehabilitation and restoration of degraded wetlands, riverbanks and lakeshores and as appropriate promote and support establishment of constructed wetlands.
7. Harmonize and coordinate the roles of various regulatory agencies charges with the management of freshwater and wetland ecosystems.
8. Involve and empower communities in the management of freshwater and wetland ecosystems.

CHAPTER 6
BIODIVERSITY

Barina wetland is home to a diversity of organisms which inhibit the diverse microhabitats provided by the wetland ecosystem. This section presents a brief overview of some of the biodiversity recorded during wetland inventories carried out by the Friends of Sawaiti (Barina) Wetland Conservancy and other stakeholders. They include plants, birds, mammals, invertebrates, reptiles and amphibians. Through regular surveys, monitoring, data collection and documentation, the biodiversity checklist continues to grow with new species recorded in each survey.

Biodiversity monitoring and survey at the wetland

Environmental education and local youth capacity building

Plants

Kenya is endowed with both indigenous and exotic plant species and they are part of our heritage. Apart from educating the community and general public about the importance of these plants, there is an urgent need for replanting and conserving them. Below are some that have been documented at the wetland.

Candle Bush (Senna alata)

Blue water lily (N. caerulea)

Gloriosa lily (Gloriosa superba)

Knot weed

Sedge

Verbana Sp.

Avifauna

Barina wetland is rich in avifauna. So far, over two hundred and fifty bird species have been recorded in the wetland area by the project team and other visiting birders in the community. Bird distribution in the wetland is greatly influenced by human activities, availability of food and seasons. A provisional checklist of birds of Barina is provided in Appendix.

Black winged Pratincole (Glareola nordmanni)

White-faced Whistling Ducks (D. viduata)

Fischer's Lovebirds (Agapornis fischeri)

Saddle-billed Stork (E. senegalensis)

Grey Crowned Cranes (Balearica regulorum)

Martial Eagle (Polemaetus bellicosus)

Mammals

Some of the mammals that have been recorded at the wetland are Plain Zebras, Ground Squirrels, hedgehogs and Cape hares. Cane rats have also been recorded, unfortunately they had been hunted and already dead when documented.

Invertebrates

Invertebrates make up the larger percent of all animal species on earth**.** Many insects, such as bees and flies, help support the ecosystem through the pollination of flowers, while other species carry plant seeds to help spread the species. They also provide other important ecosystem services like decomposition and act as a source of food for other organisms.

Mud puddling butterflies

Dancing Jewel (Platycypha caligata)

Wild Honey bee colony

Spittlebugs

Amphibians and reptiles

Reptiles and amphibians are abundant in the wetland. Amphibians are a class of vertebrates, comprising three living orders: Anura (frogs and toads), Gymnophiona (worm like), Caudata (Newts and salamanders). Some of these have been recorded during our biodiversity surveys.

Battersby's Green-snake (Philothamnus Battersbyi)

African Striped Skink (Mabuya striata)

Guttural toad (Amietophrynus gutturalis)

Hyperolius sp

Leopard Tortoise (Stigmochelys pardalis)

Nile monitor lizard (Varanus niloticus)

Appendix

A provisional checklist of Birds of Barina Swamp

	Species name	**Scientific name**
1.	Helmeted Guineafowl	*Numida meleagris*
2.	Crested Francolin	*Francolinus sephaena*
3.	White-faced Whistling-duck	*Dendrocygna viduata*
4.	Fulvous Whistling-duck	*Dendrocygna bicolor*
5.	White-backed Duck	*Thalassornis leuconotus*
6.	Spur-winged Goose	*Plectropterus gambensis*
7.	Knob-billed Duck	*Sarkidiornis melanotos*
8.	Egyptian Goose	*Alopochen aegyptiaca*
9.	Cape Teal	*Anas capensis*
10.	Yellow-billed Duck	*Anas undulata*
11.	Northern Shoveler	*Anas clypeata*
12.	Red-billed Teal	*Anas erythrorhyncha*
13.	Garganey	*Anas querquedula*
14.	Hottentot Teal	*Anas hottentota*
15.	Southern Pochard	*Netta erythrophthalma*
16.	Common Pochard	*Aythya ferina*
17.	Macoa Duck	*Oxyura maccoa*
18.	Little Grebe	*Tachybaptus ruficollis*
19.	Black-necked Grebe	*Podiceps nigricollis*
20.	Lesser Flamingo	*Phoenicopterus minor*
21.	Yellow-billed Stork	*Mycteria ibis*
22.	African Open-billed Stork	*Anastomus lamelligerus*
23.	Abdim's Stork	*Ciconia abdimii*
24.	Woolly-necked Stork	*Ciconia episcopus*
25.	White Stork	*Ciconia ciconia*
26.	Saddle-billed Stork	*Ephippiorhynchus senegalensis*
27.	Marabou Stork	*Leptoptilos crumeniferus*
28.	Sacred Ibis	*Threskiornis aethiopicus*
29.	Hadada Ibis	*Bostrychia hagedash*
30.	Glossy Ibis	*Plegadis falcinellus*
31.	African Spoonbill	*Platalea alba*
32.	Black-crowned Night-heron	*Nycticorax nycticorax*
33.	Striated Heron	*Butorides striata*
34.	Squacco Heron	*Ardeola ralloides*
35.	Cattle Egret	*Bubulcus ibis*
36.	Grey Heron	*Ardea cinerea*
37.	Black-headed Heron	*Ardea melanocephala*
38.	Goliath Heron	*Ardea goliath*
39.	Purple Heron	*Ardea purpurea*

40.	Great White Egret	*Ardea alba*
41.	Yellow-billed Egret	*Egretta intermedia*
42.	Black Heron	*Egretta ardesiaca*
43.	Little Egret	*Egretta garzetta*
44.	Hamerkop	*Scopus umbretta*
45.	Great White Pelican	*Pelecanus onocrotalus*
46.	Pink-backed Pelican	*Pelecanus rufescens*
47.	Reed Cormorant	*Phalacrocorax africanus*
48.	Great Cormorant	*Phalacrocorax carbo*
49.	African Darter	*Anhinga rufa*
50.	Common Kestrel	*Falco tinnunculus*
51.	Lanner Falcon	*Falco biarmicus*
52.	Peregrine Falcon	*Falco peregrinus*
53.	Osprey	*Pandion haliaetus*
54.	African Black-shouldered Kite	*Elanus caeruleus*
55.	Black Kite	*Milvus migrans*
56.	African Fish-eagle	*Haliaeetus vocifer*
57.	Black-chested Snake-eagle	*Circaetus pectoralis*
58.	Brown Snake Eagle	*Circaetus cinereus*
59.	Western Marsh-harrier	*Circus aeruginosus*
60.	African Marsh Harrier	*Circus ranivorus*
61.	Montagu's Harrier	*Circus pygargus*
62.	African Harrier-hawk	*Polyboroides typus*
63.	Dark Chanting-goshawk	*Melierax metabates*
64.	Gabar Goshawk	*Micronisus gabar*
65.	Common Buzzard	*Buteo buteo*
66.	Augur Buzzard	*Buteo augur*
67.	Tawny Eagle	Aquila rapax
68.	Eastern Imperial Eagle	*Aquila heliaca*
69.	Wahlberg's Eagle	*Aquila wahlbergi*
70.	Martial Eagle	*Polemaetus bellicosus*
71.	Long-crested Eagle	*Lophaetus occipitalis*
72.	Black-bellied Bustard	*Lissotis melanogaster*
73.	African Water Rail	*Rallus caerulescens*
74.	Black Crake	*Amaurornis flavirostra*
75.	Purple Swamphen	*Porphyrio porphyrio*
76.	Allen's Gallinule	*Porphyrio alleni*
77.	Common Moorhen	*Gallinula chloropus*
78.	Lesser Moorhen	*Gallinula angulata*
79.	Red-knobbed Coot	*Fulica cristata*
80.	Grey Crowned Crane	*Balearica regulorum*
81.	Water Thick-knee	*Burhinus vermiculatus*
82.	Black-winged Stilt	*Himantopus himantopus*

83.	Long-toed Plover	*Vanellus crassirostris*
84.	Blacksmith Plover	*Vanellus armatus*
85.	Spur-winged Plover	*Vanellus spinosus*
86.	Black-headed Plover	*Vanellus tectus*
87.	Crowned Plover	*Vanellus coronatus*
88.	Common Ringed Plover	*Charadrius hiaticula*
89.	Kittlitz's Plover	*Charadrius pecuarius*
90.	Three-banded Plover	*Charadrius tricollaris*
91.	Greater Painted-snipe	*Rostratula benghalensis*
92.	Lesser Jacana	*Microparra capensis*
93.	African Jacana	*Actophilornis africanus*
94.	Common Snipe	*Gallinago gallinago*
95.	Black-tailed Godwit	*Limosa limosa*
96.	Marsh Sandpiper	*Tringa stagnatilis*
97.	Common Greenshank	*Tringa nebularia*
98.	Wood Sandpiper	*Tringa glareola*
99.	Common Sandpiper	*Actitis hypoleucos*
100.	Little Stint	*Calidris minuta*
101.	Ruff	*Philomachus pugnax*
102.	Heuglin's Courser	*Rhinoptilus cinctus*
103.	Collared Pratincole	*Glareola pratincola*
104.	Black-winged Pranticole	*Glareola nordmanni*
105.	Grey-headed Gull	*Chroicocephalus cirrocephalus*
106.	Gull-billed Tern	*Gelochelidon nilotica*
107.	Whiskered Tern	*Chlidonias hybrida*
108.	White-winged Black Tern	*Chlidonias leucopterus*
109.	Speckled Pigeon	*Columba guinea*
110.	African Mourning Dove	*Streptopelia decipiens*
111.	Red-eyed Dove	*Streptopelia semitorquata*
112.	Ring-necked Dove	*Streptopelia capicola*
113.	Laughing Dove	*Streptopelia senegalensis*
114.	Emerald-spotted Wood Dove	*Turtur chalcospilos*
115.	Namaqua Dove	*Oena capensis*
116.	African Green Pigeon	*Treron calvus*
117.	Fischer's Lovebird	*Agapornis fischeri*
118.	Meyer's Parrot	*Poicephalus meyeri*
119.	Jacobin Cuckoo	*Clamator jacobinus*
120.	Great Spotted Cuckoo	*Clamator glandarius*
121.	Red-chested Cuckoo	*Cuculus solitarius*
122.	African Cuckoo	*Cuculus gularis*
123.	Klaas's Cuckoo	*Chrysococcyx klaas*
124.	Diederik Cuckoo	*Chrysococcyx caprius*
125.	White-browed Coucal	*Centropus superciliosus*

126.	Verreaux's Eagle Owl	*Bubo lacteus*
127.	Nyanza Swift	*Apus niansae*
128.	Little Swift	*Apus affinis*
129.	Speckled Mousebird	*Colius striatus*
130.	Blue-naped Mousebird	*Urocolius macrourus*
131.	Lilac-breasted Roller	*Coracias caudatus*
132.	Broad-billed Roller	*Eurystomus glaucurus*
133.	Grey-headed Kingfisher	*Halcyon leucocephala*
134.	Woodland Kingfisher	*Halcyon senegalensis*
135.	Malachite Kingfisher	*Alcedo cristata*
136.	Pied Kingfisher	*Ceryle rudis*
137.	Little Bee-eater	*Merops pusillus*
138.	Cinnamon-chested Bee-eater	*Merops oreobates*
139.	White-throated Bee-eater	*Merops albicollis*
140.	Blue-cheeked Bee-eater	Merops persicus
141.	Eurasian Bee-eater	*Merops apiaster*
142.	Northern Carmine Bee-eater	*Merops nubicus*
143.	Hoopoe	*Upupa epops*
144.	Green Wood-hoopoe	*Phoeniculus purpureus*
145.	Red-billed Hornbill	*Tockus erythrorhynchus*
146.	Jackson's Hornbill	*Tockus jacksoni*
147.	Red-fronted Tinkerbird	*Pogoniulus pusillus*
148.	Red-fronted Barbet	*Tricholaema diademata*
149.	Red-and-yellow Barbet	*Trachyphonus erythrocephalus*
150.	D'Arnaud's Barbet	*Trachyphonus darnaudii*
151.	Wahlberg's Honeybird	*Prodotiscus regulus*
152.	Lesser Honeyguide	*Indicator minor*
153.	Greater Honeyguide	*Indicator indicator*
154.	Nubian Woodpecker	*Campethera nubica*
155.	Cardinal Woodpecker	*Dendropicos fuscescens*
156.	Bearded Woodpecker	*Dendropicos namaquus*
157.	African Grey Woodpecker	*Mesopicos goertae*
158.	Chinspot Batis	*Batis molitor*
159.	Grey-headed Bushshrike	*Malaconotus blanchoti*
160.	Brown-crowned Tchagra	*Tchagra australis*
161.	Northern Puffback	*Dryoscopus gambensis*
162.	Slate-coloured Boubou	*Laniarius funebris*
163.	Tropical Boubou	*Laniarius aethiopicus*
164.	Brubru	*Nilaus afer*
165.	Black Cuckooshrike	*Campephaga flava*
166.	Northern White-crowned Shrike	Eurocephalus ruppelli
167.	Isabelline Shrike	*Lanius isabellinus*

168.	Grey-backed Fiscal	*Lanius excubitoroides*
169.	Long-tailed Fiscal	*Lanius cabanisi*
170.	Common Fiscal	*Lanius collaris*
171.	African Golden Oriole	*Oriolus auratus*
172.	Black-headed Oriole	*Oriolus larvatus*
173.	Common Drongo	*Dicrurus adsimilis*
174.	African Paradise Flycatcher	*Terpsiphone viridis*
175.	Pied Crow	*Corvus albus*
176.	Fan-tailed Raven	*Corvus rhipidurus*
177.	White-bellied Tit	*Parus albiventris*
178.	Black Saw-wing	*Psalidoprocne pristoptera*
179.	Plain Martin	*Riparia paludicola*
180.	Sand Martin	*Riparia riparia*
181.	Barn Swallow	*Hirundo rustica*
182.	Wire-tailed Swallow	*Hirundo smithii*
183.	Lesser Striped Swallow	*Cecropis abyssinica*
184.	Red-rumped Swallow	*Cecropis daurica*
185.	Red-capped Lark	*Calandrella cinerea*
186.	Rattling Cisticola	*Cisticola chiniana*
187.	Winding Cisticola	*Cisticola galactotes*
188.	Zitting Cisticola	*Cisticola juncidis*
189.	Tawny-flanked Prinia	*Prinia subflava*
190.	Buff-bellied Warbler	*Phyllolais pulchella*
191.	Yellow-breated Apalis	*Apalis flavida*
192.	Green-backed Camaroptera	*Camaroptera brachyura*
193.	Common Bulbul	*Pycnonotus barbatus*
194.	Northern Brownbul	*Phyllastrephus strepitans*
195.	Lesser Swamp Warbler	*Acrocephalus gracilirostris*
196.	African Reed Warbler	*Acrocephalus baeticatus*
197.	Upcher's Warbler	*Hippolais languida*
198.	Willow Warbler	*Phylloscopus trochilus*
199.	Red-faced Crombec	*Sylvietta whytii*
200.	Blackcap	*Sylvia atricapilla*
201.	Rufous Chatterer	*Turdoides rubiginosa*
202.	Wattled Starling	*Creatophora cinerea*
203.	Greater Blue-eared Starling	*Lamprotornis chalybaeus*
204.	Ruppell's Starling	*Lamprotornis purpuroptera*
205.	Superb Starling	*Lamprotornis superbus*
206.	Hilderbrandt's Starling	*Lamprotornis hildebrandti*
207.	Red-winged Starling	*Onychognathus morio*
208.	Red-billed Oxpecker	*Buphagus erythrorhynchus*
209.	Olive Thrush	Turdus olivaceus
210.	Irania	*Irania gutturalis*

211.	White-browed Robin Chat	*Cossypha heuglini*
212.	Whinchat	*Saxicola rubetra*
213.	Common Stonechat	*Saxicola rubicola*
214.	Isabelline Wheatear	*Oenanthe isabellina*
215.	Northern Wheatear	*Oenanthe oenanthe*
216.	Northern Anteater Chat	*Myrmecocichla aethiops*
217.	White-eyed Slaty-flycatcher	*Dioptrornis fischeri*
218.	African Grey Flycatcher	*Bradornis microrhynchus*
219.	Silverbird	*Empidornis semipartitus*
220.	Spotted Flycatcher	*Muscicapa striata*
221.	Lead-coloured Flycatcher	*Myioparus plumbeus*
222.	Eastern Violet-backed Sunbird	*Anthreptes orientalis*
223.	Amethyst Sunbird	*Chalcomitra amethystina*
224.	Hunter's Sunbird	*Chalcomitra hunteri*
225.	Beautiful Sunbird	*Cinnyris pulchellus*
226.	Marico Sunbird	*Cinnyris mariquensis*
227.	Purple-banded Sunbird	*Cinnyris bifasciatus*
228.	Variable Sunbird	*Cinnyris venustus*
229.	White-browed Sparrow Weaver	*Plocepasser mahali*
230.	House Sparrow	*Passer domesticus*
231.	Kenya Rufous Sparrow	*Passer rufocinctus*
232.	Grey-headed Sparrow	*Passer griseus*
233.	White-billed Buffalo Weaver	*Bubalornis albirostris*
234.	White-headed Buffalo Weaver	*Dinemellia dinemelli*
235.	Grosbeak Weaver	*Amblyospiza albifrons*
236.	Little Weaver	*Ploceus luteolus*
237.	Northern Masked Weaver	*Ploceus taeniopterus*
238.	Lesser Masked-weaver	*Ploceus intermedius*
239.	Speke's Weaver	*Ploceus spekei*
240.	Village Weaver	*Ploceus cucullatus*
241.	Golden-backed Weaver	*Ploceus jacksoni*
242.	Red-headed Weaver	*Anaplectes melanotis*
243.	Red-headed Quelea	*Quelea erythrops*
244.	Red-billed Quelea	*Quelea quelea*
245.	Yellow-crowned Bishop	*Euplectes afer*
246.	White-winged Widowbird	*Euplectes albonotatus*
247.	Long-tailed Widowbird	*Euplectes progne*
248.	Common Waxbill	*Estrilda astrild*
249.	Red-cheeked Cordon-bleu	*Uraeginthus bengalus*
250.	Purple Grenadier	*Granatina ianthinogaster*
251.	Red-billed Firefinch	*Lagonosticta senegala*
252.	Cut-throat Finch	*Amadina fasciata*
253.	Bronze Mannikin	*Spermestes cucullata*

254.	Black-and-white Mannikin	*Spermestes bicolor*
255.	Pin-tailed Whydah	*Vidua macroura*
256.	Village Indigobird	*Vidua chalybeata*
257.	Yellow Wagtail	*Motacilla flava*
258.	African Pied Wagtail	*Motacilla aguimp*
259.	Yellow-throated Longclaw	*Macronyx croceus*
260.	Grassland Pipit	*Anthus cinnamomeus*
261.	Tree Pipit	*Anthus trivialis*
262.	African Citril	*Serinus citrinelloides*
263.	Brimstone Canary	*Serinus sulphuratus*
264.	Golden-breasted Bunting	*Emberiza flaviventris*

References

Bird Committee, Nature Kenya-the East Africa Natural History Society. 2009. Checklist of the Birds of Kenya, 4th Edition.

Dharani, N. 2011. Field Guide to Common Trees and Shrubs of East Africa.

Dino J. Martins. 2015. Pocket Guide: Insects of East Africa.

Howell, K., Drewes, R. C., & Spawls, S. 2006. Pocket Guide to the Reptiles and Amphibians of East Africa.

Kingdon, J. 2003. The Kingdon Field Guide to African Mammals.

Ministry of Environment, water and natural resources. 2013. National Environment Policy.

Zimmerman, D. A., Turner, D. A., & Pearson, D. J. 1996. Birds of Kenya and Northern Tanzania.