

REPUBLIC OF MALAWI
DEPARTMENT OF NATIONAL PARKS AND WILDLIFE



GENERAL MANAGEMENT PLAN
VWAZA MARSH WILDLIFE RESERVE
2023-2033

Final Draft - Version, August 2023

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This General Management Plan was prepared as a collaborative initiative. Numerous institutions and expert individuals provided information, documentation and advice (refer Annexure A).

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APPROVAL

Signed at LILONGWE on this 02 day of MARCH 2024 by the Director of the Department of National Parks and Wildlife in terms of National Parks and Wildlife Act of 1992, as amended in 2004 and 2017



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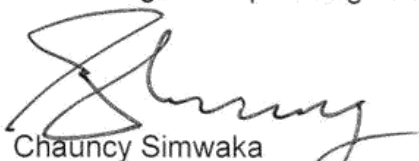
FOREWORD

Protected area management planning is an essential step towards ensuring the proper management of protected areas. The need for protected area management plans has become increasingly critical in this 21st Century as protected areas face increasing complexities in their management. Among others, protected areas are facing increasing over exploitation of natural resources from illegal wildlife trade, increased human population leading to habitat loss and increased human-wildlife conflict, and the most of them all climate change which is inflicting devastating impacts on protected areas' biodiversity and ecosystems. As a result of these, planning for protected areas has moved into increasingly complex planning environments, with higher levels of tourism and protected area resource use, critical to the planning of protected areas is the widest possible consultation with stakeholders and the development of objectives that can be agreed and adhered to by all who have an interest in the use and ongoing survival of the protected area concerned.

It is, therefore, pleasing to learn that this revised General Management Plan for Vwaza Marsh Wildlife Reserve has been developed through a lengthy consultative process with all concerned stakeholders particularly local communities, who featured strongly in the review of this management plan. Secondly, it needs to be recognised that the preparation of the protected area plans can be expensive and time consuming. Taking short cuts to these processes can be at an expense and perils of our protected areas. I, therefore, recognise the Federal Government of Germany through Kreditanstalt für Wiederaufbau (KfW) and Peace Parks Foundation (PPF), who have played a key role in providing financial and technical support respectively to this process. Their financial and time investments have made this GMP's reviewing exercise possible.

Let me call upon the authorities responsible for management of Vwaza Marsh Wildlife Reserve to ensure that the management strategies detailed in this plan are implemented to avoid the long-term management perils caused by a lack of a strategic direction. While in the past, emphasis on management planning was almost exclusively directed towards biological, ecological, physical and cultural aspects, this management plan has clearly gone beyond that historical focus as the plan reaches out and considers as never before the myriad of use patterns, the special vehicle organisational arrangements, the range of economic services generated, the financial aspects and the "benefits beyond boundaries" to the communities in general landscape of the Malawi-Zambia Transfrontier Conservation Area(TFCA) that includes Vwaza Marsh Wildlife Reserve.

It is very pleasing that this General Management Plan has comprehensively moved the management planning into the new millennium.



Chauncy Simwaka
SECRETARY FOR TOURISM

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ACRONYMS

ADC	Area Development Committees	GMA	General Management Area
AIDS	Acquired Immunodeficiency Syndrome	GMP	General Management Plan
AZE	Alliance for Zero Extinction	GN	Government Notice
CBFiMP	Community Based Fire Management Plan	HIV	Human Immunodeficiency Virus
CPUE	Catch Per Unit Effort	HWC	Human Wildlife Conflict
CMA	Co-Management Agreement	HWCMS	Human Wildlife Conflict Management Scheme
COVID	Coronavirus Disease	IBA	Important Bird Area
DCs	District Councils	IUCN	International Union for Conservation of Nature
DNPW	Department of National Parks and Wildlife	KBA	Key Biodiversity Area
EDRR	Early Detection and Rapid Response	KfW	Kreditanstalt für Wiederaufbau
EGENCO	Electricity Generation Company (Malawi) Limited	MAREP	Malawi Rural Electrification Programme
ESCOM	Electricity Supply Corporation of Malawi Limited	METT	Management Effectiveness Tracking Tool
FR	Forest Reserve	MoU	Memorandum of Understanding
FY	Future Year	MZTFCA	Malawi Zambia Transfrontier Conservation Area
GEF	Global Environment Facility	NGO	Non-Governmental Organisation
GIZ	German Agency for International Cooperation	NNP	Nyika National Park
GHI	Global Hunger Index	NRC	Natural Resource Committee
GoM	Government of Malawi	NVA	Nyika Vwaza Association
		PA	Protected Area

PES	Payment for Environmental Services	TLC	Total Land Care
PIIVeC	Partnership for Increasing the Impact of Vector Control	TMU	Transfrontier Management Unit
PPF	Peace Parks Foundation	TPC	Threshold of Potential Concern
REDD+	Reducing Emissions from Deforestation and Forest Degradation	UNESCO	United Nations Educational, Scientific and Cultural Organization
RUP	Resource Utilisation Programme	VIIRS	Visible Infrared Imaging Radiometer Suite
SEP	Socio-Economic Profile	VMWR	Vwaza Marsh Wildlife Reserve
SOP	Standard Operating Procedure	VDC	Village Development Committees
STA	Senior Traditional Authority	WHS	World Heritage Site
TA	Traditional Authority	ZNRC	Natural Resource Committee Zone
TFCA	Transfrontier Conservation Area		

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1. INTRODUCTION

1.1. Background and Purpose of the Plan

The Vwaza Marsh Wildlife Reserve (VMWR), one of four other such Reserves in Malawi, comprises an area of 986 km² low-lying wetland and woodland in northern Malawi. It lies on the watershed between Lake Malawi and the Luangwa Valley, centred upon 10°33'S, 33°50'E. The wetland alluvial type (281 km) constitutes 28% of the total area of the Reserve. Its western and part of its northern boundary coincides with the Malawi-Zambia border and is almost contiguous with Lundazi Forest Reserve (FR) except for the road that forms the international boundary. A close neighbour is the Nyika National Park to the northeast. The two Malawi Protected Areas (PA) form part of the Malawi-Zambia Transfrontier Conservation Area (TFCA) which was established in 2015 through a bilateral treaty (Figure 1 and Figure 2).

In the Malawi context the VMWR is an IUCN Category IV PA or habitat/species management area¹, it has been included on the UNESCO tentative list of world heritage sites² in 2000 (mixed category) and is also regarded as an Important Bird Area (IBA; meeting criteria A3³) and received Key Biodiversity Area⁴ (KBA) status in 2001, meeting criteria A1b, B1.

This General Management Plan (GMP) constitutes a review and update of the 2016 Master Plan draft (unapproved) (see Section 1.3.1) for the Reserve and is a ten-year management plan covering the strategic interventions in the VMWR for the period 2023 – 2033. Updates were made in line with the requirements of the Malawi Wildlife Policy 2018 and the 1992 National Parks and Wildlife Act, as amended in 2004 and 2016 respectively.

The Act mandates the Department of National Parks and Wildlife (DNPW) to conserve, manage and regulate the use of wildlife resources in the country. DNPW is thus the responsible governing authority in all matters of conservation and management of the VMWR. The Act further provides that the Director of DNPW may produce a management plan for purposes of the proper management of wildlife and in the particular cross-border wildlife resources to ensure the realisation of common wildlife goals in cross-border areas⁵. As such, the primary purpose of the management plan is thus to provide the guiding framework for the proper management of the Reserve and assure the public that this is undertaken in a responsible manner. Specific purposes are:

- To ensure that the Reserve is managed to achieve the objectives of legislation and DNPW policy goals, stakeholder expectations, and Reserve conservation management objectives. For quality assurance, consistency, and prevention of incremental degradation through *ad hoc* decision making
- To gain public involvement in the management of the Reserve and give the public a way to have their say about management
- To develop a shared understanding of and a vision for the Reserve – identify the significance of the Reserve, consolidate legislative and policy issues, integrate various elements of management and convey to the public and management staff how the Reserve will be protected, and visitors and users provided for
- To provide public accountability – a 'statement of intent': what DNPW wants to achieve and how and the criteria by which the performance of Park management under the plan will be assessed.

¹ According to Dudley, 2008, areas to protect particular species or habitats, where management reflects this priority. Many will need regular, active interventions to meet the needs of particular species or habitats, but this is not a requirement of the category.

² <https://whc.unesco.org/en/tentativelists/1420/>

³ Bioregion-restricted assemblages Criterion: the site is known or thought to hold a significant component of the group of species whose distributions are largely or wholly confined to one biome-realm

(http://datazone.birdlife.org/userfiles/images/Guidelines%20for%20the%20application%20of%20the%20IBA%20criteria_final%20approved%20version_July2020.pdf)

⁴ <https://www.keybiodiversityareas.org/site/factsheet/6666>

⁵ Article 22B and 120B



Figure 1. Malawi - Zambia TFCA



1.2. Planning and Legal Framework

Protected area management is complex and multi-disciplinary. This plan provides a framework that integrates the various thematic areas of PA management. The management plan is, however, not a standalone document – it is aligned to other Reserve plans, strategies, and operational level or subsidiary strategies, plans and protocols of which the hierarchical and dependency relationship is illustrated in Figure 3.



Figure 3. Hierarchical relationship between plans, strategies, & operational protocols of significance to the Reserve

The various levels of documents and instruments are developed and implemented cognisant of relevant international protocols; national, regional, district and local legal frameworks and land use plans as well as relevant DNPW policies and guidelines.

A recent assessment (Nyanga, et al., 2022) found that Malawi possesses legal and institutional frameworks that recognise the importance of sustainable management of natural resources, including forests and wildlife resources, and are sufficiently integrated into the international regional and global agenda on conservation and sustainable development. Within Malawi, implementation, monitoring and evaluation of legal and institutional frameworks is the mandate of sectoral ministries and departments through district and provincial administrative structures that provide technical support and supervision at community level. Notwithstanding, fiscal and human resource related challenges exist that hinder effective implementation of the current legal and institutional framework – this needs to be considered in the implementation of this management plan.

The legal framework relevant to the management of the Reserve and under DNPW mandate is as follows, noting that the National Wildlife Policy provides further linkages with other international, regional and national policies and instruments:

The **National Parks and Wildlife Act**⁶ and the purpose of PAs⁷ are -

- To preserve selected examples of biotic communities of Malawi and their physical environment
- To protected areas of aesthetic beauty and of special interest
- To preserve populations of rare, endemic, and endangered species of wild plants and animals
- To assist in water catchment conservation
- To promote education on wildlife

⁶ 11 of 1992; 15 of 2004; 11 of 2017; G.N. 57/1994

⁷ Article 27

- To provide an enabling environment for nature-based tourism in and around them
- Without prejudice to the foregoing, to provide facilities for studying the phenomena therein for the advancement of science and understanding
- Without prejudice to the foregoing, to provide facilities for public use and enjoyment of the resources therein.

The **National Wildlife Policy** and the goal, outcomes, objectives, and guiding principles for PA management- Policy Goal: To conserve and manage Malawi's wildlife resources for sustainable development of the country.

Policy Outcomes:

- Improved conservation and management of Malawi's wildlife resources
- Improved private sector investment in wildlife conservation and management
- Increased stakeholder participation in Collaborative Management of wildlife resources
- Mainstreamed climate change, gender, HIV and AIDS in wildlife programmes and policies.

Policy Objectives:

- To reduce illegal wildlife use
- To reduce Human Wildlife Conflict (HWC)
- To raise awareness and enhance stakeholder participation in wildlife conservation and management
- To improve and develop protected area infrastructure
- To promote private sector and community involvement in wildlife conservation and management
- To promote wildlife research and monitoring
- To minimise effects of climate change on wildlife and PA boundary communities
- To mainstream gender and HIV/AIDS in wildlife conservation and management.

Guiding principles:

- *State Ownership of Wildlife Resources:* The ownership of wildlife resources shall rest with the State which shall hold in trust and manage the wildlife resources on behalf of and for the benefit of the people of Malawi. However, it is recognised that those who legitimately use the land on which the resources occur are the primary custodians, and utilisation rights should accrue to them to be exercised within the limits of pertinent legislation.
- *Inter-sectoral and International Collaborative Management:* Wildlife conservation and management is a cross sectoral issue and involves ecological systems and processes that are continuous and take place irrespective of international boundaries. Inter-sectoral and international collaboration and cooperation shall be promoted to enhance wildlife conservation and management.
- *Private Sector and Community Participation in the Management of Wildlife Resources:* Recognising wildlife conservation and management as a legitimate form of land use that can be economically competitive to other land uses, and that Government structures in isolation cannot adequately conserve and manage the wildlife resources, Government shall create an enabling environment for the local communities, the private sector, Non-governmental Organisations (NGO) and any other parties with an interest in wildlife conservation and management to be fully involved.
- *Inter- and Intra-Generational Equity:* The conservation and management of wildlife will be based on long term view where the present generation makes choices that will benefit future generations.
- *Sustainable Development:* The conservation of the wildlife resources of Malawi shall be done in such a way as to meet the development and environmental needs of present generation without compromising the ability of future generations to meet their own needs.

1.3. Preparation of the Plan

This GMP constitutes a review and update of the 2016 Master Plan in line with the requirements of the Malawi Wildlife Policy 2018 and the 1992 National Parks and Wildlife Act, as amended in 2004 and 2016 respectively. Where additional information has been included, source documents have been referenced as appropriate.

1.3.1. Previous Plans

The Reserves' previous plans go as far back as 1983a and 1983b with Clarke J. E's Principal Master Plan, Protected Areas Master Plan for Northern region, which were used to manage broadly Malawi's protected areas. All previous plans were approved apart from the 2016 draft. Analysis of the implementation of these previous Master Plans has shown that there is a relatively poor implementation record due to the inadequate allocation of the financial, manpower and material resources required to implement the plans.

Analysis of the implementation of these previous Master Plans has shown that there is a relatively poor implementation record due to the inadequate allocation of the financial, manpower and material resources required to implement the plans.

1.3.2. Stakeholder Engagement

As this is a review and update of a management plan that was never completed and approved, and the stakeholder engagement processes had not been undertaken during the previous reviewing process in 2016, the consultation process undertaken was guided by the approved Stakeholder Engagement Plan for the Malawi-Zambia TFCA Project.

A consultative approach ensures that valuable inputs on implementation gaps are sourced. A wide range of stakeholders are consulted, including local communities, traditional leaders, Government departments, private sector, academic and research institutions, civil society, faith groups, non-governmental organisations, bilateral and multi-lateral development partners. Value addition of what stakeholder engagement brings forth in terms of outcomes depends to a significant extent on how well the consultation process has been planned, organized, and executed. To ensure such outcomes, therefore, the team followed a process, the detailed account of which is outlined in Annexure B.

1.4. Monitoring and Reporting on Implementation of the Plan

The monitoring and reporting on the implementation of this forgoing plan will be done through the collaboration and partnership made possible through the Co-Management Agreement (CMA) between Peace Parks Foundation (PPF) and DNPW and by the Trust established through the CMA.

Thus, monitoring and reporting on the implementation of this plan through the CMA structures will be done through:

- Annual reports
- Monthly progress reports
- Quarterly technical and financial reports

Additionally, the Management Effectiveness Tracking Tool (METT) has been designed to track and monitor progress towards protected area management effectiveness (see Appendix 5). The Reserve's managers annually conduct this assessment to monitor and report on PA management and on implementation. Reports to donors and support organisations will be submitted as per funding agreements. Reserve management will also report on projects where other organisations or affiliated partners are delivering projects or associated actions on their behalf.

1.5. Structure of the Plan

This Management Plan for the VMWR contains six chapters followed by References. The six chapters are as follows:

Chapter 1: Introduction

This chapter explains the purpose, structure and focus of the management plan for VMWR and provides a brief overview of the legal, planning and monitoring and reporting framework for the Reserve.

Chapter 2: Description

This chapter provides a brief description of VMWR regional context and historical; governance; biophysical; socio-cultural, and economic and development characteristics.

Chapter 3: Situation Analysis

This chapter provides an overview of the significance of the Reserve and constructs the Reserve's strategic opportunities and the various challenges and threats currently facing it with a view to guiding activities and interventions over the management plan period.

Chapter 4: Strategic Planning Framework

This chapter discusses the strategic plan for the VMWR and presents the Reserve's future desired state: vision, mission and strategic management objectives. It also provides a theory of change and how to approach adaptive management.

Chapter 5: Implementation Plan

This chapter fleshes out the priority management responses and programmes for VMWR that will be implemented over the management plan period to achieve the future desired state.

Chapter 6: Zonation

This chapter details the spatial zonation of the VMWR and how this aligns to tourism and other management activities as well as in relation to neighbouring communities and the integration of VMWR into the TFCA.

2. DESCRIPTION

The content of the following sections of the GMP is derived from previous Master Plans. Only where new information has been added, has this been referenced.

2.2.8. Safety and security services (Police; Fire, etc.)

Security services in Rumphi and Mzimba are largely provided in two main categories: as public security services through the Malawi Police Service and as private security services through private security guard services such as Securicor (Malawi Limited), among others.

2.1. Establishment History

The area received its first protected area status in 1941 in terms of Government Notice (GN) 166 of 1941 when it was proclaimed as *Lake Kazuni Game Reserve*. In 1956 it was proclaimed as *Vwaza Game Controlled Area* under Game Ordinance GN 130 of 1956 and it became *Vwaza Game Reserve* under the Game Act in 1997 (GN 33 of 1977). Its current name came about in 1992 in terms of the National Parks and Wildlife Act of 1992.

Two boundary realignments took place: in 1985, to correct an anomaly of the 1977 proclamation and again in 1994 because of encroachment into the Reserve by some leased tobacco estates and in response to local pressure for access to land and water. Approximately 9km² of the Reserve were excised. The new boundary has neither been surveyed nor the changes gazetted.

The first Master Plan for VMWR came into effect in 1983. Subsequent updates were made in 2004 and again in 2016. The implementation record of the previous Master Plan is relatively poor due to inadequate allocation of requisite financial, manpower and material resources, notwithstanding earlier achievements towards attaining the conservation objectives of the Reserve through Global Environmental Fund (GEF), Norway and World Bank funded support projects.

2.2. Regional Context

2.2.1. Regional Location and Importance

The Reserve forms part of the Northern Region of Malawi and most of it is situated in the Rumphi District with a small section in the south falling in the Mzimba District – the largest district in Malawi (Figure 4; Table 1). The administrative centres or capitals of these districts are Rumphi (located about 42 km to the northeast of the Reserve) and Mzimba (located about 120 km to the south), respectively.

Rumphi District is 6,640km² with a land area of the district of 4,769 km² making about 4.03 % of the total area of Malawi (118 484 km²) and 5.05% of the country's total land area (94 276 km²).

Mzimba is the largest district by size not only in the Northern Region but in the whole country. It covers 8.8% of the total area of the country, followed by Kasungu and Lilongwe at 7,878 km² (6.6%) and 6,159 km² (5.2%), respectively. The total land area for the district is 10,382 km².

The capital of the Northern Region is Mzuzu, situated about 100 km, southeast of the Reserve.

Table 1. District Coverage of Reserve

District	Percentage (total area)	Area (km ²)
Mzimba	38%	371
Rumphi	62%	609

Together with Nyika National Park (NNP) and Kasungu National Park, it makes up the core Protected Areas (PA) of the Malawi component of the Malawi - Zambia TFCA. The Reserve's entire western boundary is along the Malawi-Zambia international border where it adjoins the Lundazi Forest Reserve (Figure 1).

NNP lies to the northeast of the Reserve – the closest distance between the boundaries of the two PAs is 8.2 km. Vwaza Marsh is created by water from the Hewe River that rises in NNP, Luwewe within the reserve and South Rukulu from Viphya Plateau.

Vwaza is important in the regional context from both a socio-cultural as well as ecological connectivity perspective. Within the TFCA context, it offers the only real opportunity for joint management and wildlife dispersal at a PA level between the two partner countries. Wildlife can and does move freely between the Reserve and the Luangwa valley in Zambia.

The Reserve is internationally known as a waterfowl habitat - the wetlands of Vwaza has been identified as a potential Ramsar site for waterfowl species and Palearctic and intra-African migratory bird species. It is also one of the most northerly locations in Africa for mopane.

In addition to its ecological value, the Reserve is also strongly associated with traditional culture, linked to spiritual sacrifice and burial rituals: it is well known for Iron Age smelting at Phopo Hill and as such has been included on the UNESCO tentative list of world heritage sites as a mixed category site (BirdLife International, 2022) (UNESCO World Heritage Convention, 2022).



Figure 4. District Boundary

2.2.2. Demographics and Surrounding Land Use and Tenure

2.2.2.1. Country and district context

The Reserve is set in a landscape that is substantially transformed through settlement and agriculture. There are ten traditional authorities (TAs) and four sub-traditional authorities within the districts. TA Katumbi, TA Chikulamayembe, TA Mtwalo and TA Mperembe (see Figure 5). TAs are important and powerful in the lives of people in rural areas. They exercise public authority on the local level: regulate village life, control access to land and solve disputes.

According to the National Statistics Office (2021) slightly over half of the population in Malawi lives in poverty. Analysis by place of residence shows that 56.6 % of people from rural areas were poor⁸ compared to 19.2 % in urban areas. At regional level, the Northern Region has the lowest proportion of poor population (32.9 %). At a district level – Mzimba's proportion of poor population is 38.6 % and Rumphi, 26.4 %. At a country level – the proportion of ultra-poor population is 20.5 % (rural 23.6 % and urban 3.3 %), at a regional level – the Northern Region has the lowest levels at 8.6 % with Mzimba District, 12.3 % and Rumphi, 2.9%.

The Global Hunger Index⁹ (GHI) provides an assessment of the level of nutrition and hunger in a country. It measures four variables including, undernourishment, and for children under five years of age, mortality, wasting, and stunting. On the general index, including all the variables above, Malawi's GHI score has improved from 43 (2000) to 21 (2021), on a scale from 0 to 100 where 0 shows no stress. Worryingly though the proportion of '*wasting in children under five*' was at an alarming 41% in 2021, although this too had declined from 55% in 2000. This is an important metric to consider when exploring the role of protected areas in a country and their contribution to people's well-being especially with climate change and its likely impacts.

Furthermore, most of Malawi is classified by the findings of the fifth edition of the Global Report on Food Crises¹⁰ as Phase 2 or 'Stressed' in terms of the Integrated Food Security Phase Classification, where households have minimal adequate food consumption but are unable to afford some essential non-food expenditures without engaging in stress coping strategies. Action is required for disaster risk deduction and to protect livelihoods.

Rumphi District's total population based on the 2018 census survey (National Statistics Survey, 2018) is estimated at 229,161 (with nearly as many females as males) with a population density of 50 people per km². The 2008 population census revealed that the district has a young population that comprises about 44% of the population under the age of 15 years. This is the same as the national rate and implies a relatively high young dependency burden. The Intercensal Annual Growth Rate (2008-2018) is 3.1%. The dominant tribe in the district are the Tumbuka with agriculture being the main economic activity. Maize, cassava, sweet potatoes, bananas, pigeon peas, cow peas, soya beans, ground beans, wheat, chillies, paprika, fruits, macadamia, cashew nuts, groundnuts, tobacco, rice, millet, Irish potatoes, and coffee are the crops grown in the area (Rumphi District Assembly, 2009).

According to the National Water Development Programme (2011) the **Mzimba District** has a population of about 524,014 comprising 6.2% of the country's population. Between 1987 and 1998, the population of the district increased by 40.9% representing an inter-censal growth rate of 3.1% per annum. According to a 2008 census report, the population is expected to increase to 1,107,363 by 2022.

Agriculture is the main economic activity, which has ca. 6,000 km² of arable land. In the 2001/2002 agriculture season, 35% (ca. 2,000 km²) of the arable land was under cultivation by mostly smallholder farmers while the rest is under estates. Among the major crops grown in Mzimba are maize, millet, burley tobacco, oriental tobacco, ground nuts and beans.

⁸ Where the total poverty line is the cost meeting basic nutritional needs (that is, food poverty line) and then allowance for other basic needs (that is, the non-food poverty line). If a person's total expenditure is below the poverty line, the person is considered poor. An individual with consumption below the food poverty line is considered ultra-poor.

⁹ <https://www.globalhungerindex.org/about.html>

¹⁰ [Global Report on Food Crises - 2021 | World Food Programme \(wfp.org\)](https://www.wfp.org/publications/global-report-on-food-crises-2021)



Figure 5. Traditional Authorities (TAs)

2.2.2.2. Natural Resource Utilization around the Reserve

Natural Resources are becoming increasingly scarce outside protected areas, yet rural communities throughout the country are highly dependent on these resources. Recognising this the Department of National Parks and Wildlife (DNPW) has, as part of its Collaborative Management policy, embarked on permitting sustainable resource use of specified natural resources within the protected areas falling under the departments' jurisdiction. A target group assessment for the Nyika-Vwaza and Musalangu sub-components of the TFCA was carried out in 2020 which provides insights and understanding of the socio-economic and livelihood aspects of the communities around the Reserve (Nyanga, et al., 2022). The pertinent findings are briefly summarised below and in other sections of this chapter but for details the study report should be consulted.

A resource utilisation zone (ca. 394 km²) covering a strip of approximately five kilometres (aerial distance) inside the Reserve along the Malawian boundary has been established in which a Resource Utilisation Programme (RUP) is implemented. The main target community beneficiaries are those within a 5 km area outside the Reserve (ca. 458 km²). According to Nyanga, et al (2022), there are about 21,222 inhabitants within the 5km Resource Utilisation Programme (RUP) area around the Reserve comprised of 94 villages and 4,244 households.

The survey revealed that households generally have low levels of livelihood diversification and that in the Malawi sub-component, piecework (part time casual work) was found to be the most important income source, followed by agriculture then crafts/art. Households had significantly higher livestock units, agro-based assets and state of housing than those in Zambia although land-size was higher for Zambian households. The average household annual income in Malawi was USD 563.00, almost half of the national average (USD 1,377.00). Huge in-country income variability was observed reflecting a spectrum of extreme poverty to wealth in the communities (approximately USD 6.00 – USD 49,000). Additionally, education and food primarily accounted for annual household expenditure in Malawi.

Results from the vulnerability assessment of communities revealed consensus (70%) on their exposure to highly variable climate and other environmental shocks, including pest incidents, loss of livestock and human life to Human Wildlife Conflict (HWC; see Section 2.5.7), floods and extreme hotness. The period of November to February was identified as the peak hunger period, which also coincides with increased cases of HWC and reduced access to cash and low average household income.

The study also revealed general low awareness of benefits realised from conservation initiatives such as wildlife conservation and forest carbon trading/credits, despite moderate levels of knowledge regarding laws and regulation of wildlife and forest conservation.

About half of the land adjacent to Vwaza in Zambia is the Lundazi Forest Reserve. There are a few small villages in the northwest adjacent to Mowa. The land outside the Reserve in Malawi, right up to the boundary, is mostly used for agriculture by smallholder farmers on land occupied according to customary tenure (land that belongs to the people and held in trust and administered by TAs) or medium to large scale commercial farmers on leasehold land (estate land). Of the land available, about 40% is suitable for agriculture and about 20% of this is occupied by estates.

The main crops grown are maize and tobacco with some beans and groundnuts. Wetland gardens (dimbas) produce a variety of vegetables. Cattle have an important role in the traditional economy but numbers have declined partly due to inadequate grazing land and tsetse fly infestation compounded by breakdown in veterinary services and an increase in the prevalence of disease such as East Coast Fever. Other livestock kept include goats, sheep and pigs. There has been a promotion of small livestock rearing in the recent past around the border zone by various institutions including Ministry of Agriculture and TLC partly as an alternative livelihood strategy instead of poaching in the Reserve.

Farmers report continual depredations of their crops by wildlife from the Reserve, particularly hippo in the south but also monkeys, baboons, wild pigs and the elephant. This situation is exacerbated by the continued vandalism of the fence whenever it has been erected by Government.

Many of the small-scale farmers are unable to produce sufficient food to maintain their families. Primary causes cited are increasing human population, preference for tobacco farming while land is insufficient, declining soil fertility, rising farm input costs, poor food storage facilities, and periodic drought.

The land shortage has been aggravated by the proliferation of tobacco estates and in-migration of labour to produce tobacco. Some migration is seasonal but some of the labourers have settled and become tenant farmers.

Trees are the primary source of building material, fuel for domestic purposes, brick making and tobacco curing. In addition, logging of hard wood trees such as Mukula (*Pterocarpus chrysotrix*) for commercial purposes outside the Reserve mainly around Mwazisi area may pose as big threat to the Reserve if not checked as there are some few tree species existing inside the Reserve which may be targeted once those from outside are depleted (Department of National Parks and Wildlife, 2016). How the Reserve engages with its local communities is addressed in Section 2.3 and how these communities use resources within the Reserve in Section 2.7.4

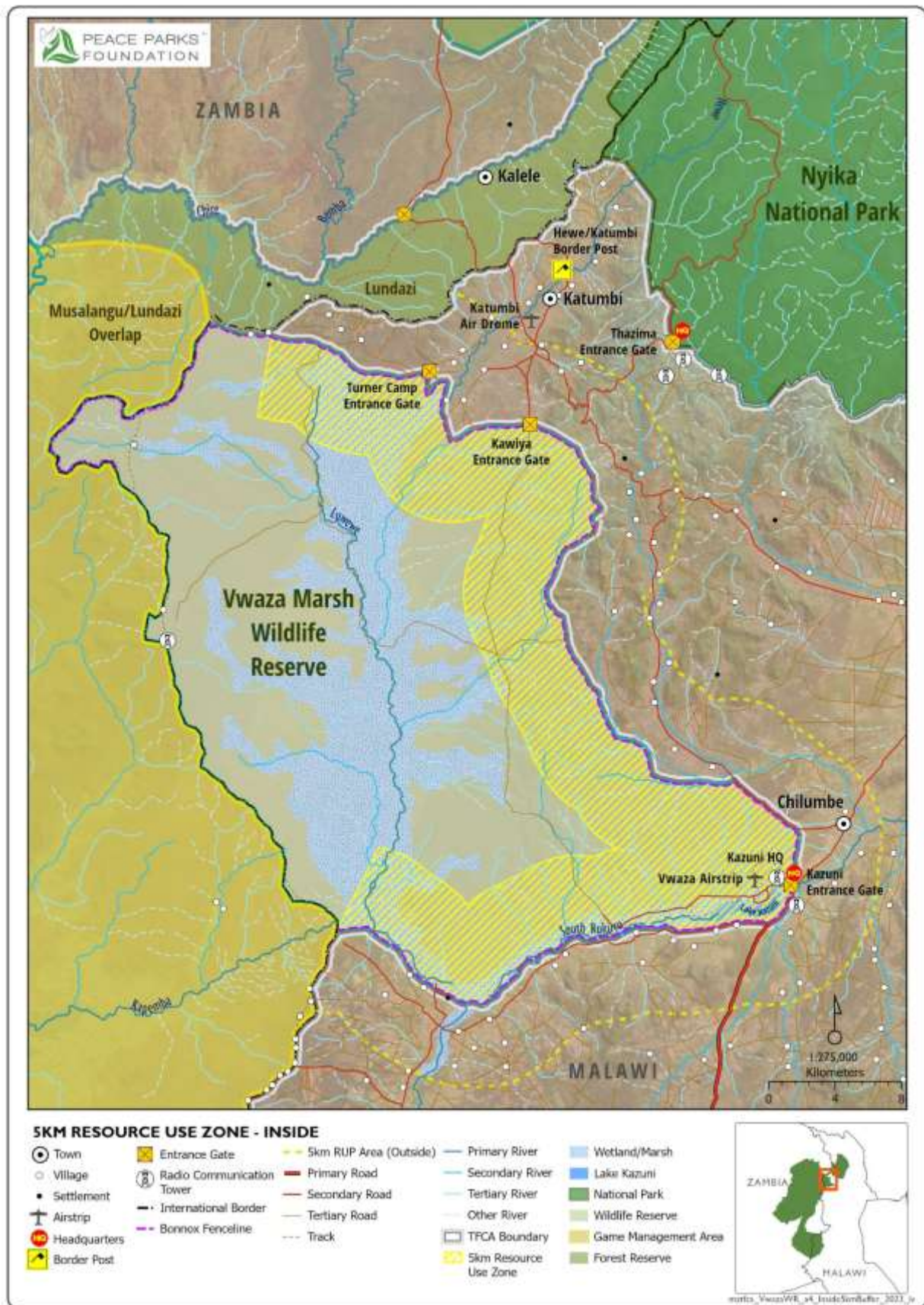


Figure 6. 5km Resource Use Zone (*Inside the Reserve*)

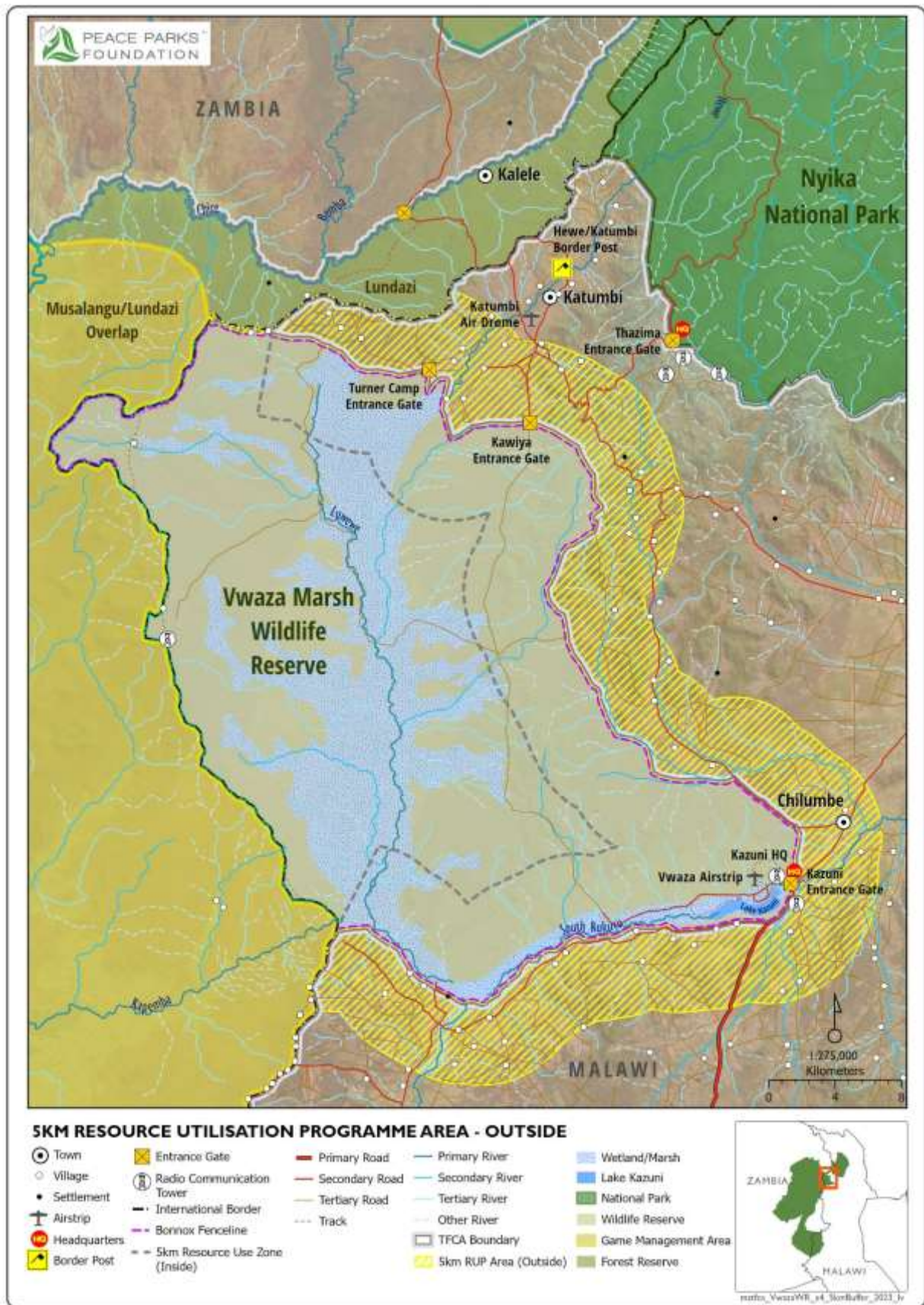


Figure 7. 5km Resource Use Zone (*Outside the Reserve*)

2.2.3. Regional Infrastructure and Services

The Reserve can be reached by road and air. The M1 is the main north-south road. From the M1, the T308 secondary road connects eastwards towards Rumphu and the M24 onwards to the M9 providing access to NNP and Vwaza. The S104 leads northwest from the M9 via Katumbi to the international border and border post with Zambia, located at Hewe/Katumbi. Kazuni can be reached by a 30km all-weather gravel road from Rumphu.

From the main roads, most villages are accessed by unpaved feeder roads, some of which are accessed only by foot or two-wheel vehicles and often made inaccessible during the rainy season. Other than the airstrip in the Reserve at Kazuni the closest airstrip in Malawi is in Mzuzu.

According to (M'mbelwa District Council, 2017) the most common source of water for communities in Malawi are boreholes, however, involving little treatment practices. The most common energy source for domestic use in the communities was firewood followed by charcoal, both key contributors to deforestation. Most have no access to hydroelectric power and so use batteries, solar technologies and candles for lighting.

2.2.4. Water and Sanitation

The South Rukulu is the main water source for the area. However, the river is heavily silted due to riverbank cultivation. In 2004, 104,689 people counted towards the population without access to safe drinking water. Only 53% of the households have access to safe drinking water (piped, boreholes and protected wells). The Northern Region Water Board is the main supplier of potable water in the urban and peri-urban centres in the district. Nonetheless, Mzimba faces water shortages throughout the year.

The analysis of district data on water supply clearly shows that boreholes are the main sources of safe water. There is a total of 5,840 safe water points in Mzimba District, of which boreholes constitute 51% (2,379 water points). About 34% of households use water from protected wells (1,992 water points) and 15% of households use water from community standpipes 901 water points (National Statistical Office, 2017).

2.2.5. Electricity/energy

According to the Malawi Demographic and Health Survey (2015-2016), 13.7% of the households in Mzimba District use electricity, 17.3% use solar panels, and 86.3% use solid fuels (firewood/charcoal, paraffin/candle). Many households use more than one energy source. Electricity Supply Corporation of Malawi Limited (ESCOM) and Electricity Generation Company (Malawi) Limited EGENCO are lead agencies in the Malawi Rural Electrification Project (MAREP). This project aims at increasing access to electricity for over 20% percent of the population in the district through MAREP and construction of an electricity generation plant.

2.2.6. Health and education services

Mzimba has poor quality and access to education services at both primary and secondary levels and low education levels among girls and women. According to the Mzimba SEP (2017-2022), education, health, water and sanitation, transport, and communications are the major services provided in the district. People have limited access to these services due to poor and inadequate delivery systems. Education, health facilities, and personnel are all inadequate.

2.2.7. Extension services (veterinary, agriculture)

All extension services are provided for through Government of Malawi staff under Community Development and Agriculture and NGOs. There are four major services that are offered across the region, these include: agricultural extension services, crop production services, land resources conservation services, and animal health and livestock development services. The shortage of personnel severely affects the effective provision and delivery of agricultural extension services thereby contributing to low yield and the continued adoption of inefficient farming technologies. The core business of forestry extension services in the district is the promotion of participation and empowerment of local communities and the private sector in forestry conservation, management and sustainable harvesting. There

are 160 forestry extension workers working in several areas in the district, 1 forest extension worker to about 5,457 people, on average.

2.3. Reserve Governance and Management Arrangements

The Parks and Wildlife Policy defines a new institutional framework for the wildlife sector in which the Department of National Parks and Wildlife acts as the focal point and seeks support for wildlife conservation from individuals and organisations from all segments of Malawian society and the international community. To promote Collaborative Management of wildlife for conservation and sustainable development.

The Department of National Parks and Wildlife in collaborative conjunction with communities, NGOs, NVA, Districts and the private sector will;

- protect wildlife against illegal use;
- manage the national parks wildlife Reserves and other areas under its authority;
- manage human-wildlife conflicts in an integrated and holistic way;
- build up capacity in the sector; and
- develop, co-ordinate and promote wildlife-based tourism.

Notwithstanding these responsibilities, it is important that any future support must be long term and must address these systemic problems. To this end, the CMA between PPF and DNPW will work to long-term partnership and support for current and future projects.

To implement the CMA an independent Trust will be established and with a Board of Trustees, it shall be registered to manage the resources and commercialise the natural resource-based opportunities which VMWR offers. The Trust will assume the rights and responsibilities include:

- Appointing the Chief Executive Officer of the Trust
- Approving the Annual Work Plan and Budget prepared and submitted by the Project Management Unit (PMU)
- Reviewing and approving the strategic recommendations submitted by the PMU which have impact on community development, conservation development and tourism development aspects of the project
- Reviewing and approving the Annual Technical and Financial Report
- Approving the Land Use Plan and Business Plans for Nyika and Vwaza; and
- Approving all agreements for the development of forest and wildlife projects as well as tourism operators and/or concessionaires.

2.3.2. Resources

The Reserve has three main sources of funding. These are the Other Recurrent Transactions (ORT) for the recurrent cost, Development Budget either from Donors (Part I) or from Malawi Government Sources (Part II). The third source are the resources from the Treasury Fund. This is the money that locally generated from both non and consumptive tourism. Financial allocation and accounts are controlled by the head of the Division based in Mzuzu.

Staff salaries are not reflected in Reserve allocations. There are a few fundamental problems with the financial management System that result in an irregular and unreliable flow of income and make it difficult for park managers to plan and control expenditure.

Management has been severely constrained by lack of resources, especially funding in the last three to four decades. However, there have been a few more financially flush periods where funding has been made available (German Agency for International Cooperation (GIZ) 1993-2003), World Bank - GEF and Royal Norwegian Embassy (2011-2017), Federal Government of Germany through KfW (2017-2023). Unfortunately, these 'flush periods' have often resulted in a splurge in building infrastructure, purchasing vehicles and equipment and supporting staff either directly with salary support or providing funding for rations, uniforms etc.

The consequences when the funding cycle ends is a dramatic decline in management's ability to continue while the assets either cannot be used for lack of funds and/or are not maintained. Assets which are not maintained seem to deteriorate exponentially. When the next funding tranche is secured, a large portion is spent repairing the deteriorated assets and the cycle starts again. Furthermore, during this process, government funding may be cut back during the funding cycles, but not restored when they end. This ebb and flow of funds has proved very disastrous.

Considerable infrastructure, equipment and training have been delivered under the World Bank - GEF and KfW Projects to enable staff to manage the Reserve effectively. It is important therefore that any future support must be long term and must address these systemic problems. Infrastructure, especially buildings, can be very useful and contribute to management efficiency but can also be a liability.

The Reserve's current equipment and infrastructure inventory and condition along with the Reserve's needs for continued and efficient management can be found in Appendix 2.

2.3.3. Law enforcement

Law enforcement in the Reserve is undertaken under the auspices of the Malawi-Zambia TFCA Transformative Law Enforcement Strategy, 2020 – 2024. This followed the Law Enforcement Risk Assessment report that unveiled several operational challenges that requires addressing to improve effectiveness in securing resources and safeguarding communities around the Reserve. The two documents resulted in the development of DNPW standard operational procedures (Use of force, Serious incident reporting, Firearm handling and control, Household search operations, and DNPW code of conduct, and Human Right Curriculum for rangers).

The strategy provides the framework for wildlife management and wildlife related law enforcement within the Reserve with the following objectives:

- Improving and strengthening field level operations in the protection of wildlife resources
- Minimising wildlife crime and illegal trade in both live and wildlife products
- Enhancing legislation and judicial adjudication of wildlife crime cases
- Enhancing inter-agency collaboration in combatting wildlife crime and illegal trade at national and transboundary levels
- Integrating people and nature in conservation and development (i.e., engagement and involvement of community structures in decision making processes).

Successful convictions are recorded by a park level administrator in the DNPW online national database (see Appendix 2).

Law enforcement efforts have been historically hindered by:

- Difficulty in deploying patrol teams by vehicle to more remote areas of the Reserve due to poor condition of roads especially during the rainy season.
- Some collaboration between some law enforcement staff and poachers.
- Understaffing of law enforcement personnel
- Low penalties in general for convicted poachers which may be a thing of the past as the new wildlife legislation bill was passed in parliament in December 2016. What remains is assenting to it by the State President of the Republic of Malawi.
- Shortage of patrol equipment due to wear and tear and insufficient resources for maintenance. The challenge is in procurement and consistency resupply of good quality field equipment.
- Fence vandalism exacerbated by poor policing of the same by the neighbouring communities.

2.4. Stakeholder Engagement

How protected area management engages with stakeholders at international, national and PA levels including relevant institutional arrangements to support the management of the PA including but not limited to:

- Relationships constructed on a needs and project basis – mainly use the TFCA structures
- Government Ministries and Departments – International (TFCA) and National
- Regional and District Councils
- Traditional governance structures
- Community action units: Natural Resources Committees (NRC); Village Development Committees and Nyika-Vwaza Association
- Private sector (tourism, other relevant sectors)
- CBOs, NGOs and other support agencies.

Current TFCA and PA operational level agreements include:

- Agreement for carbon development, carbon rights and benefits sharing between DNPW and Terra Global Capital, LLC, September 2013
- Other KfW and other support organisation related projects that benefit Vwaza (inside park and in its resource use zone)
- Co-management agreement between PPF and the Government of Malawi through DNPW, for the sustainable development and management of NNP and VMWR

2.4.1. International Level (TFCA)

The Transfrontier Management Unit (TMU) engages with the VMWR management team through the TFCA organisational structure below. Through this structure, any international partners who do not engage directly with the DNPW office, do so through the TMU).

The TMU's functions which were stipulated in the TFCA treaty were refined during a meeting of the two Departments of National Parks and Wildlife, KfW, and PPF held in Chipata in May 2019. The key functions of the TMU, include amongst several, the following:

- Coordination;
- Interim implementation until a Special Purpose Vehicle (SPV) is put in place, which will take over the implementation responsibilities;
- Project Management;
- Finance Management, Procurement, and Human Resources;
- Joint Operations Coordination; and
- Coordination of implementation of various blocks (Field Coordination)

2.4.2. National Level

Within the Ministry of Tourism, Culture and Wildlife, DNPW is responsible for the management of VMWR and has oversight over the buffer zone as regards conservation-related issues. Together with the DNPW, the Department of Agriculture has active extension services. Its focus lies mainly on teaching farmers modern agricultural practices. The Departments of Fisheries and Mining are not active in this landscape but are, however, found present and active at council level in other districts. Settlements in this area are largely controlled by traditional leaders who allocate land.

The national forests and forest Reserves are administered by the Forestry Department. Other government stakeholders include the Fisheries Department and the Department of Forestry. In both countries, the District Councils are key stakeholders and provide for coordination amongst all relevant stakeholders.

2.4.3. Park level

The stakeholders identified in the list below provide the basis for understanding the Reserve's management issues and for devising management strategies and interventions to conserve biological diversity, especially regarding the Collaborative Management Programme. However, it must be pointed out that the analysis is from the point of view of DNPW staff.

- Border Zone Communities including NRCs, and the Association
- Traditional Authorities
- Community police forum
- Traditional healers
- Tour operators

2.4.3.1. Community Action Units

NRCs are the institutional structure through which DNPW works and liaises with communities within the resource use zone to the Reserve. Each member in these committees represents local communities.

The NRCs of the Reserve as well as NNP are represented by the Nyika Vwaza Association (NVA) for natural resources and rural development target group assessment and selection criteria for beneficiaries (conservation project interventions).

According to (Gross & Shaba, 2022), A 5km belt adjacent to the VMWR as well as NNP was defined as border zone area (DNPW 2018). This zone encompasses communities to benefit legitimately from a resource utilisation programme. For the operation of the resource utilisation programme Natural Resource Committees (NRC) were set up and a Collaborative Management Agreement was signed (DNPW 2017).

The NRC is the institutional structure through which DNPW works and liaises with communities. Each member in the committee represents local communities (DNPW 2018). The NRCs of VMWR and NNP are represented by the NVA for Natural Resources and Rural Development.

A record of HWC and related law enforcement statistics can be found in Appendix 2.

Table 2. Natural Resource Committees of Vwaza Marsh Wildlife Reserve

ZONES	NATURAL RESOURCE COMMITTEE (NRC)	NUMBER	TRADITIONAL AUTHORITY (TA)
1. Zaro Zone	Pembe NRC	4	TA Zolekere
	Chasamba NRC		
	Manoro NRC		
	Zaro NRC		
2. Encisweni	Emcisweni NRC	4	TA Zolekere
	Mhungulu NRC		
	Chibangalala NRC		
	Kampondo NRC		
3. Kabira	Bongololo NRC	4	TA Zolekere
	Senyamutuli NRC		
	Kabira NRC		
	Mthandaviyuni NRC		
4. Thunduwike	Chamusisi NRC	6	TA Zolekere
	Chinofu NRC		
	Pholozi NRC		
	Kapili NRC		
	Chidika NRC		
	Kasangani NRC		
	Vwandamire NRC		

ZONES	NATURAL RESOURCE COMMITTEE (NRC)	NUMBER	TRADITIONAL AUTHORITY (TA)
5. Kazuni	Kasindwe NRC	4	TA Zolekere
	Tafika NRC		
	Kazuni NRC		
6. Lake Kazuni	Lake Kazuni NRC	5	TA Mtwalo
	Kapyolambavi NRC		
	Munyenda NRC		
	Magogo NRC		
	Nderendere NRC		
7. Bowe	Bowe NRC	5	TA Mtwalo
	Kamalaviwinda NRC		
	Phetekezi NRC		
	Phopho NRC		
	Malepete NRC		
8. Lusani	Kalakalaka NRC	4	TA Chikulamayembe
	Kawongozi NRC		
	Katope NRC		
	Lusani NRC		
9. Kamphenda	Kamphenda NRC	4	TA Chikulamayembe
	Kasele NRC		
	Waliro NRC		
	Magalasi NRC		
10. Mphangala	Bululuji NRC	3	TA Chikulamayembe
	Sinjiliheni NRC		
	Kankhoka NRC		
11. Chankharamu	Chiyora NRC	4	TA Chikulamayembe
	Chitanga NRC		
	Kapatamawe NRC		
	Chankharamu NRC		
12. Mwazisi	Msulira NRC	3	TA Chikulamayembe
	Kayora NRC		
	Kapangamawe NRC		
13. Zolokere A	Katikwi NRC	5	TA Mperembe
	Mphora NRC		
	Baliro NRC		
	Masato NRC		
	Jandalavu NRC		
14. Zolokere B	Chantchonthi NRC	4	TA Mperembe
	Lumphawa NRC		
	Kanyenjere NRC		
	Kazganthundulu NRC		



Figure 8. NRC Zones

2.5. Biophysical Characteristics

2.5.1. Climate

Albeit that recent information is not available, the rainy season is considered to start in November – mean annual rainfall is about 1,123 mm with a range of 738 to 1,880 mm. There is a pronounced wet season from November to April and little or no rainfall during the months of May to September. The rainy season in Central Africa is associated with the movements of the Congo Air Boundary and the Inter Tropical Convergence Zone. These two air circulation systems shift north and south of the equator with the changing incidence of insolation through the year. In-situ convergence and convection are the cause of most rainfall in the region, locally modified by orographic effects. Rainfall distribution varies across the Reserve rising from 800 mm in the south and west to 1,100 mm in the northeast (see Table 2). During the rains, winds are predominantly from the north and northwest.

Historically recorded mean annual maximum temperature is about 28°C with highest temperatures during the late dry season up until the start of the rains (September to November) of about 36°C. The mean annual minimum temperature is about 16°C with lowest temperatures during the early dry season (May to August) of about 7°C. The coolest month is June when average daily minimum temperatures are 14°C and the hottest, November when average daily maximum temperatures are 30.0°C. During the hotter months (September to April) temperatures in the Reserve can thus be very high and the uncomfortable effect is augmented by high humidity during the rains (McShane, 1985).

2.5.2. Physiography and (catena) ecosystems

Vwaza is located on the Central African Plateau; on a triangular fragment of continental crust surrounded on three sides by the relatively recent Lake Malawi Rift, the older Luangwa Rift and the Urema graben. The Reserve is located near the northern apex of the triangle on the watershed between the Luangwa and Lake Malawi rift valleys.

The geological setting of Vwaza (Figure 9) dates back to the Palaeozoic period about 250 million years ago, associated with the Karoo sediments of Majimalala Ridge, the Mesozoic period 150 million years ago resulting in the formation of Kapata Hills; the Mesozoic period 70 million years ago resulting in the formation of a small portion of Karoo sediments at Majimalala Ridge which was the beginning of the African erosion cycle; the Cenozoic period 10 million years ago resulting in the formation of a line of Luwewe River and the western side of Vwaza Marsh running along the north-south axis, extending from north into Zambia along the Bembe River and South Rukuru resulting in the formation of Zaro Pool; and lastly the Cenozoic period 3 million years to the present whereby the western area might have extensive marsh before silting up or being drained by cutting of streams through the alluvial levee which may have accounted for high level of water at Lake Kazuni, and the area 10 km of the South Rukuru valley west of the Lake Kazuni where there are sporadic unconsolidated deposits of pebbles of vein quartzite. (McShane, 1986).

Broadly, the western half of the Reserve bordering Zambia, comprises plateau Miombo woodland, clay soils dominated by Mopane (*Colophospermum mopane*) woodland and wetland marshes, while the eastern half of the Reserve contains Miombo and broad-leaved (*Combretum*) woodlands in the foothills of the Nyika plateau. The Reserve is predominantly flat with an average altitude of approximately 1,125 m. The lowest point is at Lake Kazuni (1,082 m) in the southeast and the highest point is 1,660 m at Mahobe Hill in the northeast.

All streams and rivers in the Reserve flow into the South Rukuru River on the southern boundary. Most of the area drains internally into the Luwewe River which rises from the Vwaza Marsh in the north. Vwaza Marsh is supplied by the Hewe River that rises in the south-eastern hills of NNP. East facing slopes of the eastern hills drain into the Mphangala Stream. The South Rukuru is no longer a perennial river (albeit that it is the biggest and longest river in the Mzimba District and the Northern Region), and the Luwewe is reduced to a series of pools during the dry season. Stream flow and water tables in the Marsh and Luwewe River have declined over recent years. Reasons for the decline are unknown but are probably due to a combination of lower average annual rainfall over the last 15 years; increased abstraction from the Hewe catchment; and degradation of the catchment through subsistence agriculture.

The extent of change in stream flow and water tables has not been measured. Lake Kazuni is also shrinking due to siltation. Water development structures are addressed in Section 2.7.2.2

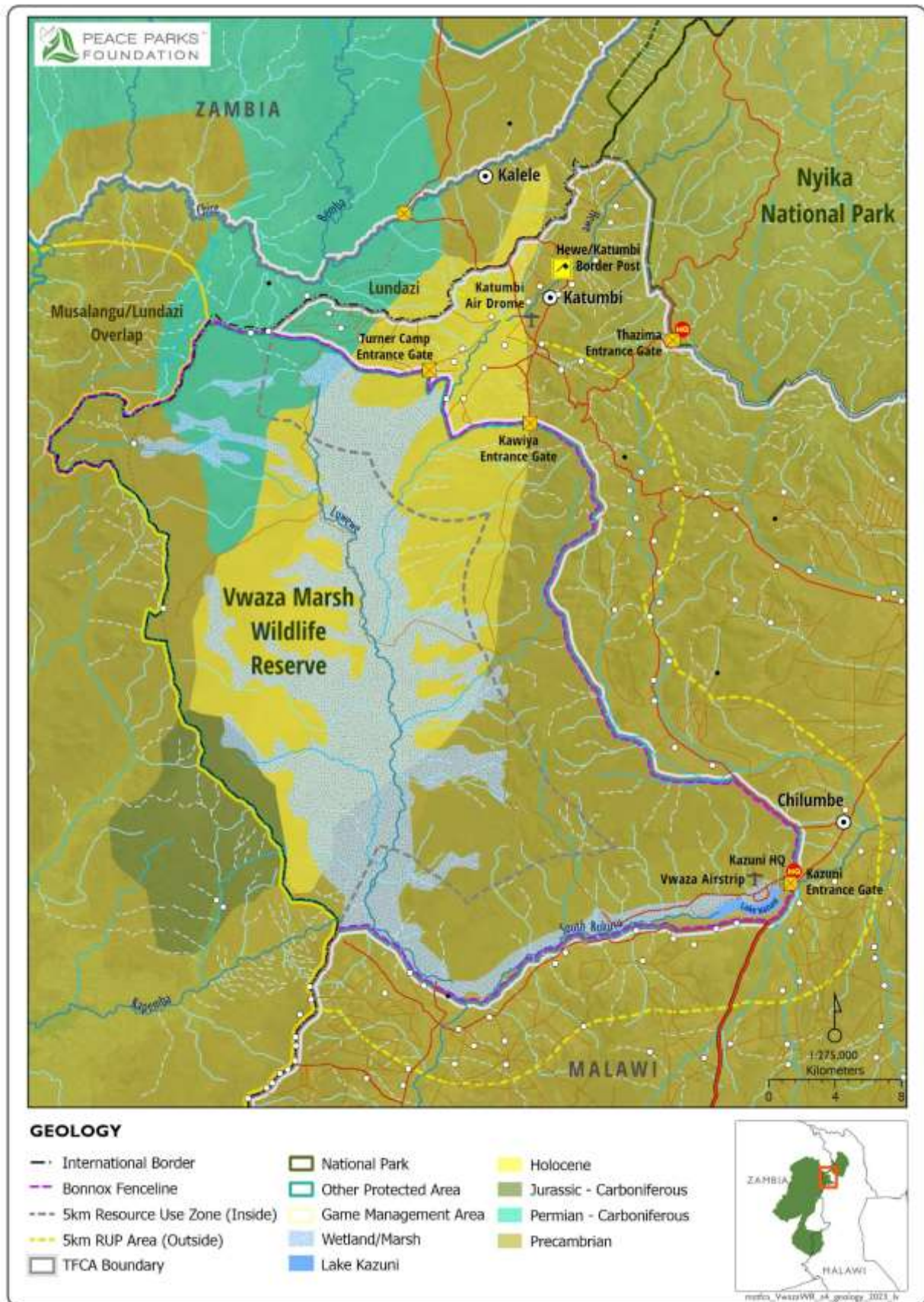


Figure 9. Geology

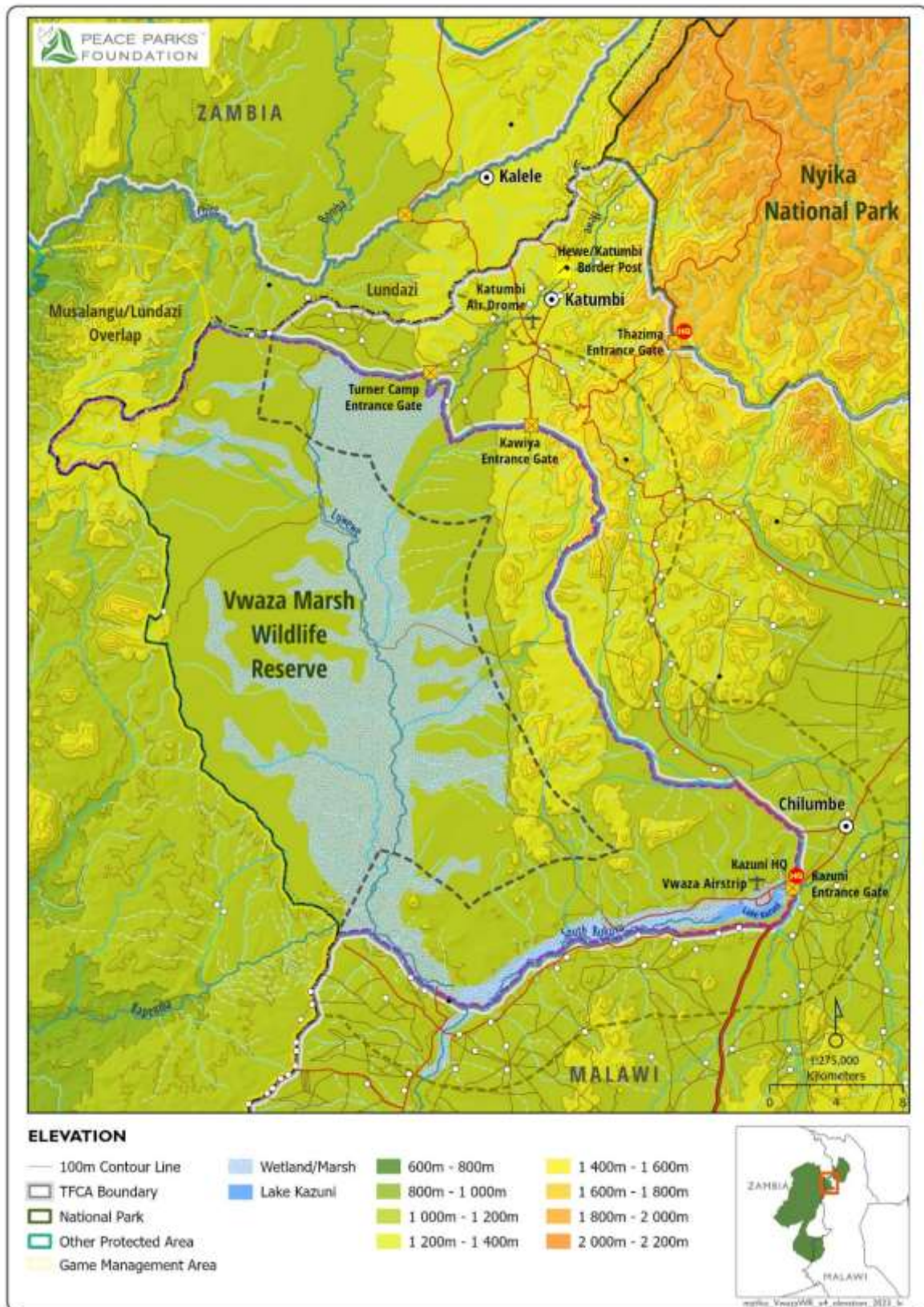


Figure 10. Elevation

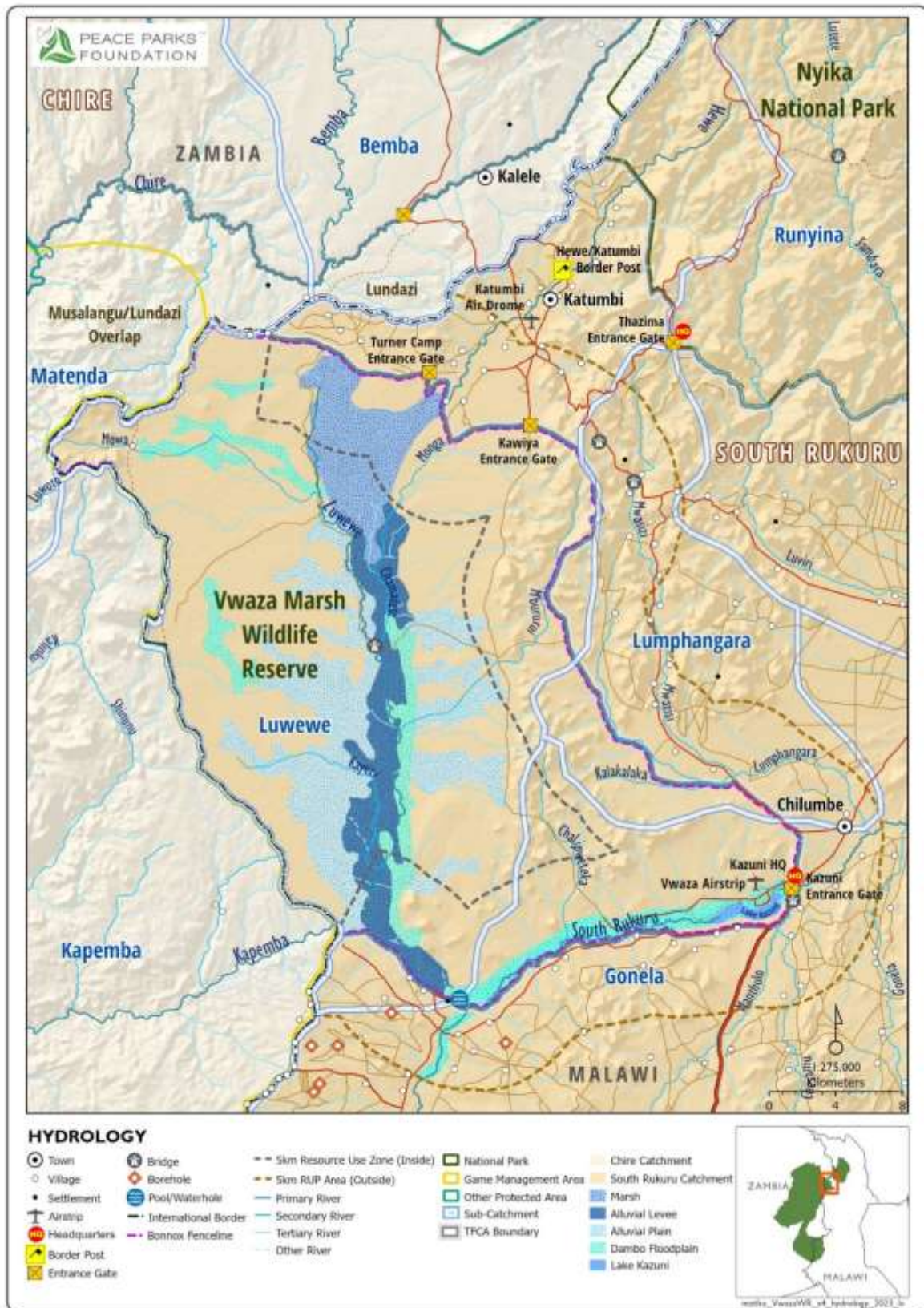


Figure 11. Hydrology



Figure 12. Soils

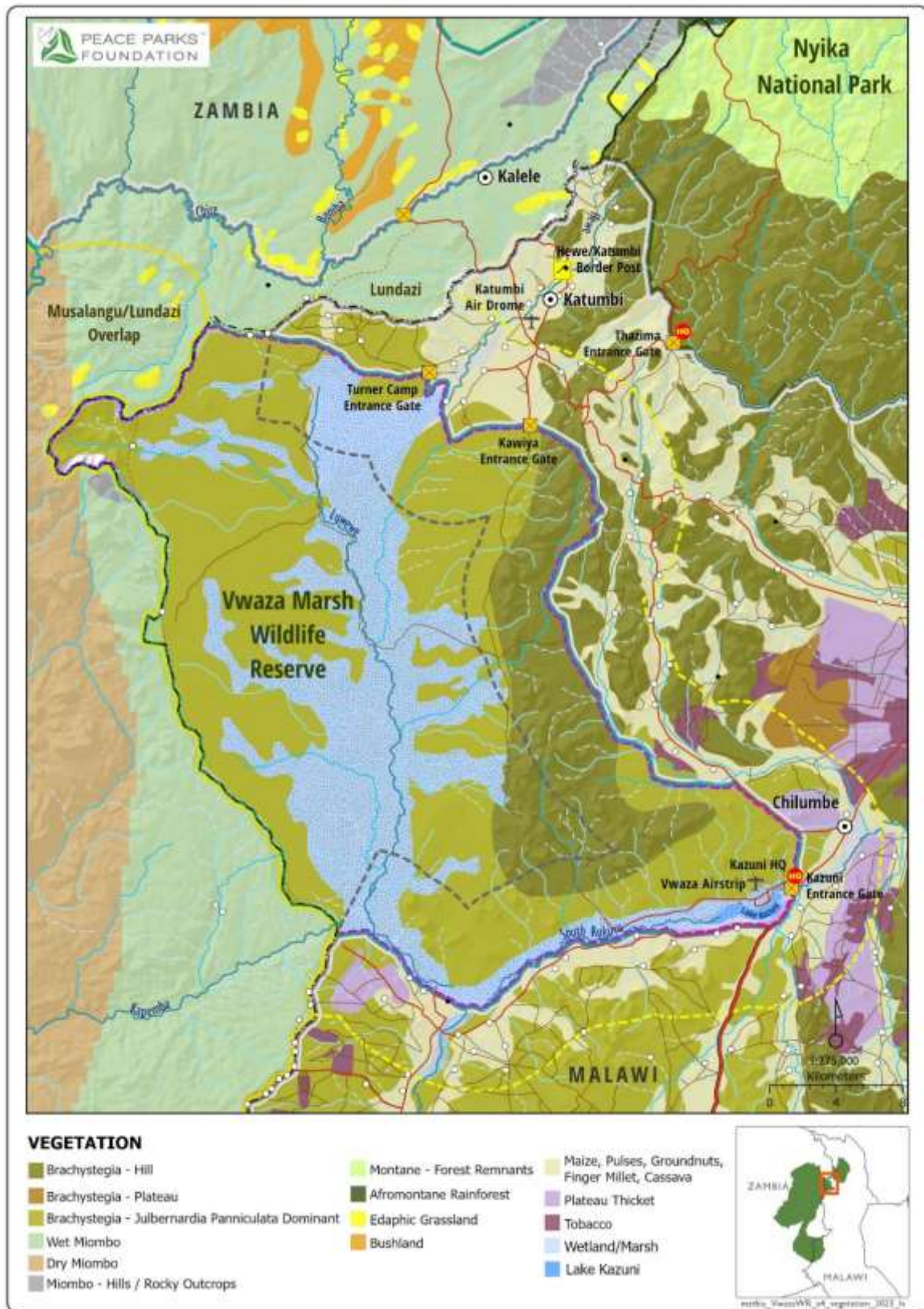


Figure 13. Vegetation

A more detailed description in terms of the Reserve's landscape units based on the survey McShane (1985) undertook in the mid 1980s, is provided in Table 3. Hierarchical Classification of Landscape Units Per Sub-region and Landscape Area. For each landscape unit, a summary of geomorphology, soils

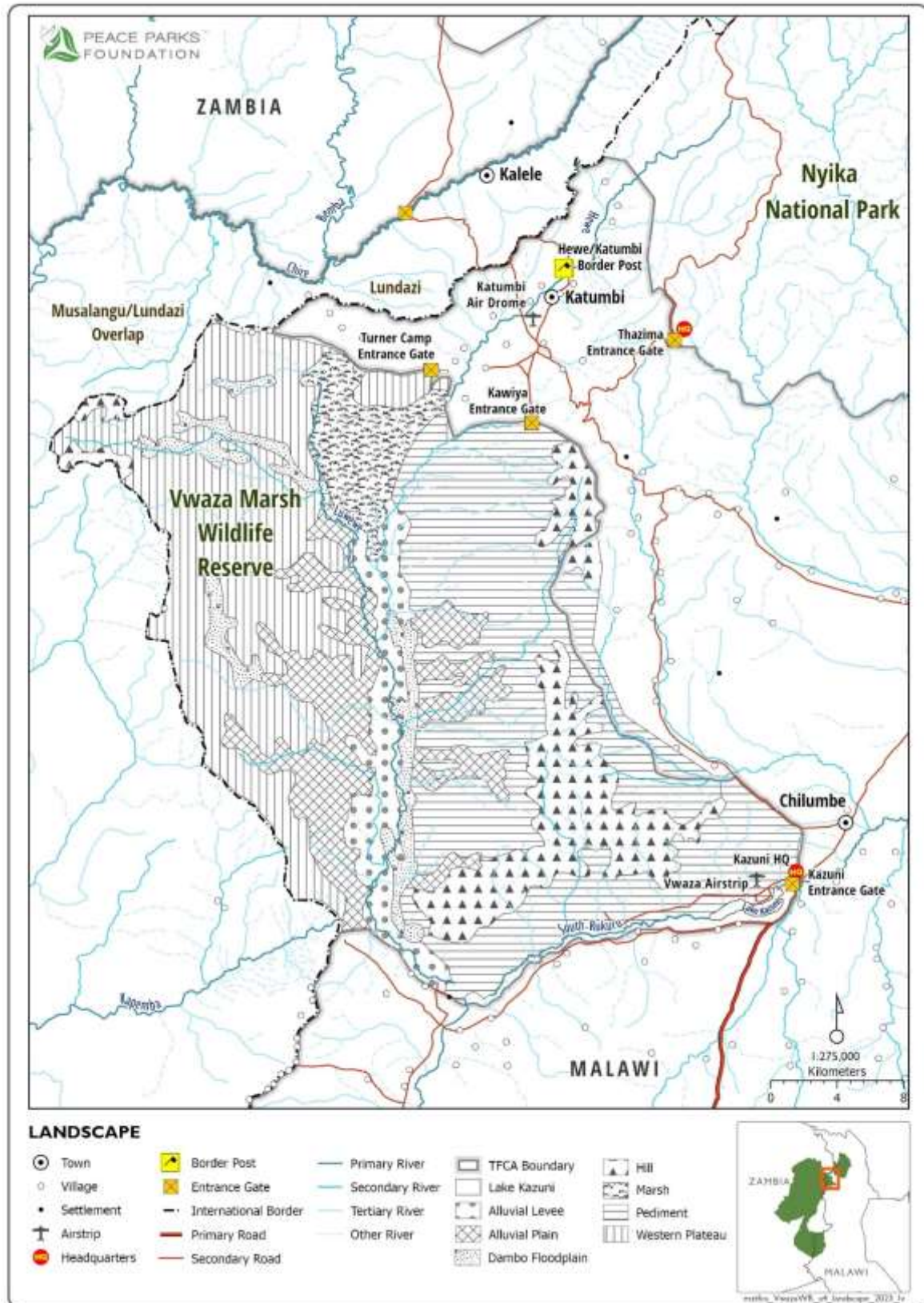


Figure 14. Habitat Classification (Adapted from McShane & McShane Caluzi, 1988)

Table 3. Hierarchical Classification of Landscape Units Per Sub-region and Landscape Area

(McShane, 1985)

Sub-region	km ²	%	Area	km ²	%	Unit	km ²	%	Rainfall (mm p.a.)	Drainage Densities
Plateau	225	23%	Western plateau	225	23%	Northwest plateau	72	7%	800-900	avg 2-3 km
						Western plateau	141	14%	800-900	avg 3-4 km
						Southwest plateau	12	1%	800-900	avg 3-4 km
Wetland-Alluvial	281	28%	Marsh	54	5%	Permanent marsh	2	0%	1,000-1,100	N/A
						Seasonal marsh	35	4%	avg 1,000	avg 3-4 km
						Marsh margin	17	2%	950-1,050 (west-east)	avg 2-3 km
			Alluvial plains	121	12%	Mopane association	49	5%	800-900 (southwest-northeast)	avg 3-4 km
						Thicket / mopane association	39	4%	800-850	avg 2-3 km
						Pediment alluvial	33	3%	800-900 (south-north)	avg 2-3 km
			Dambo floodplains	55	6%	Western plateau dambo	17	2%	850-900	avg 2-3 km
						Luwewe floodplain	24	2%	800-950 (south-north)	avg 2-3 km
						South Rukuru floodplain	14	1%	750-800	avg 2-3 km
			Alluvial levee	51	5%	Alluvial levee	51	5%	750-1,000 (south-north)	avg 2-3 km
Hills and Pediments	480	49%	Hills	151	15%	Northeast hills & valleys	24	2%	1,000-1,100 with extremes 800-1,800	< 0.5-1 km
						South-central hills & valleys	118	12%	800-900 (south-north)	< 0.5-2 km
						Western boundary hills	9	1%	800-850	0.5-1 km
			Pediments	329	33%	Western pediment	154	16%	850-1,100 (south-northeast)	avg 1.5 – 2.5 km
						Majinalala ridge	13	1%	800-850	avg 2-3 km
						Eastern pediment	43	4%	850-950 (south-north)	avg 2-3 km
						South-eastern pediment/thicket	54	5%	800-900	avg 3-4 km
						Southern pediment	65	7%	750-850 (south-north)	avg 2-3 km
Total	986	100%		986	100%		986	100%		

2.5.2.1. Western plateau

Northwest plateau

But for the Kapiri Wulungu and Kapiri Npalura Hills, this part of the Reserve is extremely flat, sloping gently from east to west with broad sour dambos. Soil parent material include heavily weathered crystalline biotite gneiss and quartzite. Soils are deeply leached sandy loams and loamy coarse sands, grading into sandy clay loams towards the eastern parts. Soils are generally moderately acid with high infiltration rates. Strongly ferallitic sandy latosols occur in areas of imperfect drainage.

Permanent water is located in the Mowa salient in the form of wells dug by villagers who occupied the area until the mid-1980s.

Poor quality miombo with 'bush clumps' characterise this unit. Along the international boundary medium high miombo woodland can be found including species such as *Brachystegia manga*, *Isoberlinia angolensis* and *Julbernardia paniculate* with some areas of *Uapaca kirkiana*, *B. spiciformis* and *J. globiflora*. Grasses tend to be short and sparse. This grades to the east into areas of mixed *Brachystegia* woodland which is more open with trees ranging from small to medium in height and grasses low to medium and denser. *Colospospermum mopane* can be found occasionally on termitaria.

Due to low fertility of the soils, animal densities tend to be low. Recorded species include roan and (previously) sable antelope, hartebeest, zebra and reedbuck. Species tend towards the west of this unit during the rains and are more common on the lower areas following burning in the dry season.

Western plateau

This unit is generally flat with a gentle but pronounced slope from west to east. Soil parent material is primarily undifferentiated crystalline biotite gneiss with a highly variable composition. Soils are shallow in the west to moderately deep in the east, generally sandy loams and well drained becoming more clayey, deeper, and less well drained towards the east. Soils are generally of low fertility and acidic with high infiltration rates.

Available surface water is scarce: surface water is reported to be available throughout most of the dry season in the headwaters of the Chamawe Stream.

The unit is characterised by mixed miombo woodland of medium to tall height with medium to closed canopy towards the west. Dominant species include *B. manga*, *B. spiciformis*, *J. globiflora* and *J. paniculate*. Here also, grasses tend to be short and sparse. The lower eastern parts are dominated by *Brachystegia* sps. as well as *Combretum* sps. with *C. mopane* occasionally on termitaria. The canopy here tends to be more open with trees of medium height and grasses of short to medium height and denser.

Typical miombo faunal species have been recorded here including roan antelope, hartebeest, and zebra at low densities with occasionally (previous) sable antelope and impala. These species occupy the western parts during the rains. Moving east in the dry season. Elephant have been recorded in small numbers through the year, moving across the international boundary into Zambia. Buffalo are widely scattered in this unit during the rainy season.

Southwest plateau

This unit consists of a flat plateau surface with underlying undifferentiated Karoo sediment extending from the Luangwa Valley, primarily composed of sandstones, siltstones, mudstones, and grits. Soil parent material consist of weathered crystalline biotite gneiss, quartzite and undifferentiated pebbles and sedimentary rock. Soils tend to be shallow to moderately deep and consist of coarse (in the west) and fine sandy clay loams (in the east) with sandier patches. Soils are moderately acid and of low to medium fertility and high infiltration rates.

There are no distinct drainage lines, and surface water is non-existent during the dry season.

Vegetation is characterised by mixed miombo woodland of medium to tall height including *Brachystegia* and *Julbernardia* sps. interspersed with patches of mopane wooldand and thickets dominated by *Combretum*

mossambicense, *Grewia monticola* and *C. bicolor*, usually confined to termitaria. The woodland tends to be generally shorter and thicket formation more common towards the east. Grass is short and sparse becoming denser towards the east.

Reedbuck and sable antelope have been recorded in the early dry season along with zebra. Movement of these species as well as elephant through the area into Zambia is evident.

2.5.2.2. Marsh

Permanent marsh

This part of the Reserve is waterlogged alluvial basin holding (less so today) permanent water throughout the year. Soil parent material is unconsolidated recent alluvium derived from the Hewe River. Soils are organic hydromorphic consisting of alluvial deposits of dark mucks, clays, and organic matter. These are extensively developed, and drainage is poor.

The unit occupies a low area in the drainage channel of the Hewe River where it enters Vwaza Marsh. Water is available year-round.

Vegetation is dominated by papyrus marsh (*Cyperus papyrus*) with patches of bullrush (*Typha Australia*) and bango reed (*Phragmites mauritianus*).

Little is known about the species which occupy this area during the rains. Occasional reports exist of hippo, buffalo are recorded along the edge of the marsh during the dry season as are reedbuck and roan antelope.

Seasonal marsh

This unit is characterised by a shallow depression or seasonally waterlogged alluvial basin drained at its southern end. This dries out at the end of the more severe dry seasons. Soil parent material is recent alluvium derived from the Hewe River with hydromorphic soils including alluvial deposits of mucks and clays of high fertility and low soil water infiltration. Soils are extensively developed with poor drainage. Termitaria with better drained soils of clay loams are scattered throughout.

Surface water throughout the floodplain tends to be seasonal, generally drying out at the end of the dry season, though some areas of perennial water exist.

Vegetation is characterised by seasonally flooded grassland including *Oryza barthii*, *Echinocloa* spp., and *Setaria* spp., with patches of *T. australi* and *Panicum mauritianus* on sites that tend to be perennially flooded. Termitaria are dominated by *Phoenix reclinatar*, *Acacia polycantha*, *Diospyros* spp. and *Kigela Africana*.

Hippo are known to occupy the larger pools during the rains while buffalo can be found throughout the unit. During the late dry to early wet seasons when water and food becomes limiting, animals congregate around the edges. Species common currently include large herds of buffalo, reedbuck, zebra, roan antelope and hartebeest. Eland and Puku have also been recorded. Lions are also present at this time of the year.

Marsh margin

This unit is dominated by raised banks and termitaria. Soil parent material is unconsolidated old alluvium probably derived from periods of high water and when the marsh was more extensive. Soils are dark brown to grey and clayey to loamy with clay loams associated with the termitaria. These soils are moderately drained with inclusions of clayey, poorly drained soils in depressions and are generally of high fertility.

The Luwewe River drains out of the southwest part of the unit and the Dela Stream out of the southeast. Water is perennially available in pools in both drainages.

Open grassland or glades characterise this unit with *Loudetia simplex* and areas of *Echinocloa* and *Setaria* spp. Most trees and thicket or 'bush clumps' are confined to raised areas and termitaria. Species associated with the termitaria

in these area include *C. mopane*, *Albizia harveyi*, *A. polycantha*, *A. tortilia*, *P. reclinata*, *Manilkara mochisia* and occasionally *Balanites segyiaca*. *C. mossambicense* and *Commiphora mollia* and *Euphorbia* sps.

Species commonly recorded include kudu, impala and eland, likely due to the palatability of the vegetation. Following burning and resprouting of grasses, grazers including roan antelope, hartebeest, zebra and reedbuck are common. Elephant are recorded occasionally, and buffalo are common along the marsh margins usually near perennial water. Lion have also been reported.

2.5.2.3. Alluvial plains

Mopane association

Located between the northwest plateau and the alluvial levee, this part of the Reserve consists of seasonally waterlogged depressions with many termitaria, frequently elongated on a NW to SE axis as if by water flow following the general slope of the land. Soil parent material consists of unconsolidated old alluvium derived from past flooding and periodic inundation. Soils are dark cracking clays and sandy clay loams, moderately deep to deep and poorly drained, grading into brownish moderately well drained sandy clay loams in the west and north. Dark brown sandy clay loams are associated with termitaria. Soils are of low to medium fertility, acid to moderately acid with low soil water infiltration.

Open glades and grassland with *L simplex* and *Setaria* sps. between termitaria characterise this unit. In the south and east, most trees are confined to termitaria and are dominated by *C mopane* (up to 15 m). Other species include *C. mollia*, *U. caerules*, *M. mochisia*, *Combretum* and *Euphorbia* sps. On better drained sites in the north and west, *C. mopane* is mixed with *Erachusteria allenii*, *B boehmii*, *B manga*, *Julbernarda* and *Combretum* sps. Grasses tend to be short to medium in height with high basal cover.

Both elephant and buffalo have been recorded to utilise this landscape during the rains, though are not common during the dry season. Following burning and resprouting of grasses in May and June, roan antelope, hartebeest, zebra, reedbuck and warthog are common. During the rains indications are that these species move to higher positions: west into the plateau woodlands and Luangwa escarpment and east onto the alluvial levee.

Deciduous thicket / mopane association

Located in the southwest of the Reserve, this unit consists of seasonally waterlogged depressions with numerous termitaria elongated along a single NW-SE axis. Soil parent material consists of unconsolidated old alluvium, overlying Karoo sediments of sandstone, mudstone and gravels, which extend from the Luangwa Valley. Alluvial levees associated with streams draining the plains are rare and poorly developed. Soils tend to be dominated by pale grey sandy clay loams, moderately deep and poorly to moderately well drained. Inclusions of heavy clays overlain by sand clay loams are common in the west producing the condition of a perched water table. Occasional surface deposits of gravel are also evident along the western edge. Generally, soils grade from heavy clays overlain by sandy clay loams and occasional gravel deposits in the west to deeper sandy clay loams in the east to southeast. Sandy loams are associated with termitaria. Soils are generally of low to medium fertility with low soil water infiltration rates.

Water is very rare to non-existent during the dry season.

The vegetation in the west and northwest is dominated by open, mixed woodland including *Brachystegia* sps. *J. globiflora* and *C. mopane* on well drained sites. Grasses are short to medium in height with medium to high basal cover. Termitaria located in areas of clays overlain by sandy clay loam caps are dominated by deciduous thicket including species such as *Turbina stenosphon*, *Mundulea sericea*, *Grewia bicolor*, *Ximinia caffra*, *C. mossambicense*, *Euphorbia* sps., *C. molla*, *U. caerulea* and occasional *C. mopane*. Open glades of grassland, including *L simulex* and *Setaria* sps., are found in the lower eastern parts of the unit with *C. mopane* the dominant tree usually associated with termitaria.

Elephant and buffalo are reported to use the area and move freely across the border into Zambia. Animals congregate on burned patches with grass regrowth during the early dry season. Species recorded include roan

antelope, zebra, hartebeest, reedbuck and warthog. Sable antelope have been recorded in the early dry season in the western parts.

Pediment alluvial

Located east of the Luwewe River, this unit consists of seasonally waterlogged alluvial plains, associated with seasonal flowing streams. These streams flow into broad depressions, with their channels becoming indistinct and then empty into the Luwewe River. The landform is moderately to gently sloped from east to west. Soil parent material is unconsolidated old alluvium in the plains with localised areas of new alluvium deposited along stream drainages during the rains and derived from material in the eastern hills and surrounding pediments. Soils are moderately deep to deep, dark grey cracking clays, of poor to moderate drainage and low soil water infiltration. Soils associated with high areas and termitaria are moderately well drained, sandy clays and sandy clay loams with moderate to high soil water infiltration rates. Soils are of medium fertility and moderately acid.

Some streams hold water through part of the dry season where their channels are well developed.

Vegetation consists of open glades of grassland including *Loudetia* and *Hyparrhenia* sps. ranging in size from medium to tall. Areas of short grasses exist in low areas. Most trees are confined to termitaria, dominated by *C. mopane*. Associated species include *Commiphora mollis*, *Schrebera tricholata*, *Rhus longipes*, *Lannea schimperi*, *Grewia monticola*, *C. bicolor*, *Albizia harveyi*, and *A. karroo*. On better drained sites *Brachystegia* and *Combretum* sps are found as is *Terminalia sericea*. *Combretum fragrans* and *Piliostigma thonningii* are common in open grassland.

Recorded animal species included impala, roan antelope, hartebeest, zebra, reedbuck and warthog. All utilise the landscape during the dry season, especially following grass flush after burning and move to the surrounding *Brachystegia* woodlands with the onset of the rains. Buffalo and elephant have been reported throughout the year with occupancy increasing during the early rains.

2.5.2.4. Dambo floodplains

Western plateau dambo

These are typical 'sour dambos' associated with the old level plateau surface in the western part of the Reserve. The dambos are wide and flat with no defined river channel and are waterlogged for much of the year. Large termitaria are common. The dambos flow from the interfluvium¹¹ along the western boundary of the Reserve, eastwards towards the alluvial plains and the Luwewe River. Soil parent material consists of unconsolidated alluvium derived from the interfluvium areas. Soils consist of pale sands of low fertility and high-water permeability along the dambo edges, while on the dambo floor, soils consist of pale grey sandy clays. Large termitaria dominated by sandy clay loams are common, often associated with patches of saline soil.

Permanent water can be found in the upper Mowa/Kawoyeka Dambo in the form of wells dug by previous residents. A waterhole which holds water for most of the dry season is reported to exist in the upper Chamawe Dambo.

Sour dambo grasses, located on the dambo floor, are dominated by *L. simplex* of medium height. Associated grasses include *Brachiaria brizantha*, *B. humidicola*, and *Tristachya superba*. Trees along the raised dambo margin include *B. manga*, *B. allenii*, *J. paniculate*, *Isobertinia angolensis* and occasionally *T. sericea*. Dambo margins are characterised by *Protea* sps. and *Syzigium cordatum*, with scattered *C. fragrans* and *Eorrasus aethiorum*. Termitaria include the trees *Manilkara mocharia*, *Cassia abbreviate*, *C. molle*, *Commiphora mollis* and *Hymenocardia acida*.

Animal species are most common following burning of the dambos in the early dry season. Recorded species include roan antelope, hartebeest, reedbuck, zebra, and warthog and occasionally elephant and buffalo. Little knowledge exists with regard to occupancy during the rains.

¹¹ A narrow, elongated and plateau-like or ridge-like landform between two valleys

Luwewe floodplain

This unit runs north-south along the Luwewe River that bisects the Reserve north-south. The river rises in from the Vwaza Marsh following an indistinct fault line or slight warp in the plateau surface forming a seasonally flooded belt parallel to the river, intersected by meander channels and dotted with large termitaria. The river joins the South Rukuru River in the south. Soil parent material consists of both old and recent alluvium derived from seasonal flooding of the river. Soils are derived from the seasonal flooding of the Luwewe River. They range from deep well drained stratified deposits of silty clay and sandy loams along the floodplain margins to deep, poorly drained dark grey cracking clays along the meander channels. Clay loams and sandy clay loams can be found on termitaria. Soils are of medium to very high fertility and moderately acid with low water infiltration.

Surface water is abundant in the main channel throughout the year, however, the Luwewe River's flow halts during dry years.

Tall grasses characterise the unit with *Hyparrhenia* sps, *Trystachua superba* and *Setaria sphanelata*. A narrow strip of well-developed riverine forest lining the Luwewe channel includes *Syzigium guineense*, *Rhus quartiniana*, *Tiliacora funifera*, *Bequaertiodendron magalismontanum*, *Diospyroa mespiliformia*, *Khaya nyassica* and *K. Africana*. Termitaria associated with the floodplain include *Diospyroa mespiliformia*, *C. mopane*, *A. harveyi*, *C. mollis*, *M. mochisia*, *C. mossambicense* and *Euphorbia* sps. Trees scattered in the floodplain include *C. fragrans*, *Piliostigma thonningii*, *Bauhinia petersiana*, *K. africana* whereas the floodplain edge is characterised by *Schelrocarya caffra* and *Terminalia sericea*.

Both elephant and buffalo utilise this landscape primarily during the rains. Elephant are also recorded at the end of the dry season moving into the area in search of water. Following burning of the floodplain (late July - August), most species of antelope move onto the floodplain to feed on resprouting grasses. Species include roan antelope, hartebeest, zebra, reedbeek and warthog. Both impala and kudu are common along the floodplain edge. Most species move into the adjacent woodlands during the rains. Lion and leopard are recorded along the river and floodplain. The unit also attracts many migratory waterfowl, specifically at Kayezi and Zaro Pool during the rains.

South Rukuru floodplains

This unit forms the southern boundary of the Reserve and is associated with the South Rukuru River which is the principal river draining much of the Reserve. It enters the Reserve at its confluence with the Luwewe River and leaves the Reserve in the southeast corner at Lake Kazuni. Soil parent material is deposited in the forms of unconsolidated alluvium, with old alluvium making up the floodplain edge and terraces while recent alluvium derived from seasonal flooding makes up the remainder. Landforms consists of a seasonally flooded belt up to 1.5 km on either side of South Rukuru channel, widening at Lake Kazuni to form an area of permanent marsh and open water. Pebble layers indicate that Lake Kazuni may have been substantially larger at one time. The river channel is characterised by a gully in the middle of the floodplain. Soils are a complex mosaic of alluvial fractions ranging from dark cracking clays to coarse sands. Deposits of silty and sandy clays and sandy clay loams exist along the floodplain edge and terraces, primarily derived from old alluvium. Deep, poorly drained dark cracking clays derived from more recent alluvium can be found in areas of seasonal and permanent waterlogging. Soils are of high fertility with areas of strong alkalinity though generally of moderate acidity.

Surface water is abundant in the main channel through the year. Flow in the river stops during dry years above Lake Kazuni. Seasonally inundated floodplain grassland dominated by 'sweet dambo' grass including *Echinochloa stagnina*, *E. haploclada*, *Stellaria palustris*, *Oryza barthii* and *Phragmites mauritanus*. Scattered trees are located on raised alluvial levees and along the floodplain edge, including *A. albida*, *A. polyacantha*, *A. pilispina*, *A. sieberana*, *K. Africana*, *Borassus aethiopum*, *Sclerocarya caffra*, *Lonchocarpus capassa* and *Ficus* sps. Common grass species are dominated by *Chloris gayana*, *C. virgata* and *Hypharrhenia* sps.

Hippos are common along the river with concentrations at Lake Kazuni and Zaro Pool. Buffalo and elephant regularly use the area – buffalo throughout the year and elephant at the end of the rains and early dry season.

Warthog and bushbuck are common with reedbuck and roan antelope recorded along the floodplain. The river and floodplain also serve as important focal point for migratory birds, especially waterfowl.

2.5.2.5. Alluvial levee

Closely associated with the Luwewe River and floodplain, this unit is characterised by a low alluvial levee about 25 km long and 3 km wide, best developed on the western side and cut in places by tributary streams entering the Luwewe. The soil parent material is dominated by coarse unconsolidated alluvium. Soils consist of moderately deep to deep well drained sandy loams and pale grey clay loams along the base of the levee and near tributaries. Soils are of medium nutrient status, moderately acid with moderate soil water infiltration rates near the base of the levee and high rates on the levee.

Water is scarce and limited to occasional pools in these tributaries.

Vegetation ranges from mixed *Brachystegia* woodland on the levee to mixed woodland on the slopes including *Brachystegia* sps. *J. globiflora*, *Pseudolachnostylis maprounifolia*, *Combretum* sps, *Terminalia* sps., *Dichrostachys cinerea* and *Pericopsis angolensis*. Species at the base include occasionally *C. mopane* and *C. mollis* on termitaria. Grass is short to medium in height and density.

Elephant occur throughout the year, but most common during the dry season. Both kudu and impala are resident while roan antelope, hartebeest and zebra are recorded during the rains, moving onto the alluvial plains and Luwewe floodplain after they have been burned.

2.5.2.6. Hills

Northeast hills & valleys

This unit is in the northeast corner of the Reserve consisting of steep sided hills rising 300 m above the surrounding pediments divided by highly dissected valleys. Soil parent material consists of biotite gneiss and migmatite with bands of micaceous phyllonite. Soils occur in two categories based on location: soils on the ridge tops are shallow to very shallow of variable texture (stoney and rocky); and the gentler slopes and valley floors are moderately deep and generally well drained sandy clay loams of moderate fertility.

Occasional pools and saline seepages occur in the drainage channels.

Vegetation varies based on location. Mixed *Brachystegia* woodland occurs on the ridge tops with low and sparse grasses. On the slopes, open canopy, broadleaved woodland are found including *Combretum collinum*, *U. zeyheri*, *Pterocarpus angolensis*, *Bauhinia petersiana*, *Piliostigma thonningii* and *Flacourtia indica*. Here, grasses are characterised by tall *Hypharrhenia* sps.

Elephant are recorded throughout the year and eland occasionally. Klipspringer, common duiker, Sharpe's grysbok and yellow-spotted hyrax are common – kudu have also been reported.

South-central hills & valleys

This unit covers the high country in the east-central and southern parts of the Reserve, characterised by steep sided rocky hills rising to 150 m and occasionally 300 m above the surrounding pediments. Most of these hills are smaller and more widely spaced than the north-eastern hills. Hills are separated by areas of broken rocky terrain and wider more open valleys. Erosion gullies are common. Soil parent material is dominated by biotite gneiss with bands of micaceous phyllonite and quartz schist occurring along some of the ridge tops. Soils vary in their position: on the hill tops and steep slopes soils tend to be shallow to very shallow and stoney and rocky. On the gentler slopes deeper and sandy clay loams are found. In the broader valleys, soils are moderately deep sandy loams and sandy clay loams. Soils are of generally low fertility and moderately acid. Soil water infiltration rates are moderate to high.

A few pools have been recorded in the area and saline seepages exist in some of the drainage channels.

Vegetation on hill tops is dominated by tall, closed canopy *Brachystegia microphylla* with *B. manga* following bands of better soils.

Rocky hill tops and ridges are dominated by thicket formations including *Landolphia parvifolia*, Mid-slope and mid-valleys consists of mixed *Brachystegia* woodland. Grass is short and sparse. Mid-slope areas in the steeper valleys down to the valley floor are often associated with thicket formations usually on the western side of the drainages. Species include *Craibia brevicaudata*, *L. parvifolia*, *Croton gratissimus*, *Grewia bicolor*, *Margaritaria discoidea*, *Combretum mossambicense* and *Vernonia amygdalina*. Grass is very sparse. Broader valley with gentle slopes, are characterised by open canopy broadleaved woodland dominated by *Combretum* sps. Grasses are primarily *Hyparrhenia* sps.

Elephant are common throughout this unit. Eland are also recorded as are kudu and impala. Klipspringer and yellow-spotted hyrax are also common. Buffalo move into some of the broader valleys during the rains.

Western boundary hills

This unit is characterised by low hills rising about 150 m above the surrounding plateau in the western part of the Reserve. Soil parent material is described as migmatite with possibly some biotite gneiss. Soils are shallow to medium in depth and tend to be rocky and stoney. Hill sides and upper pediments are medium in depth and sandy, while the lower slopes are primarily sandy clay loams.

Surface water has been recorded in the valley floors in the Mowa area primarily in form of wells dug by villagers. Vegetation is generally mixed *Brachystegia* woodland. Grass cover is short and sparse. Near hill bases and in the valley grass cover is of medium height with some 'sour dambo' formation. Trees include *T. sericea* and *Combretum* sps.

Elephant have been recorded as have kudu.

2.5.2.7. Pediment

Western pediment

This unit consists of a gently sloping pediment between the eastern hills and the Luwewe River. Incised river channels enter the pediment from the hills and become indistinct branching streams and broad wash fans. Soil parent material is probably dominated by biotite gneiss, with some alluvial deposits. Along the edge of the foothills and on the interfluvies between drainages and wash fans soils are well drained, moderately deep to deep sands and sandy clay loams. Soils are of low to medium fertility and moderately acid with high soil water infiltration rates. Along the drainages and in the wash fans, soils are moderately deep to deep dark clays, pale sandy clays and sandy clay loams subject to seasonal waterlogging in areas of impeded drainage. Soils are of medium to high fertility and moderately acid with moderate infiltration rates.

Surface water exists in pools and waterholes along some drainage lines. Some saline seepages exist near the foothills.

The edge of the foothills is dominated by mixed medium canopy *Brachystegia* woodland including *B. manga*, *B. spiciformis*, *J. globiflora*, *J. paniculate*, *Diplorhynchus condylocarpon* and *Afzelia quanzensis*. In the north, the species *B. bussei* and *B. boehmii* are also common. Grasses tend to be short and sparse. Along the drainage lines and wash fans more open canopy broadleaved woodland with tall *Hyparrhenia* sps. grass dominate with some areas of 'sour dambo'. *C. mopane* on termitaria are common in areas of impeded drainage. *C. fragrans* and *Piliostigma thonningi* are common on wash fans.

Due to diversity of habitat, most species are commonly recorded. Elephant utilise the *Brachystegia* woodlands during the dry season and move into the wash fans during the rains. Buffalo are common throughout during the rains and limited to areas close to surface water during the dry season. Eland, kudu and impala are recorded throughout the area moving into the drainage lines following burning and resprouting of grasses and woody vegetation in the dry season. Roan antelope, hartebeest and zebra are common in the *Brachystegia* woodlands during the rains, moving down to the wash fans following burning in the dry season.

Majinalala ridge

This unit is a slightly raised ridge – a steep bank of about 10 – 15 m overlooks the Luwewe River along the western edge. The soil parent material is probably biotite gneiss though gravel layers and fine sands indicate possible deposition in earlier times. Soils are moderately deep to deep, very well drained sandy loams, sands and fine sands recorded to at least 3 m below the surface. Along the western edge gravel deposits and shallow rock soils are located at the surface. Soils are of generally very low fertility and moderately acid. Soil water infiltration rates are very high.

No known surface water exists.

Vegetation is characterised by medium to closed canopy, tall *Brachystegia* woodland. Along the crest of the ridge and down the eastern side thicket including *L. parvifolia*, *Hippocratea Africana*, *Strychnos madagascariensis* and *Combretum* sps. is associated with the woodland. On areas of fine sandy soils species include *Uapaca nitida*, *U. kirkiana*, *J. paniculate*, *Isobertlinia angolensis* and occasionally *B. taxifolia* with no associated thicket. Grasses are short and very sparse. Rocky, stoney areas along the western edge are dominated by tall, open canopy *C. mopane*, *Combretum* and *Terminalia* sps. Grasses in this area tend to be of medium height and denser.

Elephant are found in the thicket areas during the dry season and buffalo and impala during the rains while kudu are found year round. Sable antelope have also been recorded.

Eastern pediment

This unit is located east of Chikatu Hill. It consists of a series of pediment sloping from west towards the valley of the Mphangara Stream in the east. The soil parent material is probably heavily weathered biotite gneiss. Soils are generally sandy and sandy loams, moderately deep to deep and well drained with sandy clay loam areas of impeded drainage. Near the interfluvium, areas of shallow coarse sands and gravel exist. Some areas of dark clay are in the Mphangara basin. Soils are of low to medium fertility and slight acid with moderately high soil water infiltration rates.

Surface water is scarce with few pools located in the Mphangara Stream bed.

Vegetation is dominated by mixed *Brachystegia* woodland of medium height and closed canopy including *Brachystegia* sps. *Diplorhynchus condylocarpon*, *J. globiflora*, *P. angolensis* and *Euphorbia matabelensis*. Sandy areas and areas of impeded drainage are dominated by *J. paniculata* and *Isobertlinia angolensis*. Occasional patches of thicket dominated *Landolphia parvifolia* occur towards the south. Grass cover is sparse and short to medium in height – more open broadleaved woodland with tall grass and *T. sericea* and *Combretum* sps. is located along the Mphangara Stream.

Animals are scarce due to settlement pressures along the eastern boundary. Elephant are rare and buffalo are occasional visitors as are kudu, roan antelope, common duiker and Sharpe's grysbok.

South-eastern pediment/thicket

The pediment gently slopes to the east and the southeast and surrounding Lusuntha and Phetekeza Hills in the southeast. Soil parent material is probably heavily weathered biotite gneiss. Soils consist of a shallow layer of sandy loams overlying an impermeable layer of laterite 1.5 – 3 m below the surface forming a perched water table. During the dry season, water flow off the surrounding hills is trapped above the layer of laterite resulting in relatively high-water availability in the upper 3 m of the soil. Soils are of generally low fertility on the upper slopes, strongly to moderately acidic with moderately high soil water infiltration rates. On the lower slopes and drainage lines, soils are of medium fertility and moderately acidic. Soil water infiltration rates ranges from low to medium.

The Mphangara Stream passes through the northeast corner. Surface water is limited to a few pools in the stream bed.

The upper slopes consist of dense low evergreen thicket dominated by *L. parvifolia*, *Hippocratea africana*, *H. parvifolia*, *Uvaria lucida* subsp *virens*, *Vitex* and *Combretum* spp., many species being more distinctive of wetter sites, like the 'jesse' thickets in the Zambezi Valley. Grass in this area is very sparse to nil and low in height. Along drainage lines, the vegetation consists of open to medium *Brachystegia* woodland with an open mixed woodland dominated by *Combretum collinum*, *U. psidioides*, *C. zeyheri*, *T. sericea*, *T. stenostachya* and *Pterocarpus angolensis* including *Pericopsis angolensis*. Grass is medium to tall and dominated by *Hyparrhenia* spp.

Animals here are sparse due to settlement to the east. Elephant and buffalo use the thickets during the day in the south moving down to the South Rukuru River at night. Eland, kudu and roan antelope are present in the more open mixed woodland areas.

Southern pediment

This unit consists of gently sloping pediment between the south-central hills and South Rukuru Floodplain. Incised river channels traverse the pediment from the hills to the South Rukuru. Soil parent material is primarily heavily weathered biotite gneiss possibly overlaid with some lake sediments along the lower portions of the pediment. Soils are dominated by moderately deep to deep sandy clay loams and sandy loams on the upper slopes and of low to medium fertility with slight acidity. These soils are generally well drained. From the lower slopes to the drainage lines soils are moderately deep to deep sandy clay loams of medium fertility. Soil water infiltration rates are high on the upper slopes and moderate on the lower and in the drainage lines.

Dambo formation is limited in extent and is indistinct. Pools, possibly associated with old village sites exist in some drainages as do saline seepages at the base of some hills and instream channels.

The upper slopes are characterised by mixed woodland including *Brachystegia spiciformis*, *Julbernardia globiflora*, *Pterocarpus angolensis*, *Ricinodendron rautanenii*, *Combretum* spp. and *Diplorhynchus condylocarpon*.

Grasses are medium in height and generally sparse. The vegetation on the lower slopes and drainages consists of mixed broadleaved woodland. This area is dominated by *Combretum collinum*, *U. zeyheri*, *C. psidioides*, *T. sericea*, *Markhemia obtusifolia*, *Schrebera trichoclada*, *Grewia monticola*, *C. bicolor*, *A. sps.*, *Pterocarpus angolensis* and *Borrassus aethiopum* in the east and dense *Brachystegia* in the west.

Grass is generally tall and dense. In more open woodland in this area, species include *B. aethiopum*, *T. sericea*, *Combretum* spp., *Ricinodendron rautanenii*, *P. angolensis*, *Schlerocarya caffra*, *A. robusta*, *Sterculia africana* and occasionally *Adonsonia digitata*.

Elephant and buffalo dominate in this unit, elephant concentrating during the late wet season and throughout the year, buffalo. Kudu and impala also throughout the year but more common during the rains. Roan antelope are also recorded. Hartebeest is scarce, likely due to the tall, coarse grasses. Most species are confined to the eastern half due to human pressures in the west and on the south bank of the South Rukuru.

2.5.3. Plant and wildlife populations

2.5.4.1. Plants

Sichinga (2019) recorded a total of 461 vascular plant species belonging to 76 families in Vwaza during a survey undertaken in 2019 (see Annexure C for the report and checklist). Of the 76 plant families, the main families in terms of species numbers are Fabaceae (80 species), Poaceae (53 species), Rubiaceae (27 species), and Euphorbiaceae (24). These four families comprise 40% of the total flora. As for Pteridophytes, a total of seven species were recorded of which family Pteridaceae (four species) was dominant (Table 4; Table 5).

Table 4. Floristic Richness

Plant Group		Family	Species
Angiosperms	Dicots	59	365
	Monocotyledons	13	89
Pteridophytes		4	7
Total		76	461

Table 5. Species Richness of the Main Vascular Plant Families

Large Vascular Plant Family	Number of Species	Percent of Flora (%)
1) Fabaceae	80	17.4
2) Poaceae	53	11.5
3) Rubiaceae	27	5.9
4) Euphorbiaceae	24	5.2

Of the total species recorded *Dombeya acutangula* was the only species considered threatened, i.e. Critically Endangered.

Although the survey by Sichinga (2019) is useful to better refine the abundance and distribution of species of high management interest (especially threatened plants and invasive non-natives), as such information is crucial when drafting a conservation programme of the Reserve, further, reliable research aiming at adding and correcting the current checklist is recommended.

In summary and based on Section 2.5.2, the vegetation of the Reserve has been broadly classified into eight types and 15 communities including:

- Three *Brachystegia* woodlands communities on hills, pediments and plateau areas
- Three mixed deciduous *Combretum–Terminalia* woodland communities on pediments, alluvial pans and valley bottoms
- *Colophospermum mopane* woodland on alluvial sites with clay soils
- *Acacia* woodland on river flood plains
- Riverine forest along the Luwewe
- Three thicket communities on pediments, termitaria, and in steeply dissected valleys
- Three edaphic grasslands communities on plains, dambos and in the marsh.

Harvesting of plants (albeit illegal or legal) are addressed under Section 2.7.4

2.5.4.2. Wildlife

Vwaza has a diverse vertebrate fauna that includes 50 species in 21 families of mammal (Happold, 2019; Annexure C) and 10 species of fish in the marsh and South Rukuru River (Tweddle, No date; Annexure C).

It also hosts a wide range of lowland birdlife of over 340 species of birds (Harwood, 2019) with the marsh and Lake Kazuni important areas for waterfowl and several Palearctic and intra-African migrants. The Reserve is specifically important for about 19 bird species based on the IBA criteria for the Zambezian biome. The occurrence of Swainson's francolin, white-winged babbling starling and wattled crane are of particular interest and special conservation concern (Dowsett-Lemaire, 2014; Annexure C).

A checklist compiled in 2013 indicates 27 species of reptiles and amphibians (Broadley, 2013; Annexure C).

A study undertaken in 2022 regarding aquatic macro invertebrate occurring in Lake Kazuni and the Luwewe and South Rukuru rivers indicates that species in 29 families occur in the Reserve (Sungani, 2022; Annexure C).

Large mammals include a range of ungulates such as puku, roan antelope, impala, reedbuck, kudu, bushbuck, and buffalo, and carnivores including spotted hyaena, leopard and side-striped jackal and lion are seen occasionally. Healthy populations of elephants and hippo are also present.

According to Stalmans & Anderson (2021) despite the significant diversity of large wildlife most species appear to be declining in numbers. Game count results from a survey undertaken in 2021 versus earlier surveys of comparable methodology are provided in Table 6 (Department of National Parks and Wildlife, 2021). Historic and current occurrence of specifically larger herbivores are provided in Table 7. The declining or stagnant trend of most species can likely be attributed to the effects of illegal hunting (see Section 2.7.4). The porous nature of the boundary fence which was a contributing factor has been addressed.

Table 6. Game Count Comparative Results – 2021, 2015 and 2013

Species	2021			2015			2013		
	Main Reserve	Sanctuary ¹²	Total	Main Reserve	Sanctuary	Total	Main Reserve	Sanctuary	Total
Baboon troop	28		28	6		6	7		7
Buffalo	266		266	170	11	181	164		164
Bushbuck	135	4	139	17		17	26	1	27
Bushpig	76	13	89	20		20	9		9
Duiker	64	2	66	19		19	21	1	22
Eland				2		2	5		5
Elephant	268		268	203		203	310		310
Grysbok	8		8			0	2		2
Hippopotamus	301		301	332		332	306		306
Impala	64		64	93	34	127	73	35	108
Klipspringer	1		1			0			0
Kudu	109		109	52		52	27		27
Lichtenstein's hartebeest	133		133	147	14	161	116	10	126
Plains zebra	5	2	7	5		5	7	4	11
Puku	37		37	21		21	31	4	35
Reedbuck Common	91	3	94	42		42	52	15	67
Roan antelope	208	9	217	147	1	148	253		253
Sable antelope				1	44	45		66	66
Vervet monkey troop	1		1			0			0
Warthog	108	10	118	23	12	35	71	23	94

Table 7. Historical and Current Occurrence of Larger Herbivores

Current status: Inc – increasing; St- stable; Dec- decreasing; Ext – locally extinct, Vag = vagrant, DD – data deficient

Common Name	Scientific Name	Current Status
Black rhino*	<i>Diceros bicornis minor</i>	Ext
Bushbuck	<i>Tragelaphus scriptus</i>	Dec
Bushpig	<i>Potamochoerus porcus</i>	St
Cape buffalo	<i>Syncerus caffer</i>	Dec
Common duiker	<i>Sylvicapra grimmia</i>	St
Common waterbuck**	<i>Kobus ellipsiprymnus</i>	Ext
Cookson's wildebeest*	<i>Connochaetes taurinus cooksoni</i>	Ext
Crawshay's zebra	<i>Equus zebra crawshayi</i>	Dec
Eland	<i>Tragelaphus oryx livingstoni</i>	Dec

¹² At the drafting of this document the Sanctuary was no longer functional.

Common Name	Scientific Name	Current Status
Elephant	<i>Loxodonta africana</i>	Inc
Greater kudu	<i>Tragelaphus strepsiceros</i>	Dec
Hippopotamus	<i>Hippopotamus amphibius</i>	Inc
Impala	<i>Aepyceros melampus</i>	Inc
Klipspringer	<i>Oreotragus</i>	nil
Lichtenstein's hartebeest	<i>Alcelaphus* buselaphus lichtensteinii</i>	Inc
Oribi	<i>Ourebia ourebi</i>	Dec
Puku	<i>Kobus vardonii</i>	Dec
Roan antelope	<i>Hippotragus equinus</i>	Dec
Sable antelope	<i>Hippotragus niger roosevelti</i>	Dec
Southern reedbuck	<i>Redunca</i>	Dec
Warthog	<i>Phacochoerus africanus</i>	Dec

* Cookson's wildebeest was last seen in 1945 or 1946, and black rhinoceros in 1969 - McShane (1985) also recorded rare and endangered mammal species which included wild dog and clawless otter

** also *Sigmoceros*

Stalmans & Anderson (2021) suggest that the populations of several species are still large enough to recover rapidly without supplementation as long as the illegal off-takes can be brought under control. Other species have either disappeared, such as wildebeest, or will need a boost. It is proposed to re-establish a resident population of Cookson's wildebeest as well as to enhance the gene pool of puku and to augment zebra, waterbuck, eland and warthog.

The estimate of the carrying capacity for Vwaza is about 7,000 kg/km², significantly, the marshy valley floor. Even assuming the very conservative figure of 2,000 kg/km², the stocking rate in Vwaza has been consistently below this guideline figure. The stocking has also declined over time, with the uptick from the last count resulting from larger-bodied animals such as elephant and hippo. However, small and medium-sized antelopes have continued to decline, most likely also because of continued illegal hunting.

The study led by Stalmans & Anderson (2021) into the reintroduction of certain wildlife species will be used in future planning and future desires to improve wildlife numbers in the Reserve.

2.5.4. Alien and invasive plant species

Sichinga (2019) recorded 19 species considered exotics. Among the 19 exotics, four species are known to be invasive, and their locations were marked, and estimated abundances recorded.

G. arborea was the only exotic and invasive species observed in abundance within the Reserve. The species was seen occurring in huge stands or woodlots. Other such species present but not in great numbers including *Toona ciliata*, *Lantana camara* and *Tecoma stans* and seem not to be of concern at present but should be eradicated before they become better established.



Figure 15. Exotic Species

2.5.5. Fire

The previous Master Plan cites high incidences of bush fires in the Reserve. Combatting these, mostly started by communities intentionally or unintentionally, is hampered by lack of a clear fire management strategy for the Reserve. The result of this is insufficient firebreaks; lack of firefighting team to respond to fires that occur in the Reserve; staff are not adequately trained in firefighting and insufficient appropriate firefighting equipment.

Also, according to the previous Master Plan, should a community fire management plan be put in place, the number, location, extent and month of occurrence of all management fires will be recorded on a map and summarised in tabular form each year. The number of wildfires' month of occurrence and their extent will be measured, recorded and plotted on a map. Where possible the cause of the fire (e.g. illegal hunting, honey collection, resource harvesting activity, lightening, tourists, escaped management burn) will be determined and recorded. Wildfire data will be summarised in tabular form. Mapped information will be aggregated over the years to develop a map of the distribution of fire and distinguish between those areas of the Reserve, which are prone to fire and those which are relatively well protected.

Key indicators should be:

- All planned controlled burns are completed as per targets defined in the annual workplan.
- On average the number and extent of wildfire decreases by 30% per year until no more than 40% of the Reserve is burnt by annual wildfires.

According to the Global Forest Watch (2022) the peak fire season typically begins in early July and lasts around 15 weeks. There were 26 Visible Infrared Imaging Radiometer Suite (VIIRS) fire alerts reported between 13th of September 2021 and 5th of September 2022 considering high alerts only. This is low compared to previous years going back to 2012.

According to previous Master Plans the high incidence of fire results in soil erosion and impacts water resources, specifically the marsh and the floodplains (affects quantity and quality of water, degrades habitat).

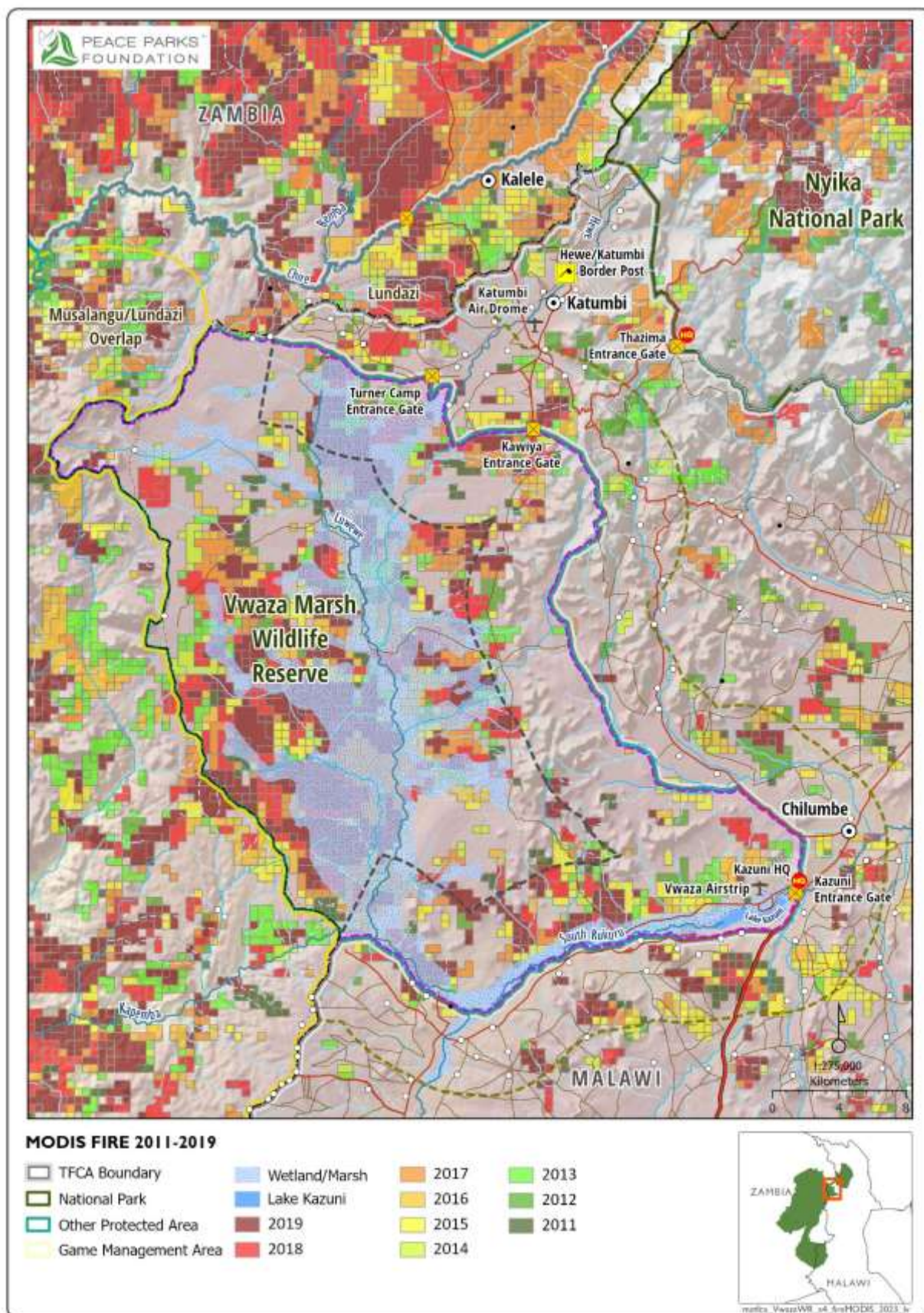


Figure 16. MODIS Burnt Area (2011 - 2019)

2.5.6. Human Wildlife Conflict (HWC)

In the areas adjacent to the Reserve, HWC is an important concern for the local population and HWC management challenges both DNPW and local communities, with killing of wildlife species in retaliation and a decreased support for conservation activities being the consequences (Gross & Shaba, 2022).

The Reserve and NNP are important habitats for many large herbivores and carnivores. While baboons, monkeys and bush pigs can cause continuous crop damage to farms, crop damage by elephants often leads to situations in which a subsistence farmer can lose an entire livelihood overnight. Wildlife that frequent crop fields contribute to loss or reduced harvest, leading to food shortages and food insecure households. The presence of wildlife in villages and close to roads also pose safety concerns of community members.

At the same time, an increasing human population within the border zone is associated with opening of more land to farming. According to population estimates, the population in the 5 km border zone of the Reserve has more than doubled since 2007. Natural places for wildlife to move into are increasingly reducing and corridors for wildlife species with large territories and migratory behaviour, such as elephants, are blocked due to human encroachment. This will likely bring wildlife into contact with more densely populated human areas, thereby exacerbating situations of HWC.

Nyanga, et al. (2022) reveal a prevailing perception that wildlife has caused more harm to humans than humans have caused to wildlife, with a widespread view that there have been no compensations for property and human loss due to HWC. Communities generally agreed on the interventions such as fencing as well as increased patrols and culling as mechanisms for managing HWC.

To decrease the pressure of wildlife on the safety of people living adjacent to the Reserve and their livelihoods, a game proof fence is being constructed along 70 km of the southern and eastern boundary of the Reserve. Furthermore, an electric fence shall be installed along the southern NNP boundary, with a focus on keeping the elephant population (which was supplemented through translocation in 2017) within the PA. It is understood that the construction of a fence is not the only solution to HWC and that longevity and sustainability of HWC management measures need to be embedded in a holistic and integrated system, involving and defining the roles all partners need to play in the integrated approach. The future of conservation in the Reserve depends on the success of holistic and integrated HWC management and the development of long-term co-existence strategies benefitting both people and wildlife.

A **Human Wildlife Conflict Management Scheme (HWCMS)** for VMWR and NNP, Malawi was commissioned through TFCA support funding and a report completed in February 2022. The objective of an HWCMS is to develop most effective, suitable and feasible management actions to prevent and mitigate HWC, this scheme takes a step further and integrates sustainable rural and livelihood development with a strong consciousness about the neighbourhood of wildlife and its importance. The scheme also includes a framework for stakeholder engagement as well as an institutional framework and describes a set of tools and multiple strategies, to implement the HWCMS in an integrated and holistic way by stakeholders such as DNPW, NVA, NGOs, District, NRCs etc.

The HWCMS is accompanied by an **HWC Management Manual**, which encompasses a detailed action plan, outlines for curricula and draft decision support systems, as well as monitoring tools for HWC and its management.

According to Goss & Shaba (2022), the appointment of co-existence officers to work within existing NRC structures and the Reserve's extension units is important to –

- manage the conflict with fence maintenance (through appointed and remunerated attendants, with equipment),
- crowd control, develop and capacitate rapid response teams and community sensitisation monitor,
- budget and report to improve strategies to implement the HWC Management Scheme and develop safe water points.



Figure 17. Wildlife Management Fence Status

2.5.7. Tsetse fly

Tsetse fly is endemic in the Reserve and both bovine trypanosomiasis and human sleeping sickness (Human African Trypanosomiasis; HAT) are regularly reported. Tsetse fly densities are highest in areas of low bush and thickets and tall grass (McShane, 1985). Control with traps is implemented in scout and tourist camps as well as in villages near the boundary of the Reserve.

According to the Partnership for Increasing the Impact of Vector Control or PIIVeC (2022) a surge in Rhodesian HAT has recently been reported in Rumphi District. HAT is closely associated with PAs in Malawi but poses the most risk at the interface between PAs and livestock areas. It disrupts agricultural activities and exposes infected people and their families to poverty and famine. HAT also places a huge financial burden on households for costs of treatment and transport. Furthermore, HAT potentially affects revenue from tourism, which is the second largest contributor to GDP in Malawi.

HAT interventions in Malawi focus on diagnosis, treatment and community awareness. Vector control is less emphasised and multisectoral coordination is weak. In the Reserve, 50 odour baited targets are available to be deployed, but ~1,500 targets would be needed for a control programme to protect people in Mzimba and Rumphi, the most severely affected districts.

The vector control within the Reserve is thus clearly insufficient. The opportunity therefore exists to strengthen research, collaboration, and diagnosis and treatment. Strengthening tsetse control would contribute to preventing HAT risk but needs to be based on knowledge of local tsetse fly density, climate, land-use, wildlife patterns and trypanosome PIIVeC infection rates. The programme is currently supporting research to inform targeting of vector control in Vwaza and in doing so, develop a plan for tsetse fly control in the Reserve with applicability to other game Reserves in Malawi.

2.6. Cultural and Heritage Characteristics

The Reserve is strongly associated with traditional cultures, human settlement, and land use as evident from its listing as tentative World Heritage Site in 2011 (UNESCO World Heritage Convention, 2022).

The Reserve was once a home to thousands of people from the Early Iron Age who practiced subsistence agriculture, iron smelting works, hunting in the last twentieth century. There is, however, no current settlement within the Reserve.

There are several Middle and Late Stone Age sites known from the areas around Vwaza, notably from Chowo and Fingira on the Nyika and Hora Mountain in the Mzimba District. However, the earliest evidence of human settlement in (or just outside) the present VMWR is of the important early Iron Age at Phopo Hill, discovered in 1967. The site was excavated and revealed pottery, iron slags, tuyere fragments and bone fragments which contain elements which are not unlike the Gokomere pottery of Zimbabwe and southern Zambia. This indicates human occupation during the third century AD (Department of National Parks and Wildlife, 2016).

Records indicate that during the last half of the eighteenth century, the Balowoka people came into the area due to an abundant supply of elephants at that time. Ivory was, therefore, plentiful resulting in extensive trade for cloth, beads and similar merchandise. Chief Chikulamayembe established a firm trade route to the Nkhamanga plains and the monopoly was broken by the appearance of Swahili slave and ivory traders and the intrusion of the Ngoni into the area (McShane 1985).

Several cultural landscapes and sites thus reflect human settlement. These include amongst others the Themba Triangular Hill where Chief Chikulamayembe and Katumbi parted from each other, one went to the north and the other settled in Nkhamanga plains. The Reserve was used as Zolokere chiefs' burial site from 1500 to 1986. The collection of a rock from Themba Hill for annual ceremonies is a symbol of Katumbi chieftainship, while the Zolokere Chieftainship burial site on the edge of the Marsh continues to be preserved. Other spiritual sites include the Chinyawima, Chiwambala and Nthuthika hills.

None of these cultural elements has been altered or destroyed; they remain intact though natural weathering may have taken its course. Several additional sites of cultural significance have been named by traditional leaders living adjacent to the Reserve. See Annexure D for a list of the recorded cultural and heritage sites.



Figure 18. Cultural and Heritage Sites

2.7. Development and Utilisation Characteristics

2.7.1. Infrastructure

The access and transport network within the Reserve consists of the following:

- Entrance gates at Kawiya (northeast) and Kazuni (southeast). In total, the Reserve has 10 management gates. The Reserve also has a few pedestrian gates whose use and locations are determined by the NRC.
- There is only one major road within the Reserve, running from south to north. Other existing internal Reserve roads comprise:
 - a spine road running between Kawiya in the north and the South Rukuru and Kazuni;
 - roads off this to Zaro pool and Central Luwewe;
 - a road along the west side of the Luwewe River and the Vwaza Marsh; and
 - roads off this one to Mowa and Kalindamawe scout camps.
- There is also a road along the northern and western boundary, part of it on the Zambian border. Total internal road length is 124 km. Certain other roads have existed in the past including some opened for safari hunting in 1983, but they are now overgrown.
- The internal roads are all dirt and are impassable during the rains. In May/June they are opened by grass-slashing, pothole filling and clearing of drains providing a set of primary roads that provide all weather north-south access between Kazuni and Kawiya, and east-west access from Kazuni to Zaro and from Kawiya to Kalindamawe.
- Current access to Kalindamawe via Central Luwewe has just been made possible due to the construction of a concrete bridge at Central Luwewe River. However, access to Zaro and Kawiya is still a challenge due to the absence of proper bridges and culverts. With the support of a GEF project only one bridge was constructed in 2013. About five main concrete bridges and five culverts need to be constructed for the whole to be accessed throughout the year. It is not possible to drive around the western side of the Reserve (i.e., the border with Zambia, which makes up one side of the protected area).
- An airstrip at Kazuni. It was established in 2003 with financial resources from the Nyika-Vwaza Conservation Project, Nyika Safari Company and DNPW.

Park management facilities and amenities include:

- The Reserve headquarters located at Kazuni, including a staff village
- Other management facilities
- Two sector ranger camp, at Zaro and Kazuni and a ranger camp at Kalindamawe
- Tourism infrastructure at Zaro, Kalindamawe and Kawiya

VMWR has a total distance of 110 km that is supposed to be fenced and maintained. In 2008, 30km of fence line was erected from Kanyenjere to Chankharamu courtesy of Malawi Government. Between 2012 and 2015 a total of 40 km of wire strand fence was erected from Bambanda to Kazuni courtesy of the World Bank project but fell-off such that materials were removed and kept (leaving 90km unfenced). In 2021-2022, a 70km fence was constructed with support from German Government leaving 10 km unfenced. Construction of the 70km line started in November 2021 from Bambanda-Zaro Camp northwards. The initial 30km bonnox fence line still exists but requires rehabilitation. The reserve has 18 fence attendants – an additional 18 are required for proper rotation to patrol the fence effectively.

2.7.2. Services

2.7.2.1. Water resource infrastructure

Boreholes

A new borehole with holding tank and reticulation system was constructed at Kazuni under the Nyika-Vwaza Conservation Project which was later maintained and improved by the GEF Project by installing an electric pump in the year 2015. A new borehole was drilled at Zaro and a new hand pump fitted to the borehole at Kawiya.

Kalindamawe is supplied with water from an old model borehole fitted with a hand pump. The pump was recently rehabilitated using spare parts obtained from one of the abandoned boreholes in the Reserve.

There are plans to provide potable water by gravity fed system from NNP in the area by MAZA Project that will see about 6,000 beneficiaries.

Sanitation and waste

Pit latrines are currently used at all camps in the Reserve, although Kazuni has plumbing for water borne sewerage. The camp has water-borne sewerage facilities due to availability of pipe water supply. The only challenge is that the pumped water is salty which affects the plumbing system greatly as most of the pipes are more often corrugated thereby reducing water flow to most of the houses. Pumping of water is by an electrical pump powered by ESCOM courtesy of the MAREP Project. Additionally, 22 pit latrines otherwise known as conservation pits were constructed at Kazuni camp in the year 2015-2018. Nonetheless, the situation has not improved much as most of the pit latrines sinks due to sandy soils in most of the camps like Zaro, Kawiya and Bambanda.

Solid waste is placed in rubbish pits situated at various points around camps. The waste is regularly burned in pits to prevent them being smelly, unsightly and posing a health hazard, as well as attracting scavengers. Filled up pits are replaced by new ones.

2.7.2.2. Communications

Vwaza was equipped with a range of HF radios including base sets, a vehicle mounted radio and man packs for law enforcement patrols by the Nyika-Vwaza Conservation Project (NVCP) and PPF law Enforcement Project but became non-operational with time. The Malawi-Zambia TFCA Project has re-installed a new digital radio communication system. The radio system is integrated with the Nyika national park and Chama Musalangu GMA in Zambia. Despite all these investments, there seems to be a problem with maintenance and oversight over the proper functioning of the system. In total, communication towers in Vwaza are located at Kazuni, Bambanda and Kawiya (Figure 1).

2.7.3. Park enterprises

2.7.3.1. Tourism

Tourism in Vwaza is centred on two tourist camps at Lake Kazuni. Tourism management was handed over to a private sector operator in 1997 and improvements to facilities under the Nyika-Vwaza Conservation Project were completed by the end of 1999. The concession expired and another concessionaire came in 2009 but terminated the contract in 2011 citing low business volume as the main reason. Since then, the Department has managed the facilities.

The Reserve has quality bird watching and attractive scenery. Game viewing is also popular mainly during the dry season particularly around Lake Kazuni when large mammals concentrate around the lake. However, game viewing is poor during the rainy season but the occurrences of tsetse fly deter some international tourists some of whom prefer areas that are devoid of insect pests.

2.7.3.2. Consumptive use of wildlife

Hunting and other forms of consumptive use of wildlife including safari hunting, licenced hunting by local communities, culling and game capture have been included as forms of public use in the Reserve since the earliest of the Master Plans (1983). Resource management objectives included maintaining animal populations at between 60-70 % of the estimated ecological carrying capacity (McShane, 1985).

It also forms part of the Collaborative Management policy of the DNPW which states that the Department will amongst other *‘facilitate co-ordinated marketing of wildlife and wildlife products including tourism and hunting to enable wildlife to release its economic potential applying, as far as possible, market mechanisms’*.

Although the Reserve has a recorded history of the consumption use of wildlife over the previous years, this has not been a formalised activity and thus no official documentation or recordings have been kept.

2.7.3.3. Carbon

Though Terra Global LLC, VMWR is part of the Kulera REDD+ project to be implemented in protected areas in Malawi. Terra Global is a global leader in sustainable forest and agriculture programme development, land-use greenhouse gas quantification and finance, and provides technical expertise and investment capital to their global client base in a collaborative and innovative manner.

The REDD programme areas are located within a 5km zone inside the boundaries of the Reserve. The overall goals of the Kulera Landscape REDD+ Programme are to reduce deforestation and degradation in these select protected areas, and to improve livelihoods by managing natural resources as an asset base to capture long-term economic benefits. Additional carbon finance sources can be explored and exploited for the benefit of the Reserve’s communities.

2.7.4. Resource use

Most residents within the RUP area of the Reserve are subsistence/smallholder farmers, often desperately poor and already economically and nutritionally vulnerable. They are forced by circumstances to encroach into the Reserve to collect resources for own use and trade. The collection of resources is regulated in the Reserve’s Resource Utilisation Programme Guidelines (Gross & Shaba, 2022; see below section on Permitted community resource use), however, not all resource use is undertaken lawfully.

2.7.4.1. Illegal use of natural resources

According to the Department of National Parks and Wildlife (2021) the distribution and abundance of human footpaths within the Reserve indicate that access into the Reserve by people is widespread and frequent along with associated illegal human activities, much of which takes place nocturnally. Primary among these are well organised illegal hunting for bushmeat and fishing, as indicated by poacher camps across the Reserve and meat drying racks to process large amounts of bushmeat and fish before transporting it out of the Reserve. All these activities penetrate deep into the Reserve.

Stalmans & Anderson (2021) also indicates that illegal hunting of large mammals is a threat, compounded by poor infrastructure and access, and the low numbers of National Parks staff based there.

According to Van Velden (2020) bushmeat hunting and consumption exists at appreciable levels within the communities surrounding the Reserve. Hunting peaks in the wet season between November to March. Hunting during the dry season (June-October) is effectively undetectable. Consumption is year-round with about 39% of the population consuming bushmeat. Van Velden (2020) also found that wild meat was predominately eaten by poorer households. Households with knowledge of NRCs consumed significantly more bushmeat than households without knowledge.

Motivations behind hunting and eating wild meat are multi-faceted and are not only related to economic factors. Taste is a significant factor in consumption of wild meat as has been found elsewhere in Africa. Cultural factors in the area were found to be important for both hunting and consumption but that consumption was strongly linked with poverty, but hunting was not. The consumption of bushmeat appears to play a key role in food security or a safety net in lean conditions, but there are indications that hunting may be performed by the wealthier sections in society, or that people become wealthier when they hunt.

Van Velden (2020) offers recommendations regarding interventions in the bushmeat system, however, emphasises that law enforcement and community-based initiatives must work together and the value that wildlife holds must be adequately recognised at all levels.

The wetland area in the north-eastern portion of the Reserve has also been disrupted by numerous drainage furrows that have been dug to divert water and fish into fish traps. As a result, the wetland area is effectively devoid of birdlife. Removal of chopping of trees for firewood and building materials is also occurring within the Reserve (Department of National Parks and Wildlife, 2021).

2.7.4.2. Permitted community resource use

The communities surrounding the Reserve are largely natural resource dependent, with historical economic and socio-cultural links with the Reserve. In terms of DNPW's **collaborate management policy**, the Department has embarked on permitting sustainable resource use of specified natural resources within PAs with the aim to contribute towards an improvement of the relationship between PAs and their neighbouring communities. As such, it has undertaken a Resource Utilisation Programme (RUP) and has drafted **Resource Utilisation Programme Guidelines** (2003) to guide DNPW in the implementation of the RUP in the Reserve.

As part of the RUP, a resource use zone has been defined for the Reserve covering a strip of approximately 5km (aerial distance) inside the Malawian boundary of the Reserve. The main target community beneficiaries are those within a 5 km area outside the Reserve. However, communities living beyond the 5km area can seek permission from NRCs to participate in the RUP.

For the operation of the RUP, NRCs have been set up and Collaborative Management agreements signed – a particular NRC holds the resource use rights for a defined area but except for beekeeping – this may be undertaken further afield and has been observed on the north- and southwestern portions of the boundary, as well as inside the southern boundary near Lake Kazuni.

According to Gross & Shaba (2022), the level of dependency on the natural resources varies strongly between the 21 NRCs. However, in most NRCs at least 25% of the resource collectors are highly dependent on natural resources as livelihood and regularly collect natural resources in the Reserve, mostly mushroom, fish, caterpillars, termites, mushrooms, medicinal plants, thatch grass, reeds, wild fruits and thatch grass. Natural Resources are becoming increasingly scarce outside protected areas and rural communities throughout the country are highly dependent on these resources. Recognising this Department of National Parks and Wildlife (DNPW) has, as part of its Collaborative Management policy, embarked on permitting sustainable resource use of specified natural resources within the protected areas falling under the department's jurisdiction. These include fish, caterpillars, termites, mushrooms, medicinal plants, thatch grass, reeds, and wild fruits.

Once an NRC has signed an agreement with DNPW and the occurrence of resources in their resource utilisation area has been determined either through mapping or scientific investigations, the NRC is issued with quotas of resources permissible for harvest. Resource harvesting permits for community members are issued by their respective NRC. These quotas are supposed to be reviewed after 5 years. Monitoring is done by Research Officers jointly with NRCs in their respective areas. Sustainability is monitored by use of permit system that are issued and sent back to protected areas and enforced by the Extension officers that are in the various outpost around the protected areas.

Resources that may be harvested under permit during certain times of the year and of which quantities are limited include amongst other grasses, bamboo, reeds, palm fronds, medicinal plants, wild fruit, mushrooms, fish, and insects. When entering the Reserve, communities should be accompanied by DNPW staff and harvests should be recorded. Beekeeping, fishing activities and visits to graveyards are allowed only in the company of DNPW officers/Extension of law enforcement since they take place deeper into the Reserve; in some cases beyond the designated 5km resource use zone. The collection of other resources require accompaniment by NRC leaders.

3. SITUATIONAL ANALYSIS

3.1. Ecological Significance of the Reserve

The Reserve is an important area for the **conservation of fauna and flora of this area including large herbivores and some carnivores**. It forms part of the MZ TFCA and the western boundary with Zambia which was largely unfenced allowing free movement of wildlife between the Reserve and the Luangwa ecosystem, including the Musalangu GMA and North Luangwa National Park. Historically it has provided refuge and habitat for a large number of herbivore species, many previously abundant, however the numbers of most species are low to extremely low with some recently rare or absent from the Reserve.

The wildlife numbers in the 1980's suggested a biomass density of approximately 1 500kg/km². However, two independent assessments have placed the likely potential biomass density higher, one at 4 000kg/km² (Bell 1983a) and the more recent by Stalmans and Anderson (2021) estimate about 2 000kg/km². **The last population census estimates the wildlife biomass at about 750kg/km²**. This suggests that wildlife numbers could significantly increase by over two and half fold for the lower estimate and up to five-fold for the higher estimate. Stalmans and Anderson (2021), suggest the number of herbivores could possibly increase by over 7 500, mostly medium and small sized ungulates, but also an additional 600 buffalo, this is subject to various species mixes. These figures indicate that currently the area is producing below its potential and this impacts on nutrient and trophic cycling. This represents a large loss of productivity annually, which cumulatively over many years is a significant loss.

The **wetlands and associated fertile alluvium remain a very important ecological asset**. However, the catchment for the wetlands originates in Nyika and flows through a heavily populated corridor with seemingly significant abstraction of water for urban and agricultural use. This will likely impact on the available water in this ecosystem in the dry season, especially in dry years. The wetland will therefore have less moisture and available surface water, which is likely to be compounded by climate change, resulting in further lost productivity and ecosystem function.

3.2. Social Impact of the Reserve

The deteriorated state of the fence along the Malawi portion of the Reserve led to **increased HWC and contributed to the decline in community relations** with the Reserve management, no doubt aggravated further by the few benefits received (see next point). Recently (2021-2022), with additional funding, this fence is in the process of being improved together with management agreements with the local communities to check its integrity.

Benefits to communities from the Reserve remain limited. Collection of forest products and more recently some income from a carbon REDD+ project have provided some cash. **Tourism, often heralded as a benefit, is insignificant as an impact for communities**.

The **local communities living** within the 5km RUP area, like most other rural communities in Malawi, are desperately poor, all of whom aspire to a better life, especially for their children. Sadly, child malnutrition and other negative impacts of poverty significantly curtail this realisation, robbing the children of achieving their potential. The scale of illegal activities, whether setting fires, or bushmeat are therefore mostly survival strategies. Studies, however, have indicated that the communities wish to be better informed about the natural environment and to assist and be more involved with natural resource management.

Tourism to the Reserve is very low and currently does not offer a viable tourism product to develop the economies of scale required to at least break even. The attraction, compared to other wildlife offerings in the region, is very weak and the presence of tsetse fly, especially in certain seasons, make it less appealing. There is also a high incidence of sleeping sickness associated with the tsetse fly. A poor road network is an additional constraint.

The proclamation of the Reserve and subsequent expansion resulted in some resettlement of communities who previously lived and used resources within the existing park boundaries. **Some of these remain unhappy about the Reserve boundary alignment and benefits received**, although there is a 5km resource use zone within the Reserve where communities may harvest a limited number of natural resources. These resources remain confined to forest products and honey, although honey may be harvested in some areas beyond the resources use zone. Managing

community relations between park management and the communities is undertaken via NRCs, clustered into zones who then are represented on the NVA, the overarching body for the communities. A limited number of DNPW extension workers, who are based in the villages, facilitate access to the Reserve and any other issues. HWC is a significant issue especially in certain areas on the Reserve boundary and this remains a source of conflict and tension with communities, although recently a fence has been erected to help mitigate this and Reserve management has commenced with implementing the HWCMS.

3.3. Management Implications for the Reserve

Dealing with these threats requires funding, a dedicated, experienced, and well-resourced team. This is difficult to provide in a country with so many and significant social needs. Furthermore, government administration is often not properly structured to firstly dedicate the funding but secondly to provide the staff and support required. It is simply not sufficiently dynamic to respond adequately and rapidly to do what is needed. This capacity is further diminished when social expectations and needs are included in the delivery package.

To further compound these problems management of Vwaza has suffered over the years from **unreliable, insufficient and unsustainable revenue to fund the essential management interventions required to maintain the system**. Donor funding has often been lumpy with periods of more funding often followed by years of no or very limited funding. This type of funding is extremely detrimental because of the resulting impacts, these include:

Topping up funds for staff or providing funds for additional staff. When funding is stopped these cannot be supported as government cannot 'suddenly' secure the funding needed. Skills and experience are lost and management programmes significantly affected.

Equipment is purchased, which requires fuel for vehicles, maintenance as well as replacement. These can no longer be funded, further aggravating the management outcomes. Infrastructure is developed and it too cannot be maintained, often with severe environmental costs, such as dysfunctional sewage systems or poorly maintained roads to mention a few.

Governments have limited funding and can only provide a fraction of what is needed given the importance of other priorities. Donors stepping into this gap, reduce the pressure on Government, leaving a bigger hole when they depart. Furthermore, Governments are not the most flexible and nimble when allocating resources and responding to changed conditions (such as COVID), or incentivising staff. This aggravates the funding situation and the ability to recruit, train and retain competent staff.

Clearly a long term, realistic and reliable funding stream is needed to help reduce or eliminate these consequences and this Plan must lay the foundation to ensure such an outcome. Developing programmes which have the highest impact, which are measurable, and for which the likelihood of securing funding is high and must be prioritised. This implies a clearly identified set of strategic and operational objectives with affordable and achievable outcomes which must address the threats while realising the opportunities.

3.4. Opportunities to Unlock Benefits

Despite the foregoing threats and challenges there are still unrealised opportunities to secure the biodiversity and deliver more benefits for communities. These could potentially include:

- More engagement with and involvement by communities to assist with management of at least some issues, possibly:
 - Assisting with fence maintenance and checking the integrity of the fence to help combat HWC, this is already being piloted and implemented
 - Exploring possibilities to assist with fire control and management in designated areas where benefits could be shared (see carbon income below)
 - Assisting with reducing illegal activities such as bushmeat harvesting
 - Assisting with other varied Reserve operations such as maintenance and the control of small alien plant issues.
- The wildlife population is currently stocked way below the predicted stocking rate, if this could increase, there is a sustainable, potentially large, harvest of animals and their products which could be removed. Meat is a highly valued and prized protein source in the area, much needed by children especially. Increased wildlife, especially fast producing small and mesoherbivores could provide such a sustainable benefit. This could be enhanced by increasing the numbers of some species to boost them so their growth can accelerate sooner and faster and while also re-introducing recently extirpated species.
- Improved understanding of the ecosystem and the drivers of some of the threats, through carefully focussed research, will help direct management priorities on critical aspects. Water supplementation in the wetland may help restore lost productivity during the dry season to the water abstraction impacts outside the Reserve.
- There is an increasing awareness globally of the value of biodiversity and the benefits it offers, this may provide a potential revenue stream in the future. Building investments which would provide sustained funding through, for example, products such as the Legacy Landscape Fund.¹³
- The communities are organised and have structures which provide an excellent platform and are suited to deal with many of the challenges and capitalise on opportunities with park management.
- Improved governance mechanisms can help improve efficiency and effectiveness, improve staff employment conditions, provide confidence for investors, raise funding, retain revenue, and operate on business principles in a decentralised environment with more autonomy and flexibility.
- The TFCA governance mechanisms provides a very good platform to deal with threats and opportunities which operate across the border.

3.5. Summary

The Reserve's natural assets still have significant potential and remain largely intact. It remains a resources rich asset, which can **sustainably deliver significantly more tangible outputs to local people without compromising the integrity of the system, but without proper management these assets can be further diminished representing a huge lost opportunity.** Some of the illegal activities including bushmeat, and setting of fires are, at least to some extent it could be argued, under the 'control of the local communities'. These current harmful practises are compromising the long-term or indeed medium-term persistence of the species themselves and the ecosystem, limiting the capacity of the system to provide sustainable benefits for the locals. It could be possible for a sustainable harvest, and indeed a significantly increased harvest, in the context of bushmeat if this was conducted

¹³ [weblink \[https://legacylandscapes.org/\]](https://legacylandscapes.org/)

more appropriately by experienced staff using appropriate techniques ensuring a more sustainable harvest, with improved quality and higher value – indiscriminate and inhumane killing benefits few.

To achieve this would require all parties agreeing on a management strategy with measurable outcomes where the resources can be optimally developed to be used wisely, shared equitably, by responsibly harvesting the surplus and protecting the scarce and vulnerable. The communities have the institutions to engage and help solve these challenges and realise the opportunities. Park Management, for their part, must secure the mandate and support required to effect the changes needed. The alternative is to maintain the prevailing status quo of an **'island of diminishing plenty in a sea of poverty'** that relies increasingly on a fortress conservation approach, driving the stakeholders further apart.

These are significant challenges but there are equally great and realisable opportunities. All that is required is a willingness and a framework to solve them and a mandate to do so. This Plan offers Park management a Vision with the supporting framework and policy toolkit to ensure the priorities are focussed on outcomes which will deal with the most important issues efficiently and effectively.

Funding will always be 'inadequate', and the best solutions are to focus on those aspects which, if allowed to fall and fail, cannot be easily recovered or lost forever and that must guide future decision making and help allocate resources to priorities. To help guide this there are three important areas to get right, namely:

- Enhancing the resilience, productivity and maintaining the diversity of the ecosystem to deliver sustainable and achievable products/resources for the people of Malawi, especially locals
- Strengthening the resilience of communities through real benefit sharing underpinned by meaningful co-management linked to responsibilities with measured outcomes and sanctions for breaches
- Empowering, capacitating and rewarding Park management, with adequate funding to undertake the work needed to deliver on the foregoing.

4. STRATEGIC MANAGEMENT FRAMEWORK

4.1. Future Desired State

4.1.1 Vision

Fully functioning and productive co-managed ecosystem with a full complement of species and value adding enterprises operating to the benefit of Malawi especially local communities.

Tagline: Participatory managed biodiversity hotspot with benefits for all.

4.1.2. Mission

Improving governance to enhance the integrity and productivity of the natural assets to improve and optimise benefit streams for surrounding communities.

4.1.3. Strategic Management Objectives

- To rebuild the wildlife species and numbers and ensure poaching is contained, species diversity improved, and trophic cycling of the ecosystem is optimised
- Improve community relations and engagement and explore co-management of various Reserve activities to expand benefits, especially from wildlife
- Explore options for improving the hydrological function of the wetland and perennial water for wildlife as occurred historically
- Manage the impact of tsetse fly and associated health impacts for communities, staff and tourists
- Improve management effectiveness and explore decentralised and co-management models with funders and donors
- Find partners to invest in tourism use, especially consumptive use of wildlife in the short to medium term

4.2. Theory of Change and Management Programmes

The issues management need to address can broadly be split into four categories, namely

1. Those which are the **result of community activities**, especially illegal off take of natural resources, especially wildlife and setting of illegal fires
2. Those where **management may be deemed as the cause**, these include: poorly maintained infrastructure impacting of the natural resources and aggravating Human Wildlife Conflict
3. Where the responsibility is **shared between park management and communities**, these include HWC and improving engagement on issues of collaborative nature and governance
4. Those where **management must principally realise the outcome**, these include governance and improved revenue from Reserve's assets, carbon and others
5. Importantly for management there are benefits to be gained through engaging with communities on resolving (1) above; significantly these aspects currently consume at least 51% of the Reserve's operating expenses.
6. Management must therefore engage with communities to implement critical management interventions to restore trust and build an agreement with measurable outcomes which reward the communities for quantifiable improved performance through shared access to the additional natural capital developed and/or mobilised. It is recognised that these will be difficult and surely will experience many challenges, but in the long term the prize must be worth it for everyone, it must be a win-win.
7. Through this theory of change the following will be achieved:
 - Governance agreement/s will be entered into with communities for shared responsibilities and benefits to:
 - Improve wildlife numbers, this will increase the resilience of the ecosystem through improved production and trophic and nutrient cycling. The increase in numbers will allow for a sustainable harvest, the benefits of which can be shared with the partners

- Explore expanding the range of natural assets which could be sustainably used
- Contain, limit and possibly eliminate other illegal off take and activities
- Improve other management activities such as fence patrols and maintenance of infrastructure as well as other activities will be explored to find joint solutions
- Fire management will be improved so that illegal fires will be reduced or eliminated
- Where wildlife populations of some species are deemed to be too low or locally extinct, to boost numbers to critical thresholds through re-introduction
- Explore strategies to boost the productivity, especially in the wetland where water availability has been significantly negatively impacted
- To reduce the impacts of tsetse fly on humans in and around the Reserve through active control campaigns
- HWC will be managed and operated collaboratively with affected communities and other stakeholder to mitigate negative impacts
- Roads and other infrastructure will be developed only when essential after an impact assessment and then to ensure proper maintenance to minimise environmental impacts
- Various forms of tourism will be developed to help unlock economic benefits and funding BUT it must deliver a cost-effective outcome
- Other sources of revenue and economic benefits will be explored to improve and diversify the revenue streams
- Governance will be improved to ensure high effectiveness and efficiency with adequate funding through the development and operation of decentralised and autonomous management
- Improved engagement with the Zambian authorities, via the TFCA mechanisms, will help address impacts (positive and negative) on the Reserve from the Zambian side.

4.3. Adaptive Management

Adaptive management requires that baseline data is available on which impacts of a particular action can be measured and monitored, thereby allowing one to take corrective measures when and if necessary. The setting of appropriate quotas for all resources permitted for harvest necessitates detailed knowledge about the natural history, distribution and density of all species concerned within VMWR. It is important that communities are actively involved in the generation of these data to ensure that all involved parties understand the requirements and outcome of any investigation. A detailed set of scientific guidelines has been developed for the resources occurring within the Reserve and have been summarised by Mphepo (2002b). While the scientific methods described in Mphepo (2002b) produce accurate and reliable data, they are often time-consuming and require a great deal of human and financial resources to conduct. However, time is often limited because there is a great demand from communities to implement RUP. Consequently, it may not always be possible to carry out the necessary scientific research within the timeframe required. Thus, an alternative method, resource mapping, which is faster to conduct and ensures adequate community participation is implemented when required.

An analysis of the impact of harvesting on individual resources is to be carried out every three to four years. Monitoring is to be conducted either with resource mapping or by utilising the scientific methods described in Mphepo (2002b). The research section is responsible to organise and conduct the research, with assistance, where needed from the other sections.

One of the fundamental objectives of Collaborative Management is to achieve the sustainable conservation of the Reserve by promoting legal and controlled use of specified resources and thereby substantially reducing the level of illegal activities ongoing in the Reserve. Thus, poaching activities should be reduced to minimum levels and wildlife populations recovering. Both long-term objectives need to be monitored over time to determine whether the initiative is achieving them. Research is monitoring and analysing the number of wildlife species within the Reserve and the incidence of illegal activities within the Reserve over time. An analysis of the trends should be done every four to five years. In addition, to determine the impact of the Collaborative Management initiative on the relationship between communities and DNPW and people's attitudes towards the Reserve, an attitude survey should also be conducted every four to five years and compared with the previous survey.

5. IMPLEMENTATION PLAN

5.1. Programme 1: Natural Resource Management

5.1.1. Context

Vwaza is an important biodiversity asset although significantly less so than the nearby NNP. Historically the wetland located in the middle basin of the Reserve was more extensive and mostly had permanent water in most seasons. By local accounts it is now more seasonal with often long periods of no surface water in the dry season. Tourism, the often-touted main benefit, unfortunately remains limited and its impact, even when successful, at the local level remains limited. The high infestation of tsetse fly and the very poor road network make building a tourism brand and destination expensive and risky. The herbivore population, especially the small and medium sized animals have been heavily over exploited and the populations of many species are very low while others are now locally extinct in the Reserve. The linkage with the neighbouring forest and GMA in Zambia and their further links to North Luangwa National Park are increasingly threatened by settlement and other human activities.

The 'illegal over exploitation' of most of the wildlife populations has led to declines in their populations which is resulting in significant lost productivity. This is in nobody's interest and alternative management strategies and benefit sharing systems must be explored. This could potentially be implemented through better collaboration focussed on rebuilding the wildlife populations, allowing limited sustainable harvesting which would improve trophic cycling, increase local benefits and potentially saving management expenses – a truly win-win situation. This is a likely possible reality that must be explored and pursued through improved dialogue and agreement between the Reserve authorities and communities with support from donors. HWC has been a source of conflict with communities although the recently improved fence and better collaboration with communities is showing a positive improvement. The areas requiring priority attention to improve productivity and ecosystem function, are:

- Increasing wildlife number with some species requiring limited re-introduction and /or boosting of populations to a minimum threshold; The improvement in water availability in the dry season to restore historical water availability, this will also help increase productivity.
- The role of wildlife, especially herbivores and their purpose beyond biodiversity conservation, and their potential to deliver sustainable benefits to local people; and Increasing benefits to communities from improved natural resource productivity and increasing wildlife numbers.
- The objectives, guiding principles and strategies set out in this section will provide a framework to guide management on the aspects listed above. The overriding management strategy is one of balancing critical threats to biodiversity and delivering sustainable benefits to communities and the people of Malawi without compromising species resilience and diversity.
- Aligned with the overarching Objectives and Vision, the natural resources still present an opportunity to offer increased and wider benefits to the surrounding communities. Use of these must be explored within an accountable and equitable framework which safeguards critical species and supports responsible, humane and sustainable use.

Table 8. Summary Natural Resources Management Implementation Plan

Vision: Wildlife numbers and species diversity restored, and productivity improved and secured through shared and sustainable incentivized co-management				
SPECIFIC OBJECTIVE(S)	GUIDING PRINCIPLE(S)	MANAGEMENT STRATEGY	ACTIONS	TTIMEFRAME
Resource Use Management				
Rationale: The threats associated with unsustainable and illegal off take of wildlife and other natural resources within the Reserve must be reduced and/or eliminated. Law enforcement is an important component of this strategy; however, it may be possible, working through the community structures to agree on a range of joint interventions, which may include increased benefits for measurable and real outcomes which reduce and/or eliminate these threats. These must be explored with a view to finding win-win solutions. In the process the natural resources can always endure some level of sustainable harvesting, some species more than others, and this must be explored and developed for a range of species.				
Rebuild the wildlife population	Law enforcement will remain an important strategy to deal with illegal activities, however it will be supplemented through developing co-management of resources in collaboration with communities	Explore opportunities to broaden sustainable and manageable natural resource use to provide communities with important benefits while sharing management responsibilities	Explore co-management strategies with communities and if possible, implement an incentive driven scheme Build substantiable use models and monitoring strategies to improve the growth the production from the wildlife resources	FY1 and ongoing
	The status and biology of the resource must be well understood, and management must, where possible, explore and develop sustainable use parameters with communities with agreed operating standards	Explore and implement strategies to enhance the productivity of the ecosystem and to improve sustainable harvest options.		
	Wildlife will be managed primarily to improve the herbivore densities while also balancing the species diversity	Affordable and practical monitoring of wildlife population must be developed as part of the wider management plan for wildlife in Vwaza and the wider TFCA environment.		
	The ‘closed’ nature of the system means that the wildlife populations will be activity managed according to a ‘fixed stocking density’ with some fluctuations between species and seasons as informed by monitoring and adaptive management	There are several different species of herbivores in the Reserve, their roles and ‘carrying capacities’ must be further explored and management plans/systems developed	Develop a Wildlife Management Plan with details for important species and monitoring.	FY1 and ongoing
		To determine the reasons for wildlife population declines and how to address these. To define the role of elephant and the management of the population, especially as numbers will increase.		

		To define the role of predators - existing and new arrivals (such as lion which periodically are seen) To develop a re-introduction strategy of previously occurring but now locally extinct species and implement it To develop a broad stocking model for the different species with broad management parameters of the various guilds or species To explore management interventions to enhance productivity and population growth rates, such as improving water availability, especially in the wetland where availability is now reduced;		
	The short to medium term some species may require support to help boost numbers	Affordable and practical monitoring of wildlife population must be developed as part of the wider management plan for wildlife in Vwaza and the wider TFCA environment;	Undertake a feasibility study of potential resources which could be harvested and define limits with monitoring and management guidelines	FY1 and ongoing
	Other species, which may be more prolific may offer the potential for limited sustainable use, even if populations are low			
Rationale: Most natural resources offer the opportunity for some sustainable use - an ‘excess’ which can periodically be harvested under controlled and managed conditions with appropriate monitoring. The timing, amount, type (sex, age etc.) and methods applied are important in ensuring the harvests are sustainable and responsible. Irresponsible and inappropriate harvesting can be highly detrimental and is not what is considered as sustainable. To ensure use is sustainable, control in essential and adaptive management is important to respond and if necessary, adjust to changing situations – the bottom line - use must be properly monitored. The use of resources is primarily focused on use by people from the local area and is not intended for sale and export away from the surrounding districts. It is intended to allow access to and use of resources previously used by local people for a range of uses including food. The policies and legislation in Malawi are very supportive of resource use, probably one of the most accommodating across the region. To permit this use all parks include a resource use zone where communities may access certain defined natural resources for their own use. This is regulated and controlled via resource use agreements and by DNPW staff located within the villages. Some products such as honey may be harvested outside of the formally proclaimed resource use area. The system has weaknesses and control is not as effective as it should be however, it provides an excellent baseline from which to improve and expand the access to resources.				
All harvesting of resources is legal, optimised, sustainable, monitored and quantified	Engagement with the communities must be conducted through the formally recognised institutions	Many species of wildlife are likely being unsustainably harvested – engage with communities to explore and develop co-management strategies with incentives and measurable outcomes and formulate agreements and implement a monitoring, compliance and incentives agreement	Engage with communities to explore reasonable and equitable resource use	Ongoing
	Use of resources for commercial use outside of the area, for example honey, will be subjected to a more		The best techniques for harvesting including the seasons The appropriate levels of harvesting	

	stringent control and application and monitoring of use to ensure harvests do not impact on the ecosystem, fees may be applicable All use must be monitored, and the resource used must have a monitoring system within the Reserve of sufficient resolution to ensure the underlying resources are sufficient to support use. Uncontrolled and illegal use must be limited and control measures including any sanctions must be defined The use is for own consumption by local communities and is not for sale outside the area or for export out of the country	Any natural resources use must be preceded by a feasibility study which defines how use may be permitted.	The control and importantly the monitoring required The factors which determine the level and type of harvesting and the limits which may apply and require monitoring and how these will be agreed and implemented between the parties An operational plan including a costing of such a plan which must set out all the details including access control, season of use, levels of use, sanctions for non-compliance, zones and any other relevant information	
Rationale: There are areas in the Reserve where HWC is a problem, especially with elephants but not limited to elephants only. A detailed study of the impacts, scale, and mitigation measures¹⁴ of HWC and a manual¹⁵ for dealing with it was developed in collaboration with communities and park management in 2022. The findings of these studies and the HWC Manual developed must be implemented.				
Manage and contain Human Wildlife Conflict (HWC)	To work with communities and impact effecting stakeholders and partners to develop and ensure a HWC strategy is implemented	Explore all options to mitigate and significantly reduce HWC	Continue to Implement the existing HWC Management Scheme and associated institution (<i>aligning interventions and activities with those implemented in NNP through the Scheme</i>)	Ongoing

¹⁴ Gross, EM and Shaba, T. 2022.HWC management scheme. Vwaza Marsh Wildlife Reserve & Nyika National Park, Malawi. TFCA Unit MAZA and KfW.

¹⁵ Gross, EM and Shaba, T. 2022.HWCMS Manual. Vwaza Marsh Wildlife Reserve & Nyika National Park, Malawi. TFCA Unit MAZA and KfW

Ecosystem Monitoring				
SPECIFIC OBJECTIVE(S)	GUIDING PRINCIPLE(S)	MANAGEMENT STRATEGY	ACTIONS	TIMEFRAME
Rationale: Little recent knowledge is available from the ongoing monitoring of the various components of the ecosystem, including fire. (Recently a game census was undertaken, however, there is no local vegetation map and no monitoring of vegetation for the Reserve.				
A wildlife and vegetation monitoring system must be developed to help guide management on cost effective actions	A monitoring system for the natural resources must be developed which focusses on those aspects which are likely to have large impacts on the resilience of the system Monitoring must be cost effective and implemented by Reserve staff and/or community members		Implement a basic fauna & flora monitoring strategy	Ongoing
The surface water availability of the wetland is improved	Develop a water supplementation strategy Provide water for wildlife in areas where evidence suggests it was mostly available all season, especially in the wetland Avoid placement in areas which may aggravate HWC	Explore the best options to provide water to ensure improved productivity from wildlife	Secure water quality and ensure quantity is made available	FY1 and ongoing
Manage the vegetation to optimise diversity and resilience and improve productivity	Fire management, must continue but according to a systematic plan to improve productivity of the ecosystem	Explore fire impacts and, where appropriate, management interventions designed to mitigate adverse impacts	Develop a basic fire management plan detailing season, type, strategies and equipment and resource needs	FY2 and ongoing

5.1.2. High level resource considerations and requirements

The estimated steady state operating costs including initial once-off or capital expenses are reflected in the table below:

Table 9. Programme 1: Financial Considerations

ACTIVITY	TYPE (\$)	
	Once-off	Ongoing
Natural Resources		
Fauna		
Wildlife Introduction	850,000	-
Game Management Strategy Plan	50,000	-
Water supplement in carrying capacities	120,000	
Monitoring – Census	30,000	20,000
Tsetse fly management	35,000	7,500
Sustainable Use strategy	40,000	25,000
Monitor and control SU		25,000
Law Enforcement		265,000
Vegetation		
Develop vegetation map	15,000	-
Develop vegetation monitoring plan	15,000	-
Monitor vegetation		5,000
Fire management		10,000
Invasive Species Management		5,000
Integrated HWC Management	<i>Incl. in Community</i>	-
TOTAL	1,155,000	362,500

5.2. Programme 2: Cultural and Heritage Resource Management

5.2.1. Context

Conservation of cultural heritage sites as well as the role and value of cultural heritage resources can be enhanced through alignment and integration into other plans and programmes of the VMWR including tourism, stakeholder engagement and environmental awareness.

A key feature of cultural and heritage resources that should be included in any plan or intervention associated with the conservation identified assets is that they are an irreplaceable source of identity and inspiration, which can also be an important driving force for sustainable development (UNESCO, 2020), and for this to be effective, authentic trusteeship over the cultural and heritage resources needs to be established.

Table 10. Summary Culture and Heritage Implementation Plan

<i>Vision: Integrated Cultural and Heritage resources with all Reserve significant attributes.</i>				
OPERATIONAL OBJECTIVE(S)	GUIDING PRINCIPLE(S)	MANAGEMENT STRATEGY	ACTIONS	TIMEFRAME
<i>Assess and proceed with WHS nomination process (if deemed necessary)</i>				
Resource Management				
Rationale: Cultural and heritage resources management in a protected area requires that these resources be managed alongside all the precious natural resources and wildlife. No management problems are identified, this may change as tourist density increases.				
Link cultural and heritage resources with the Reserve's natural resources	Communities are holders of the more recent history and their input in identifying and prioritising management interventions is essential	Interventions must have a management/operational plan to support actions	Develop and implement a Cultural and Heritage Resource Management Plan	FY3 and ongoing

5.2.2. High level resource considerations and requirements

Ongoing implementation associated and estimated costs can only be assessed once the Cultural and Heritage Resource Management Plan has been finalised and approved. For this programme, there are no considered high level financial resources yet determined. See Annexure D for the Reserve's complete list of recorded Cultural and Heritage sites.

5.3. Programme 3: Community Engagement

5.3.1. Context

Communities lie at the heart of the Reserve both in terms of managing impacts, positive and negative, but also receiving benefits. Underlying this, and building on positive outcomes, is strong communication and governance. When these function effectively, relationships are strengthened, and trust is built. There have been positive impacts for communities because of the Reserves' functioning relationships and the benefits offered. However, there are also underlying tensions and areas of conflict; there remain areas for improvement. These tensions occur in all relationships, not surprising therefore in an environment as complex as this, but how they are dealt with and how trust is built suggests there is much work still outstanding in this regard and further benefits could be gained by all. As mentioned, many of the negative impacts in the Reserve have their origins within the communities either directly or indirectly. The best method to deal with communities is through engagement with a view to finding common ground and seeking win-win solutions and building trusting relationships.

Table 11. Summary Community Engagement Implementation Plan

<i>Vision: Respectful and accountable relations with shared outcomes</i>				
OPERATIONAL OBJECTIVE(S)	GUIDING PRINCIPLE(S)	MANAGEMENT STRATEGY	ACTIONS	TIMEFRAME
<i>Resource Management</i>				
<i>Rationale: The Reserve remains a resources rich asset which can deliver a significant sustainable stream of benefits for communities while still achieving its fundamental underlying biodiversity Objectives. Unsustainable and illegal off take is detrimental to the resources base and, in some instances, such as wildlife numbers, has reduced the productivity by orders of magnitude; this is not an optimal outcome for anybody. It is proposed that this can be improved through developing shared outcomes with equitable sharing of benefits, but these must be underpinned by responsible and accountable management by both the Reserve and the communities. To achieve this the parties will need to work together to reach agreement/s which is/are based on achievable and measurable outcomes with rewards for achieving targets and sanctions commensurate with breaches, underpinned by monitoring.</i>				
To identify those resources (natural, cultural and physical) in the Reserve which are threatened and to which the communities could significantly contribute to eliminating or significantly reduce the adverse impacts. To significantly improve the benefits arising from the natural and cultural resources reducing the threats, risks and impacts.	There is considerable scope to increase the wildlife population of most small, medium, and large mammals, as these increases will likely be a great opportunity to increase responsible and humane annual removals based on sustainable quotas The range of possible natural resources which can offer benefits is potentially large, but it is proposed to start with the easier to define, measure, and manage and as capacity and experience grows this can be extended	Through this process the Reserve management must strive to build a sense of ownership and pride in the Reserve by the communities	Develop and implement a comprehensive Natural Resource Use Management Plan and Community Engagement Plan/Strategy (Exploring opportunities for strengthening collaboration should be brought into the development of a Community Engagement Strategy at national level) Develop a Stakeholder Engagement Plan (to encourage and facilitate regular exchange with and between key stakeholders and affected groups)	FY1 and ongoing

	All use must not compromise the natural resources and special attention must be paid to threatened species and habitats Where possible 'employ' community members to assist with management functions where it is cost effective to do so Community engagement should not be limited to natural resource management and HWC related issues only, it should be considered as an integral conservation partner. Use will be guided by the zonation which may be amended in response to perceived threats and potential opportunities, but still underpinned by the principle of sustainable use			
To fairly consider what resources could be responsibly and sustainably used to increase benefits	All areas of conflict must be resolved, agreed, and formalised including boundary delineation, access, human wildlife conflict hotspots management and other areas of conflict	Promote alternative and sustainable livelihoods for local communities. Ensure benefits are linked to performance and agreed outcomes	Develop and implement a Human Wildlife Conflict Resolution Strategy Implement the Environmental Awareness and Education Programme	FY1 and ongoing
Improve community livelihood resilience				
<i>Rationale: Tsetse fly are an important and significant problem for communities and staff inside and those bordering the Reserve. Although they have always occurred in the area and the wildlife are largely unaffected, the health impacts for humans are significant and control to eliminate this impact is essential</i>				
Tsetse fly infestations managed to acceptable limits especially on the perimeter and near staff and tourism areas to reduce the impacts on humans	To work towards eliminating tsetse fly impact on neighbouring communities and around staff/tourism facilities inside the Reserve	To continue to implement mitigation measures. A small but nevertheless significant risk exists which is likely to remain unless large-scale control measures are taken.	Proactively Develop a Strategy with costs and implement - to control and where feasible eliminate high threat area i.e. (South Rukuru floodplain) Embed this strategy in a monitoring framework	FY1 and ongoing
Governance and Management				

To contractually agree on meaningful and outcomes focussed co-management agreement between the Reserve authority and the communities to mitigate these threats	High levels of governance are essential and to this end governance arrangements may need to be strengthened and improved to ensure: Transparency, equity, accountability, and responsibility must underpin all relationships Administration and other overheads are contained Control, monitoring and effective sanctions are critical	Park management must ensure adequate and properly trained staff are available and accessible to communities to manage and control areas of common concern and develop and implement a Community Engagement Strategy	Establish/build a functional Co-Management Agreement. Underpinned by high standards of governance, ensure outcomes and impacts are effectively managed. Develop and implement a Community/ Stakeholder Engagement Plan Develop and implement a Community Action Plan (<i>which incorporates Grievance Redress Mechanisms and/or associated Risk Management Strategies, supported by the HWCMS Manual Action Plan¹⁶</i>)	FY1 and ongoing
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5.3.2. High level resource considerations and requirements

The estimated steady state operating costs including initial once-off or capital expenses are reflected in the table below:

Table 12. Programme 3 Financial Considerations

ACTIVITY	TYPE (\$)	
	Once-off	Ongoing
Community Engagement		
In collaboration with communities explore wider co-management options and develop a Community Engagement Strategy	75,000	
Improve and support community governance institutions	75,000	35,000
Community partnerships supporting park management activities	<i>Incl.</i> under maintenance in Admin	
Community Engagement & support <i>incl.</i> Integrated HWC management		90,000
TOTAL	150,000	125,000

¹⁶ Gross, EM and Shaba, T. 2022.HWCMS Manual. Vwaza Marsh Wildlife Reserve & Nyika National Park, Malawi. TFCA Unit MAZA and KfW

5.4. Programme 4: Tourism and Enterprise Development

5.4.1. Context

It is important that park management develop and explore the expansion and development of enterprises which will contribute economically to the region and the nation but also importantly to contribute to offsetting the operating expenses of the Reserve while also significantly contributing to benefits to local communities. Traditionally photo tourism has been seen as the most important revenue stream (not always PROFIT) in this regard, it is however, as shown through COVID-19, vulnerable, and exposed the risks of relying on the revenue earned to fund operations and support communities. Relying on a single revenue strategy is risky with potentially large impacts. In the context of Vwaza photo tourism this is even more relevant. Building Vwaza as a brand and destination will be hugely capital intensive, long term and therefore extremely risky. Fortunately, there are, however, other evolving opportunities to generate revenue. Currently the sale of carbon offers exciting and significant potential. This has already been secured in the Resource Use area of the Reserve and is helping communities. This could potentially be expanded and other revenue streams such as Payment for Environmental Services (PES) also increasingly looking like a possible alternative. This is a rapidly changing landscape, and all opportunities should be explored. The sustainable use also offers opportunities to beneficiate products, especially locally.

To explore photo tourism further, a few attempts to attract operators have proved unsuccessful as the product is not financially workable. To develop this as an option is extremely risky because, the Reserve currently does not have an exceptional wildlife product, it may appeal to a small user group but accommodating these users at low volume is unlikely to deliver significant benefits and is unlikely to prove to be financially viable, rather the opposite. The administration required and capital needed to develop a photo tourism product is unlikely to be justified on economic grounds. This is further compounded by a poor road network and high tsetse fly infestations. It is likely that over time as wildlife numbers increase this may change and photo tourism may then prove to be a viable option. There may be some opportunity for limited access under specific conditions to permit some use in certain seasons to specific user groups and, if cost effective, these should be explored. For now, the costs to develop and expand tourism are not viewed as a priority given the wider threats and demands which must be met in the short to medium term.

Table 13: Summary Tourism and Enterprise Development Implementation Plan

<i>Vision: To grow and expand the income streams to contribute to park management operating costs</i>				
OPERATIONAL OBJECTIVE(S)	GUIDING PRINCIPLE(S)	MANAGEMENT STRATEGY	ACTIONS	TIMEFRAME
Enterprise Development				
<i>Rationale: Photo tourism requires significant financial investment and skills to unlock obstacles which are unlikely to be achieved by the market, assuming a wildlife product is ready and accessible. The infrastructure required and the marketing investment to build the brand and destination will be significant. The mobilisation of other funding sources such as the expansion of carbon sequestration and others must be explored.</i>				
Generate revenue to offset park operating expenses	Ensure all potential revenue streams offer a cost beneficial return for the Reserve	Explore all opportunities to increase revenue to the Reserve to help offset operating costs	Continue to explore all option	
Generate benefits for communities			Ensure all initiatives are financially viable – do basic business feasibility studies	

		Ensure all opportunities are cashflow positive after considering all the costs To attract investment and capital to help build viable businesses which contribute socially and economically to the Reserve's management costs	Ensure conditions for operators/investors are balanced with risk appropriately shared	FY1 and ongoing
Tourism Development				
To explore and if feasible unlock tourism at scale by improving access and removing other major obstacles	Tourism (broadly defined not only photo tourism), if it is developed must be achieved through private public partnerships (PPP) where risks and rewards are shared equitably between the partners	Explore more options for sustainable use and enterprises based on park resources and sustainable products which support conservation	Review, update and implement the Tourism Development Plan	FY1 and ongoing
	Concession agreements through PPP's must be fair and balanced, as risks in this sector remain very high and especially with building and developing a new brand and destination			
	Tourism operators understand their markets and their needs and to this end, sites selection should be guided by their needs but with essential environmental and other limitations to ensure a sustainable and responsible outcome		Implement the Tourism Development and Facilities Rollout Strategy forming part of the Tourism Development Plan	FY2 and ongoing

5.4.2. High level resource considerations and requirements

Significant capital expenditure will likely be required to unlock the tourism potential and ensure the Reserve is an attractive opportunity for operators and investors. The feasibilities to explore further use options including carbon sequestration and payment for environmental services must be developed.

The estimated steady state operating costs including initial once-off or capital expenses are reflected in the table below:

Table 14. Programme 4 Financial Considerations

ACTIVITY	TYPE (\$)	
	Once-off	Ongoing
Tourism and Enterprise Development		
Explore the expansion of carbon revenue	100,000	
Explore sustainable use enterprises	40,000	
Provision for capital to unlock product development from sustainable use activities	100,000	
TOTAL	240,000	

5.5. Programme 5: Management, Administration and Finance

5.5.1. Context

All the programmes are underpinned by management, administration and finance. This programme supports all the staff, vehicles, equipment, infrastructure and other items as well as securing and administering funding.

Operating directly within the Government system as a department offers secured funding (if not adequate) and some certainty for staff, however it is not sufficiently nimble nor resourced or structured to respond rapidly to a changing environment and expressly to secure adequate funding. It furthermore has limitations on improving the employment conditions for staff and their support needs. A common strategy to address these challenges is via additional funding provided by donors. Typically, these have been provided in the past by the World Bank and the EU and other smaller donors, however this funding is erratic and short term (3 to 5 years) and as a result causes severe shortages when it ends. A longer term, more reliable and sustainable solution is required. Successful models elsewhere such as the approach by African Parks (Majete, Liwonde and Nkhotakota) based on a long term (>20 years) co-management model underpinned by an agreement with an NGO or third party is therefore a viable option worth considering. This offers more flexibility, is likely to secure significant additional funding and can improve conditions for staff, if properly structured. DNPW is currently exploring and in the final stages of concluding such an arrangement with an NGO.

Table 15. Summary Management, Administration and Finance Implementation Plan

<i>Vision: To Ensure Long Sustainable and Adequate Funding</i>				
OPERATIONAL OBJECTIVE(S)	GUIDING PRINCIPLE(S)	MANAGEMENT STRATEGY	ACTIONS	TIMEFRAME
Reserve Funding				
To ensure adequate stable and long-term funding is available and secured for the Reserve's various operations	Any intervention must significantly contribute to the Strategic Objectives, and the scale of the intervention must be commensurate with the cost, the priority and importantly the expected outcome Any intervention is costly, and the achievement of an outcome is critical to ensure management effectiveness	A long term (at least 20 years) strategic business plan is developed, implemented and when necessary, adapted to changing conditions A shorter term (3 to 5 years) funding strategy is developed and implemented to ensure immediate funding can be mobilised An annual budget with performance measures is developed annually and reported on at least quarterly with variance explained and contingency plans developed	Develop funding strategies linked to developed lower-level operational plans and implement with important focus on outcomes	Ongoing
Reserve Staffing				
To ensure staff are properly trained, equipped, remunerated and motivated to undertake a range of tasks	The deployment of staff, and/or the purchase of equipment, vehicles and supplies as well as the construction of infrastructure all carry liabilities, such as training and development, maintenance and provision for replacement; these aspects must be properly considered and accounted for when considering implementing an activity	Required employee competencies and behaviours; high levels of employee engagement, motivation, and job satisfaction; increased park management efficiencies: attainment of Reserve objectives and satisfaction of key stakeholders	Develop and implement necessary Human Resource Management Policies Develop and implement an Environmental Awareness and Education Programme for staff and surrounding communities	FY3 and ongoing
Reserve Equipment and Infrastructure				
To ensure all equipment and infrastructure is maintained , replaced and operationally serviceable	Equipment and infrastructure must contribute to the effectiveness of management, i.e. the costs of	All equipment and infrastructure must have a maintenance and operational plan to ensure they are	Develop and implement an Infrastructure and Equipment policy and Management Systems	FY2 and ongoing

	managing and maintaining it must be justified by the benefits received	maintained in working order with adequate budgets	Develop and implement an Infrastructure Development Plan	
Reserve Governance				
To ensure high levels of governance, accountability, efficiency and control are implemented.	Priority must be afforded to those interventions which will contribute the best outcome to the most significant threats or realise the best opportunities All outcomes must have a measurable output, and these must be monitored and reported to improve efficiency and effectiveness Management must set clearly defined targets with achievable goals set against priorities. These must be reported on and lessons learnt and if necessary, corrective action implemented An operating environment must be based on sound business principles which is dynamic and incentivised	Policies must be developed and implemented to provide a framework for managing human resources, finance, safety and security, vehicle, equipment and infrastructure use and allocations A long-term co-management agreement is implemented (currently being finalised) to de-centralise management and to improve efficiency and to explore the possibility of broadening oversight of management performance and Reserve programmes, to include community representation and other third parties. It is assumed in this Plan and the high-level resource requirements estimated in the next section that Nyika and Vwaza will be managed by a joint overarching directorate, formed and operated under a co-management agreement The Co-Management Agreement with the communities must support incentives for benefit sharing	Management must develop a work schedule, with outcomes, guided by the framework described herein, and this must be report frequently (ideally quarterly) Develop standard operating procedures and share with the necessary staff to ensure compliance with standards and performance.	FY1 and ongoing

5.5.2. High level resource considerations and requirements

Table 16. Programme 5 Financial Considerations

ACTIVITY	TYPE (\$)	
	Once-off	Ongoing
Finance and Admin		
Financial control and general administration		220,000
Maintenance		190,000
Develop polices and systems	50,000	
TOTAL	50,000	410,000

A summary of all the Programmes¹⁷ with a total once-off and annual estimated steady state operating budget are presented below:

Table 17. Summary Financial Considerations - All programmes

ACTIVITY	TYPE (\$)	
	Once-off	Ongoing
Natural Resources		
Fauna		
Wildlife Introduction	850,000	
Game Management Strategy Plan	50,000	
Water supplement in wetland	120,000	
Monitoring - Census	30,000	20,000
Tsetse fly Management	35,000	7,500
Sustainable Use strategy	40,000	25,000
Monitor and control SU		25,000
Law Enforcement		265,000
Vegetation		
Develop Vegetation Map	15,000	
Develop Vegetation Monitoring Plan	15,000	
Monitor Vegetation		5,000
Fire management		10,000
Invasive Species Management		5,000
HWC Management	<i>Incl. in community</i>	
TOTAL	1,155,000	362,500
ACTIVITY	TYPE (\$)	
	Once-off	Ongoing
Community Engagement		
In collaboration with communities explore wider co-management options and develop a Community Engagement Strategy	75,000	
Improve and support community governance institutions	75,000	35,000
Community partnerships supporting park management activities	<i>Incl. under maintenance in Admin</i>	
Community Engagement & support <i>incl.</i> Integrated HWC management		90,000
TOTAL	150,000	125,000

¹⁷ Apart from Programme 4: Cultural and Heritage Resource Management

ACTIVITY	TYPE (\$)	
Tourism and Enterprise Development	Once-off	Ongoing
Explore the expansion of carbon revenue	100,000	
Explore sustainable use enterprises	40,000	
Provision for capital to unlock product development from sustainable use activities	100,000	
TOTAL	240,000	
ACTIVITY	TYPE (\$)	
Finance and Admin	Once-off	Ongoing
Financial control and general administration		220,000
Maintenance		190,000
Develop policies and systems	50,000	
TOTAL	50,000	410,000
TOTAL ALL PROGRAMMES	1,595,000	897,500

6. ZONATION

6.1. Approach

The zonation must reflect the purpose of the Reserve and ensure the Strategic Objectives can be achieved. Zonation is a useful mechanism to ensure that a range of often incompatible strategies may be accommodated within the Reserve. With water production and flora conservation being the two most important objectives, these be the main guiding principles which will anchor the zonation. Furthermore, there is also a strong need to optimise community benefits and sustainable use. There already exists a 5km wide Resource Use area around the Reserve perimeter on the Malawi component park as an initial starting point and this perhaps requires some further refinement and expansion especially if fugitive resources such as wildlife form part of the use resources within this zone.

The floodplains along Lake Kazuni and the wetland are important natural assets. These areas may offer additional resources which communities could sustainably use, especially sustainable and responsible harvesting in the wetlands with permitted controlled use. These are very productive ecosystems as they offer a significant range of potential resources to communities but ideally these should be demarcated in areas, which may allow some harvesting with areas of protection, and this may vary over the season and indeed between seasons. A dynamic zonation may in this instance seem more appropriate. Given the existing biodiversity and the need to unlock benefits for communities it is felt that areas such as 'Wilderness' may no longer be relevant, although in theory inaccessible areas are likely to retain this character. However, irresponsible and very visible development must not scar the landscape.

6.2. Categories of Zonation and Details

The following broad zones are proposed:

5.1.1. Resource use zone

This is an area in which resources may be harvested by the communities to deliver important benefits. Currently this is limited to a rather 'blunt' 5km zone. A more appropriate approach may be to have a 'dynamic zone' in which some harvesting of different resources may be permitted, these may change in time and also in place as areas are 'closed' or open.

The default position therefore is that no resources use is permitted anywhere, but it is proposed that much of the Reserve is designated as a Potential Resources Use Zone, where Management, as informed by sustainable use studies, will designate areas where use will be permitted and under what conditions.

If infrastructure is required within this zone, this should be based on a sensible screening and for larger developments/structures an independent impact assessment undertaken to highlight any significant environmental or social impacts. Importantly, structures must be carefully positioned so as not to create an 'eye-sore' in an otherwise pristine landscape, careful positioning can help prevent this, and this is very important. Impacts from light pollution must also be considered.

5.1.2. No take or no-use zones – Protection zones

These are areas where no harvesting of any resources is permitted. These may be designated by management, guided by solid reasons, over time to offer protection to, for example, special bird nesting sites such as heronries, fish breeding areas, sites of cultural significance etc. Areas such as wetlands may require this zonation.

5.1.3. Utility zones

These are areas where park management infrastructure may be developed and facilities to support the Tourism and Enterprise Development Programme. Some areas are identified in the Zonation Figure below, however further areas may be designated by management to meet specific needs. These will still be subject to environmental screening and/or environmental assessments.

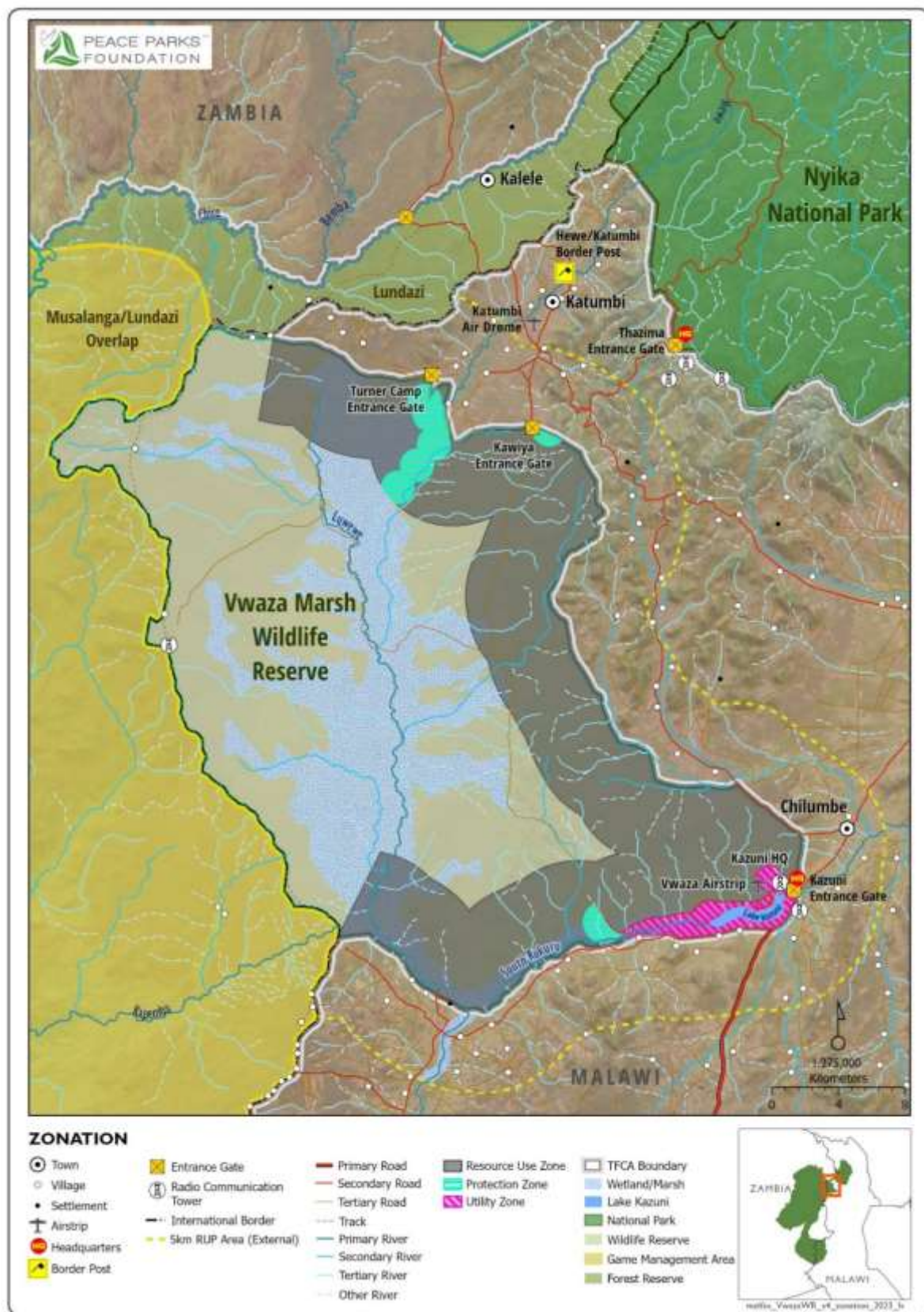


Figure 19. Proposed Reserve Zonation

The content of this General Management Plan is largely derived from the review of the previous management plan drafts and these are thus not continuously cited. Neither are personal communications and inputs by Park Management and experts received during the consultation process, nor are legal instruments such as laws and decrees. However, where new sources have been consulted, and new information included, such sources are cited below.

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APPENDICES

Appendix 1. Law Enforcement Statistics

Table 18. Law Enforcement Data

PATROL EFFORT PARAMETERS										
Parameters	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Planned Long Patrols	113	246	138	231	201	197	172	156	153	
Effectuated Long Patrols	95	217	107	158	165	163	135	136	122	
Planned short Patrols	0	0	0	0	0	134	188	227	188	
Effectuated Short Patrols	0	0	0	0	0	89	135	238	307	
Planned Man-days	2825	5904	3036	6006	6030	5873	5516	6103	5966	0
Effectuated Man-days	2375	5208	2354	4108	4950	5157	4272	5276	5770	0
Number of Patrollers	25	24	22	26	30	28	31	36	32	
Patrol Coverage %	50	74	43	60	75	77	61	109	77	
Catch Per Unit Effort (CPUE)	0.48	0.2481	0.5786	0.4740	0.4228	0.2177 6226	0.3422 2846	0.3040 182	0.2740 0347	#DIV/0 !
Poached Elephants	0	6	8	2	8	3	3	2	1	
Poached Others	27	46	26	47	42	48	30	14	13	
Gun Shots	30	120	102	77	66	41	47	18	76	
Drying Racks	13	25	26	37	9	29	32	11	27	
Illegal Camps	27	36	215	26	38	34	31	30	25	
Tree Cutting	569	201	0	167	157	201	361	226	397	
Timber Sawing	0	0	13	0	0	2	1	0	0	
Wildfires	16	5	0	12	8	13	16	16	3	
Encroachments	0	0	0	0	0	0	0	0	0	
Unarmed Group	27	10	24	36	30	18	51	44	13	
Snares	230	504	738	1339	1450	618	718	1147	887	
Armed Group	23	28	26	25	15	11	13	12	6	
Illegal Fishing	98	218	123	123	101	16	94	41	49	
Orchid Collection	0	0	0	0	0	0	0	0	0	
Arrests	65	61	42	42	105	57	36	31	58	
Firearms Seized	15	32	19	14	64	32	29	12	26	
TOTAL ILLEGALS	1140	1292	1362	1947	2093	1123	1462	1604	1581	0
					Baseline	80	80	80	80	80
Projected CPUE Target					0.4407	0.3526	0.2820	0.2256	0.1805	0.1444

Key species	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Poached animals	14	8	34	14	27	51	33	21	13	
Elephant	2	6	5	4	9	3	3	2	1	
Eland	0	0	1	1	0	0	0	0	0	
Roan	0	1	1	4	3	3	4	6	4	
Bushbuck	7	3	0	2	2	3	3	5	1	
Reedbuck	0	0	0	2	4	1	1	2	0	
Impala	4	0	3	4	3	2	2	4	1	
Kudu	5	3	8	9	4	4	1	7	8	
Common Duiker	1	0	1	0	4	4	0	2	1	
Porcupine	2	1	1	1	0	1	1	0	0	

Parameters	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Timber Sawing / Logging	0	0	0	0	0	2	1	0	0	
Firewood collection	16	16	0	5	0	6	9	8	3	
Plant collection / Orchid	0	0	0	0	0	0	0	0	0	
Wildfires	0	0	0	0	2	13	16	16	3	
Encroachment	0	0	0	0	0	0	0	0	0	
Mining	0	0	0	0	0	0	0	0	0	
Parameter	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Game meats (Kgs)	0	0	0	0	59	98	35.5	25	10 Kg	
Orchid (kg)	0	0	0	0	0	0	0	0	0	
Rifle	0	0	0	1 (.375)	1 (.375)	1	0	0	0	
Shotgun	0	0	0	0	0	0	0	0	6	
Muzzle loading Gun	15	16	80	82	57	32	29	12	10	
Homemade shotgun	0	0	0	0	0	1	1	0	1	
Ammunition	0	0	0	2 (.375)	9 (.375)	5	1	146 pellets	6	
Snares	257	313	1629	1579	2018	618	718	1147	887	
Skins	0	0	0	2	0	10	2	2	0	
Ivory	0	0	1 piece	2 pieces	1 piece	1 piece	5 pieces	4 pieces	1	
Hippo Teeth	0	0	0	0	0	79 pieces	44 pieces	14	0	
Other weapons (knives, spears, fishing baskets)	50	17	363	415	959	440	109	17	18	
Parameters	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Other Weapons Seized	58	78	22	64	250	440	109	17	18	
Illegal Honey Collection	0	0	36	18	11	12	7	15	6	
Livestock Grazing	0	0	0	0	0	0	1	0	0	
Firewood Collection	16	16	0	5	0	6	9	6	3	
Parameters	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Planned Investigation days	0	0	0	0	0	0	0	0	3	
Actual investigation days	5	4	16	40	4	0	0	2	6	
Number of reports received	3	9	2	7	15	27	13	11	0	
Effectuated Search Operations	7	9	3	1	25	20	9	5	3	
Roadblocks	0	0	0	0	0	1	0	0	0	
Parameters	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Arrests	65	60	28	96	116	57	36	33	58	
Escapees	Not capture d	in reports	31	50	32	67	73	72	35	
Ivory	0	0	1 piece	2 pieces	1 piece	1 piece	5 pieces	4 pieces	1 piece	
Assorted game meat (Kg)	0	0	0	0	0	98	35.5	25	15 Kg	
Rifle	0	0	0	1 (.375)	1 (.375)	0	0	0	0	
Shotguns	0	0	0	0	0	0	1	0	6	

Muzzle loading guns	15	16	34	82	57			12	10	
Homemade guns	0	0	0	0	0	32	29	0	13	
Skins	0	0	0	2	0	10	2	2	0	
Ammunition	0	3	0	2 (.375)	14	5	1	146 pellets	0	
Snares	257	313	1629	1579	2018	618	718	1147	887	
Spears	0	0	0	1	0	1	0	1	0	
Motor vehicles	0	0	0	1	1	0	0	0	0	
Motorcycles	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	2	0	1	0	0	
Gun Powder	0	0	2 bottles	14 bottles	5 bottles	4 bottles	22 bottles	11 bottles	2 bottles	
Axe	3	10	14	21	17	8	6	10	17	
Orchids (Kg)	0	0	0	0	0	0	0	0	0	
Animal products (Curios)	0	0	0	0	0	0	0	0	0	
Parameters	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Cases brought forward	57	60	22	88	101	31	8	0	0	
New cases	0	0	12	0	1	57	36	33	58	
Police bond / Bail	10	0	0	10	24	8	17	10	10	
Court Bail	0	0	0	1	4	5	0	0	1	
Convicted	38	60	35	29	71	25	15	21	42	
imprisonment	0	4	11		10	20	9	17	35	
Fined	23	44	12	20	61	3	0	4	1	
Suspended sentence	15	10	11	17	3	2	6	0	3	
Community Service	0	0	1	0	0	0	0	0	2	
Discharge	0	0	0	0	1	0	0	1	1	
Acquittal	0	0	0	2	0	4	1	1	1	
Forfeitures										
Parameters	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Motor Vehicles	0	0	0	0	0	0	0	0	0	
Rifles	0	0	0	1	1	0	0	0	0	
Shotguns	0	0	0	0	0	0	0	0	6	
Homemade firearms	0	0	0	0	0	14	5	0	11	
Muzzle loading guns	10	13	28	55	36	0	0	12	10	
Motor vehicles	0	0	0	0	0	0	0	0	0	
Motorcycles	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	0	0	1	0	0	
Spears	0	0	0	0	0	0	0	0	0	
Tents	0	0	0	0	0	0	0	0	0	

Table 19. Monthly Breakdown of Law Enforcement and HWC (2014 to 2022)

MALAWI ZAMBIA TFCA - VWAZA MARSH WILDLIFE RESERVE (2014)													
Activity	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	TOTAL
# Rangers deployed	21	21	21	21	26	21	22	24	29	21	20	22	269
# Patrols (All types)	19	25	22	18	19	19	22	28	29	24	24	20	269
# Man Hours on Patrol	-	-	-	-	-	-	-	-	-	-	-	-	-
# Animals Poached	2	1	2	2	4	2	4	4	1	6	4	2	34
# Road Blocks	-	-	-	-	-	-	-	-	-	-	-	-	-
# Snares	86	3	2	59	237	48	26	119	322	30	3	48	983
# Gin Traps	-	-	-	-	-	-	-	-	-	-	-	-	-
# Firearms	1	4	-	2	3	-	3	-	-	-	-	4	17
# Arrests	2	1	1	9	3	1	1	7	2	14	12	-	53
Fines issued (MWK)	6,000	60,000	21,000	87,500	42,500	17,500	18,000	45,000	53,000	210,000	-	-	560,500
Fines paid (MWK)	-	-	-	-	-	-	-	-	-	-	-	-	-
# Convictions	2	1	1	4	3	1	1	7	2	14	-	-	36
# HWC cases	-	11	17	11	9	5	3	16	1	2	1	1	77
MALAWI ZAMBIA TFCA - VWAZA MARSH WILDLIFE RESERVE (2015)													
Activity	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	TOTAL
# Rangers deployed	21	27	26	28	30	31	26	32	38	37	38	38	372
# Patrols (All types)	21	29	19	25	26	23	28	23	25	34	39	32	324
# Man Hours on Patrol	-	-	-	-	-	-	-	-	-	-	-	-	-
# Animals Poached	6	1	3	2	2	2	3	4	5	6	7	3	44
# Road Blocks	3	-	-	-	-	-	-	-	-	-	-	-	3
# Snares	86	104	237	114	103	338	134	292	101	227	76	38	1,850
# Gin Traps	-	-	-	-	-	-	-	-	-	-	-	-	-
# Firearms	1	1	3	-	-	2	4	2	3	15	3	2	36
# Arrests	-	3	3	-	2	4	3	8	5	14	16	13	71
Fines issued (MWK)	-	34,700	160,000	-	-	319,000	115,000	71,000	34,000	417,000	96,000	75,000	1,321,700
Fines paid (MWK)	-	-	-	-	-	-	-	-	-	-	-	-	-
# Convictions	-	3	2	-	-	4	3	6	5	9	8	4	44
# HWC cases	-	11	9	13	5	3	-	1	1	-	-	1	44

MALAWI ZAMBIA TFCA - VWAZA MARSH WILDLIFE RESERVE (2016)													
Activity	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	TOTAL
# Rangers deployed	39	39	39	39	39	34	38	33	32	28	26	25	411
# Patrols (All types)	27	9	16	26	48	46	52	23	18	19	14	20	318
# Man Hours on Patrol	-	-	-	-	-	-	-	-	-	-	-	-	-
# Animals Poached	2	2	3	4	2	6	3	3	3	5	4	1	38
# Road Blocks	-	-	-	-	-	-	-	-	-	1	-	-	1
# Snares	83	30	27	45	5	99	91	-	21	31	38	10	480
# Gin Traps	-	-	-	-	-	-	-	-	-	-	-	-	-
# Firearms	-	1	1	3	2	11	3	3	8	10	6	3	51
# Arrests	1	8	1	4	10	4	6	8	8	14	12	7	83
Fines issued (MWK)	150,000	430,000	9,500	132,000	244,000	37,000	332,000	-	100,000	170,000	900,000	90,000	2,594,500
Fines paid (MWK)	-	-	-	-	-	-	-	-	-	-	-	-	-
# Convictions	1	6	1	4	3	1	5	-	6	7	8	4	46
# HWC cases	-	13	23	17	-	-	2	1	2	-	-	-	58
MALAWI ZAMBIA TFCA - VWAZA MARSH WILDLIFE RESERVE (2017)													
Activity	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	TOTAL
# Rangers deployed	27	27	26	26	26	19	26	26	26	19	24	21	293
# Patrols (All types)	16	18	17	16	16	16	12	15	17	21	17	21	202
# Man Hours on Patrol	-	-	-	-	-	-	-	-	-	-	-	-	-
# Animals Poached	4	3	2	2	2	3	1	1	1	5	2	1	27
# Road Blocks	-	-	-	-	-	-	-	-	-	-	-	-	-
# Snares	23	77	40	4	23	41	43	21	31	28	-	29	360
# Gin Traps	-	-	-	-	-	-	-	-	-	-	-	-	-
# Firearms	2	3	8	-	1	4	1	1	-	2	3	1	26
# Arrests	1	7	7	6	6	3	5	3	2	1	2	3	46
Fines issued (MWK)	50,000	-	-	-	-	-	-	-	-	-	-	-	50,000
Fines paid (MWK)	-	-	-	-	-	-	-	-	-	-	-	-	-
# Convictions	1	-	-	-	-	5	-	-	-	-	1	2	9
# HWC cases	3	5	4	-	4	-	8	9	9	6	-	2	50

MALAWI ZAMBIA TFCA - VWAZA MARSH WILDLIFE RESERVE (2018)													
Activity	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	TOTAL
# Rangers deployed	21	21	26	26	26	26	26	24	22	26	23	33	300
# Patrols (All types)	16	26	-	18	20	22	13	16	11	28	17	21	208
# Man Hours on Patrol	-	-	-	-	-	-	-	-	-				-
# Animals Poached	1	4	1	1	-	-	7	2	1	1	6	3	27
# Road Blocks	-	-	-	-	-	-	-	-	-				-
# Snares	117	-	34	2	10	12	22	-	17	6	36	32	288
# Gin Traps	-	-	-	-	-	-	-	-	-			10	10
# Firearms	1	3	-	2		3	1	1	-	1	4	4	20
# Arrests	6	2	-	-	1	-	2	4	-	5	5	-	25
Fines issued (MWK)	-	-	-	-	-	-	-	-	-	-	-	-	-
Fines paid (MWK)	-	-	-	-	-	-	-	-	-	-	-	-	-
# Convictions	-	-	-	-	-	-	-	-	-	5	3	1	9
# HWC cases	-	11	5	71		11	21	33	43	71	53	79	398
MALAWI ZAMBIA TFCA - VWAZA MARSH WILDLIFE RESERVE (2019)													
Activity	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	TOTAL
# Rangers deployed	33	32	3	32	38	26	28	28					220
# Patrols (All types)	21	21	19	17	52	22	34	16					202
# Man Hours on Patrol	-	-	-	-	-	-	-	-					-
# Animals Poached	1			4	3	7	12	3					30
# Road Blocks	-	-	-	-	-	-	-	-					-
# Snares	25	313	5	128	91	22	116	52					752
# Gin Traps	-	4	-	-	-	-	-	-					4
# Firearms	-	5	-	-	3	1	1	-					10
# Arrests	1	-	-	-	6	2	3	2					14
Fines issued (MWK)					332,000								332,000
Fines paid (MWK)													-
# Convictions	-	-	-	-	5	-	-	-					5
# HWC cases	8	72	30	48	2	21	17	23					221

MALAWI ZAMBIA TFCA - VWAZA MARSH WILDLIFE RESERVE (2020)													
Activity	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	TOTAL
# Rangers deployed	28	31	32	30	25	25	35	28	28	31	31	31	355
# Patrols (All types)	41	40	28	31	30	31	35	39	53	46	36	38	448
# Man Hours on Patrol	-	-	-	-	-	-	-	-	-	-	-	-	-
# Animals Poached	1	-	-	-	-	-	2	4	4	1	3	2	17
# Road Blocks	-	-	-	-	-	-	-	-	-	-	-	-	-
# Snares	156	51	68	36	35	14	93	107	55	49	50	73	787
# Gin Traps	-	-	-	-	-	-	-	-	-	-	-	-	-
# Firearms	4	1		5			12	4	1		1	1	29
# Arrests	1	2	3	-	-	-	9	5	6	2	2	2	32
Fines issued (MWK)	-	-	-	-	-	-	-	-	-	-	-	-	-
Fines paid (MWK)	-	-	-	-	-	-	-	-	-	-	-	-	-
# Convictions	1	2	-	-	-	-	6	5	-	-	-	-	14
# HWC cases	73	81	109	57	26	10	27	48	29	14	30	44	548
MALAWI ZAMBIA TFCA - VWAZA MARSH WILDLIFE RESERVE (2021)													
Activity	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	TOTAL
# Rangers deployed	32	32	30	30	20	32	32	27	35	33	31	31	365
# Patrols (All types)	38	38	40	28	36	40	36	35	35	36	38	40	440
# Man Hours on Patrol	-	-	-	-	-	-	-	-	-	-	-	-	-
# Anti-poaching Operations	-	-	-	-	-	-	-	-	-	-	-	-	-
# Animals Poached	5	1	1	2	1	1	3	6	5	4	5	1	35
# Road Blocks	-	-	-	-	1	1	-	-	-	-	-	-	2
# Snares	35	12	88	29	62	18	71	95	138	92	80	67	787
# Gin Traps	-	-	-	-	-	-	-	-	-	-	-	-	-
# Firearms	2	2	-	-	-	3	1		1	1	2	1	13
# Arrests	1	5	3	5	1	2	3	2	3	2	13	3	43
# Contacts	-	-	-	-	-	-	-	-	-	-	-	-	-
# Footprints	-	-	-	-	-	-	-	-	-	-	-	-	-
# Timber sawing	-	-	-	-	-	-	-	-	-	-	-	-	-
Fines issued (MWK)	-	-	-	-	-	-	125,000	-	-	-	-	-	125,000
Fines paid (MWK)	-	-	-	-	-	-	-	-	-	-	-	-	-
# Convictions	1	1	1	-	-	-	1	2	2	-	5		13
# HWC cases	38	40	68	55	38	25	27	8	18	39	36	21	413

MALAWI ZAMBIA TFCA - VWAZA MARSH WILDLIFE RESERVE (2022)													
Activity	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	TOTAL
# Rangers deployed	34	32	30	60	60	29	29	29	29	30	29	27	418
# Patrols (All types)	32	41	39	61	33	37	43	35	40	35	37	37	470
# Man Hours on Patrol	-	-	-	-	-	-	-	-	-	-	-	-	-
# Anti-poaching Operations	-	-	-	2	2	-	-	-	-	-	-	-	4
# Animals Poached	4	3	-	-	-	2	2	3	-	-	4	3	21
# Road Blocks	-	-	-	7	3	-	-	-	-	-	-	-	10
# Snares	65	34	5	-	-	31	88	113	70	48	46	222	722
# Gin Traps	-	-	-	-	-	-	-	-	-	-	-	-	-
# Firearms	3	8	3	-	-	2	-	-	3	-	2	1	22
# Pit saws	-	-	-	-	-	-	-	-	-	-	-	-	-
# Fishing Nets	-	-	-	-	-	-	-	-	-	-	-	-	-
# Arrests	2	10	2	2	5	1	7	1	2	1	2	2	37
# Fireplace	-	-	-	-	-	-	-	-	-	-	-	-	-
# Gunshots	-	-	-	-	-	-	-	-	-	-	-	-	-
# Poachers camp	-	-	-	-	-	-	-	-	-	-	-	-	-
# Contacts	-	-	-	-	-	-	-	-	-	-	-	-	-
# Footprints	-	-	-	-	-	-	-	-	-	-	-	-	-
# Timber sawing	-	-	-	-	-	-	-	-	-	-	-	-	-
Fines issued (MWK)	-	-	-	-	-	-	-	-	-	-	-	-	-
Fines paid (MWK)	-	-	-	-	-	-	-	-	-	-	-	-	-
# Convictions	-	6	-	1	3	-	-	-	-	-	-	-	10
# HWC cases	5	7	33	-	-	5	8	2	2	2	4	2	70

Appendix 2. Reserve Resources and Infrastructure

Table 20. Existing Vehicles and Plants

TYPE	REG./ SERIAL NO.	CONDITION	UNIT/ LOCATION	REMARKS
VEHICLES				
Toyota Land Cruiser (van)	MG 190 AG	Good	Mgt/RM	Runner
Toyota Land Cruiser (pickup)	MG 186 AG	Good	Management	Runner
Toyota Land Cruiser (pickup)	MG 187 AG	Poor	Management	Non-runner
Toyota Land Cruiser Van. (project)	BN 1735	Fair	Management	Runner
MOTORCYCLES				
Yamaha motorcycle	MG 194 AG	Good	Management	Runner
Yamaha motorcycle	MG 195 AG	Good	M Management	Runner
Yamaha motorcycle	MG 159 AJ	Excellent	EE	Runner
Yamaha motorcycle	MG 196 AG	Good	Extension	Runner
Yamaha motorcycle	MG 197 AG	Good	Research	Runner
Yamaha motorcycle	MG 199 AG	Good	Management	Runner
TRACTORS				
Tractor Mahindra	MG 350 AG	Good	Management	Runner
Tractor John Deere	MG 991 U	Poor	Management	Non-Runner
TRACTOR TRAILERS				
Tractor trailer (for Mahindra).	MG.	Good	Management	Runner
Tractor trailer	MG 989 U	Poor	Management	Non-Runner
Tractor trailer (project)	RU 2644	Poor	Management	Non-runner
OTHERS				
Generator	U 100723 D	Good	Management	Runner
Water pump	---	Good	Management	Runner
Boreholes (3)	---	Good	Management	Runner
Compressor	---	Good	Management	Runner
Welding machine	---	Good	Management	Runner

Table 21. Existing field, Office and Workshop Equipment

ITEM	NUMBER	REMARKS / CONDITION
FIELD EQUIPMENT		
Global positioning system (handheld)	7	6 good, 1 faulty
Camera 35 mm	1	Good
Binoculars	7	Worn out
Compass	6	Worn out
Statistical calculator	1	Good
Stevenson screen	1	Worn out
Water container 20 l	6	Worn out
Water container 200 L	2	Fair
Fire beaters	40	Worn out
Drip torches	5	Worn out
Back-pack sprayers	5	Worn out
3 men tents	20	Good
Hoe	20	Worn out
Pick	20	Worn out
Axe	20	Worn out
Spade	20	Worn out
Wheelbarrows	5	Poor
OFFICE EQUIPMENT		
Computers desktop	2	Good
Printer	2	Good

ITEM	NUMBER	REMARKS / CONDITION
Software	1 ??	Good
Radios HF base sets	6	All are faulty (Not Working)
Radio HF vehicle mounted	1	Worn out
Statistical calculator TI 83	2	Good
Aerial photographs (sets) 1972 & 1995	2	Poor
Solar Panels and Batteries	8	Panels good, batteries worn out
Power Inverter	1	Worn out

Table 22. Required Equipment

ITEM	QUANTITY REQUIRES
Field, Office and Workshop Equipment	
Toolbox	1
Jack, 5 ton	1
Tyre levers	2 sets
Foot pump	1
Grinder	1
Welding machine	1
Mechanical repair (set)	1
Carpentry tools (set)	1
Research Equipment	
Range finder	1
Compass with clinometer	1
Portable electronic balance	1
Thermometers	4
Stevenson screen	1
Soil auger	1
Tsetse Chemical Control Requirements	
Jerry cans	2
Wire 12-gauge roll	1
Plastic bottles 1 l	100
Glossinex	10 litres
Phenols sachet	200
Cloth blue & black 100 m each	2 rolls
Fire Fighting Equipment	
Pangas	10
Slashers	25
Hoes	20

Table 23. Existing Buildings

LOCATION/ TYPE	NO.	ROOMS	YEAR BUILT	CONDITION /REMARKS	ADDITIONAL REQUIRED
Kazuni / Housing					
DH7	1	3	1997	Good	0
CL7	1	3	1997	Good	0
DH6	1	3	1998	Good	0
EL2A	3	3	1998	Good	1
EL2	15	2	1998	Good	13
Class F	5	2	1986	Requires maintenance	
Kazuni / Offices etc					
Office block	1	6	1997	Good	0
Pump house	1	1	1997	Good	0
Gate house	1	1	1997	Good	0

LOCATION/ TYPE	NO.	ROOMS	YEAR BUILT	CONDITION /REMARKS	ADDITIONAL REQUIRED
Pump Attendant House	1	2	2014	Good	0
Water Tank	1		1997	Good	1
Kalindamawe (Flying Camp)					
EH5	1	2	1997	Requires maintenance	0
Class F	2	2	1998	Require maintenance	0
Office Block	1	1	1998	Requires maintenance	0
Kapalala Fence Attendant Camp					
Mud Houses	2	2	2013	Requires replacement	
Class F. (Proposed)	2	2	Proposed	Proposed	
Kawiya					
EL2A	1	3	1978	Fair (requires maintenance)	0
DH4	2	1	1981	Fair (requires maintenance)	0
Class F	3	2	1999	Fair (requires maintenance)	3
Mud House	1	2	2013	Fair (needs replacement)	
Office block	1	2	1999	Fair (require maintenance and Extension)	0
Zaro					
EL2 (mod.)	5	2	1998	Good	1
Mud houses	1	2	2002		0
EL2A (Proposed)	1	3	Proposed	Proposed	
Bambanda-Zaro					
Class F	10	2	2008	Requires maintenance	4
Gate House	2	2	2008	Requires maintenance	

Appendix 3. Malawi Protected Area Zonation Descriptions

Table 24. Malawi PA Zonation Categories

ZONE	PURPOSE
Utility Area	These are sites for management and visitor purposes where substantial infrastructure may be located.
Resource Use	To increase the value of the Reserveto neighbouring villages and provide incentives for their collaboration in its protection.
Semi-wilderness	These are tracts of relatively undisturbed but accessible land designated primarily for public use but also available for scientific study.
Special Areas	These are relatively small sites designated to protect unique, unusual, or otherwise important biotic, abiotic, or cultural features.
Wilderness Area	These are relatively large tracts of undisturbed land intended for aesthetic recreational experience and conservation of biological diversity, which may also be valuable for scientific benchmarks.

Appendix 4. Map References and Disclaimer

Table 25. Map Reference List

REF	NAME	SOURCE	DATE
Figure 1	Malawi-Zambia TFCA	PPF delineation based on MZTFCA Treaty	2017
Figure 2	Vwaza Marsh Wildlife Reserve Locality	PPF	2022
Figure 4	District Boundary	PPF	2022
Figure 5	Traditional Authorities (TAs) around VMWR	DNPW Malawi	2022
Figure 6	5km Resource Use Zone (Inside the Reserve)	DNPW Malawi	2022
Figure 7	5km Resource Use Zone (Outside the Reserve)	DNPW Malawi	2022
Figure 8	NRC Zones	DNPW Malawi	2022
Figure 9	Geology	PPF	2022
Figure 10	Elevation	PPF	2022
Figure 11	Hydrology	PPF	2022
Figure 12	Soils	PPF	2022
Figure 13	Vegetation	PPF	2022
Figure 14	Habitat Classification	https://www.researchgate.net/figure/Map-of-landscape-types-in-Vwaza-Marsh-Wildlife-Reserve-Source-McShane-and_fig5_349608601	1988
Figure 15	Exotic Species	DNPW Malawi	2022
Figure 16	MODIS Burnt Area (2011-2019)	NASA Moderate Resolution Imaging Spectroradiometer (MODIS) Fire Data products	2019
Figure 17	Wildlife Management Fence Status	DNPW Malawi	2022
Figure 18	Cultural and Heritage Sites	DNPW Malawi	2022
Figure 18	Reserve Zonation	PPF	2023

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Appendix 5. Past METT Scores

Table 26. Past METT results for the Reserve

ASSESSMENT CRITERIA	SCORE			
	2019	2020	2021	2022
1. Legal status: <i>Does the protected area have legal status (or in the case of private reserves is covered by a covenant or similar)?</i>	3	3	3	3
2. Protected area regulations: <i>Are appropriate regulations in place to control land use and activities (e.g. hunting)?</i>	2	2	2	2
3. Law enforcement: <i>Can staff (i.e. those with responsibility for managing the site) enforce protected area rules well enough?</i>	2	2	2	2
4. Protected area objectives: <i>Is management undertaken according to agreed objectives?</i>	2	2	2	2
5. Protected area design: <i>Is the protected area the right size and shape to protect species, habitats, ecological processes, and water catchments of key conservation concern?</i>	2	2	3	3
6. Protected area boundary demarcation: <i>Is the boundary known and demarcated?</i>	2	2	2	2
7. Management plan: <i>Is there a management plan and is it being implemented?</i>	2	2	2	2
8. Regular work plan: <i>Is there an annual work plan?</i>	2	2	2	2
9. Resource inventory: <i>Do you have enough information to manage the area?</i>	2	2	2	2
10. Research: <i>Is there a programme of management orientated survey and research work?</i>	1	1	1	1
11. Resource management: <i>Is the protected area adequately managed (e.g. for fire, invasive species, poaching)?</i>	2	2	2	2
12. Staff numbers: <i>Are there enough people employed to manage the protected area?</i>	1	1	2	2
13. Personnel management: <i>Are the staff managed well enough?</i>	2	2	0	0
14. Staff training: <i>Is there enough training for staff?</i>	2	2	2	2
15. Current budget: <i>Is the current budget sufficient?</i>	2	2	1	1
16. Security of future years' budget: <i>Is the budget secure?</i>	1	1	1	1
17. Management of budget: <i>Is the budget managed to meet critical management needs?</i>	2	2	2	2
18. Infrastructure & Equipment: <i>Is equipment adequate & sufficient</i>	2	2	2	2
19. Maintenance of equipment: <i>Is equipment adequately maintained?</i>	1	1	2	2
20. Education and awareness programme: <i>Is there a planned education programme?</i>	2	2	-	-
21. State and commercial neighbours: <i>Is there co-operation with adjacent land users?</i>	2	2	1	1
22. Indigenous people: <i>Do indigenous and traditional people resident or regularly using the PA have input to management decisions?</i>	0	0	-	-
23. Local communities: <i>Do local communities' resident or near the protected area have input to management decisions?</i>	2	2	1	1
24. Visitor facilities: <i>Are visitor facilities (for tourists, pilgrims etc) good enough?</i>	1	1	2	2
25. Commercial tourism: <i>Are visitor facilities (for tourists, pilgrims etc) good enough?</i>	3	3	0	0
26. Fees: <i>If fees (tourism, fines) are applied, do they help protected area management?</i>	3	3	3	3
27. Resource assessment: <i>What is the condition of the protected resource base?</i>	2	2	2	2
28. Illegal access assessment: <i>Are the available management mechanisms working to control access or use?</i>	2	2	2	2
29. Economic benefit assessment: <i>Is the protected area providing economic benefits to local communities?</i>	2	2	2	2
30. Monitoring and evaluation: <i>Are management activities monitored against performance?</i>	1	1	2	2
TOTAL SCORE:	56	56	49	49

ANNEXURE A: STAKEHOLDER ENGAGEMENT AND VALIDATION REPORT

Table 27: Process Followed for the Preparation the GMP

DATES	DESCRIPTION	LOCATION	COMMENTS
26 April 2021	Inception meeting	Virtual	To introduce the project and pprove the project charter
24 - 25 August 2021	1 st Stakeholder engagement	Rumphi, Malawi	To introduce the project to the stakeholders and get buy and gather information and background data
04 - 06 October 2022	2 nd Stakeholder engagement	Rumphi, Malawi	Situational Analysis and Gathering data
25 Oct - 01 Nov 2022	Data gathering	Vwaza Marsh WR & Nyika NP, Malawi	Gathering and verifying spatial data
April - June 2023	1 st Draft review	Virtual	Review of the GMP's first draft by DNPW and KfW
25, 27 & 28 July 2023	Final draft validation	Dowa & Rumphi, Malawi	Validation of GMP final draft by all stakeholders
2023	Launch of GMP	Malawi	Launch of GMP

Table 28. List of Key Stakeholders Consulted

STAKEHOLDER	RESPONSIBILITY
Government:	
Relevant Ministries:	
Department of National Parks and Wildlife	Management of protected areas and Collaborative Management with the surrounding local communities
Ministry of Natural Resources, Energy and Mining	Overall responsibility for environmental management and studies including EISs and ESMPs.
Department of Forestry (Rumphi District Officer)	Forests reserves that could be used as wildlife dispersal areas/corridors
Department of Tourism (Regional Tourism Officer – Mzuzu)	Tourism information management, and marketing
Department of Immigration (Regional Immigration Officer – Mzuzu)	Cross border formalities, both tourism and TFCA Officers
Department of Culture (Regional Culture officer- Mzuzu)	Preservation of cultural artifacts and tradition
Environmental Affairs Department (Senior Biodiversity Officer – Lilongwe)	Environmental management including EIAs and other environmental issues
District and Municipal Administrations:	
Rumphi District Commissioner and Director of Planning	District planning and community livelihoods
Police (Police in-charge Rumphi)	Law enforcement, peace, and order
Judiciary (Senior Magistrate Rumphi)	Law enforcement and prosecution
International Coordinator	TFCA bilateral coordination
Country Manager	TFCA national coordination
Transfrontier Management Unit	Coordinating implementation of TFCA initiatives in the TFCA - blocks
Community Structures:	
Chiefs/Traditional Authorities/Patrons	Community mobilisation, custodial of culture
Village Action Group (Representative)	Community development
Natural Resources Committee (Representative)	Mobilisation of Community conservation awareness and action
Zone Natural Resources committee (Representative)	Community conservation
Nyika - Vwaza Association (Representative)	Coordination of Collaborative Management between DNPW and Border communities
Support Organisations:	
National Cooperation Partners	
Total Land Care	Community livelihoods
Lilongwe Wildlife Trust (Rumphi Coordinator)	Provide support to DNPW and communities

STAKEHOLDER	RESPONSIBILITY
Mzuzu University National Herbarium and Botanic Gardens (Department of Forestry)	Research and Resource monitoring
<i>International Cooperation Partners:</i>	
KfW Principal Project Manager	Technical support, fundraising
Peace Parks Foundation	TFCA technical support, fundraising

Table 29. Broad stakeholder engagement details

CATEGORY	INSTITUTION	DETAILS	COMMITMENT TOOLS	FREQUENCY AND TIMING	RESPONSIBLE ENTITY
Government unit in charge of the project / client	Department of National Parks and Wildlife	Information to be disclosed: Draft Nyika and Vwaza GMPs, policies and legislation and Business Plans, TFCA Treaty, Project documents, SEP	Rules of Engagement for Project Implementation, management, Contracts Agreements	As per contractual obligations and rules of engagement throughout all task phases	Ministry of Tourism, Culture and Wildlife
		Format: Periodic reports, minutes of meetings and workshop proceedings			
		Engagement strategy: Consultation, Negotiation and partnerships Reporting Participation in project meetings,			
		Methodologies: phone call, meetings, workshops and joint planning sessions			
Project Implementing Agency	Transfrontier Management Unit	Information to be disclosed: Project progress, Implementation procedure, policies, ESMFs, Draft Nyika and Vwaza GMPs, policies and legislation and Business Plans, TFCA Treaty, Project documents, SEP	Rules of Engagement for Project Implementation, management, Contracts Agreements	As per contractual obligations and rules of engagement throughout all project phases <i>(Monthly, quarterly) throughout all task phases</i>	Peace Parks Foundation
		Engagement strategy: Partnership meetings, Reporting, project monitoring			
		Methodologies: emails, phone calls, in-person and virtual meetings, reporting, planning, monitoring and supervision			
Community Based Organisation	Nyika-Vwaza Association including Chiefs and Traditional Leaders	Information to be disclosed: Draft Nyika and Vwaza GMPs, policies and legislation and Business Plans, TFCA Treaty, Project documents, SEP	Co-management agreements, MoUs of co-management	As needed throughout task phases	Nyika-Vwaza Association
		Engagement Strategy: partnership meetings, Review meetings,			

CATEGORY	INSTITUTION	DETAILS	COMMITMENT TOOLS	FREQUENCY AND TIMING	RESPONSIBLE ENTITY
		Methodologies: emails, phone calls, in-person and virtual meeting			
Local Government	District Councils	Information to be disclosed: meeting minutes, planning documents: Draft Nyika and Vwaza GMPs, policies and legislation and Business Plans, TFCA Treaty, Project documents, SEP	District Executive Committee guidelines	Twice during review phases (<i>Consultation – data gathering and feedback session</i>) As needed throughout task phases	Rumphi District Council
		Engagement Strategy: partnership meetings, project planning, reviews, monitoring			
		Methodologies: emails, phone calls, in-person and virtual meeting			
NGOs	Total Land Care Lilongwe Wildlife Trust	Information to be disclosed: Draft Nyika and Vwaza GMPs, policies and legislation and Business Plans, TFCA Treaty, Project documents, SEP	Implementation agreements, District Executive Committee guidelines	Twice during review phases (<i>Consultation – data gathering and feedback session</i>)	Total Land care Lilongwe Wildlife Trust
		Engagement Strategy: partnership meetings, project monitoring			
		Methodologies: emails, phone calls, in-person and virtual meeting			
Surrounding communities	NRCs /Villages	Information to be disclosed Draft Nyika and Vwaza GMPs, policies and legislation and Business Plans, TFCA Treaty, Project documents, SEP	MoUs, minutes of meetings, consent agreements, SEP	Twice during review phases (<i>Consultation – data gathering and feedback session</i>)	Nyika-Vwaza Association
		Engagement strategy Consultations, information disclosure, negotiations, reporting and joint planning			
		Methodology			

CATEGORY	INSTITUTION	DETAILS	COMMITMENT TOOLS	FREQUENCY AND TIMING	RESPONSIBLE ENTITY
		Community meetings, meetings with leaders, Workshops,			
Universities and Research Institutions	Mzuzu University, University of Livingstonia. Botanic Gardens Forest Research Institute	Information to be disclosed: meeting minutes, planning documents: Draft Nyika and Vwaza GMPs, policies and legislation and Business Plans, TFCA Treaty, Project documents, SEP	MoUs, minutes of meetings, consent agreements	Twice during review phases (Consultation – data gathering and feedback session)	Mzuzu University, University of Livingstonia. Botanic Gardens Forest Research Institute
		Engagement Strategy: partnership meetings, project planning, reviews, monitoring			
		Methodologies: emails, phone calls, in-person and virtual meeting			
Inter-Agency Committee on Combatting Wildlife Crime (IACCWC)	Judiciary, Police, Immigration, Malawi Revenue Authority, Financial Intelligent Unit, Ministry of Justice, Malawi Defence Force and the Anti-Corruption Bureau	Information to be disclosed: meeting minutes, planning documents: Draft Nyika and Vwaza GMPs, policies and legislation and Business Plans, TFCA Treaty, Project documents, SEP	Implementation agreements, MOUs District Executive Committee guidelines	Twice during review phases (Consultation – data gathering and feedback session)	Ministry of Justice, Ministry of Internal Security Department of Immigration Malawi Revenue Authority Malawi Defence Force Anti-Corruption Bureau
		Engagement Strategy: partnership meetings, project planning, reviews, monitoring			
		Methodologies: emails, phone calls, in-person and virtual meeting			

Table 30. Stakeholder Consultation Process

PROCESS THINKING	VWAZA MARSH WR PROCESS STEP			
Define the objective of the consultation - this is the “ <i>why</i> ” aspect that needs to be answered as priority during engagements with communities.	This task entailed critical review and update of Nyika National Park’s 2017 <i>draft</i> GMP and Vwaza Marsh Wildlife Reserve 2016 <i>draft</i> GMP. This was to be done as all protected areas in Malawi are to have an approved and updated GMP as to be line with the requirements of the Malawi Wildlife Policy (2018).			
Identify and create a database of stakeholders, part of the stakeholder mapping. This step addresses the “ <i>who</i> ” aspect (who will take part).	A comprehensive list of key stakeholders with whom we engaged and consulted during this GMP process can be found in			
	DATES	DESCRIPTION	LOCATION	COMMENTS
	26 April 2021	Inception meeting	Virtual	To introduce the project and pprove the project charter
	24 - 25 August 2021	1 st Stakeholder engagement	Rumphi, Malawi	To introduce the project to the stakeholders and get buy and gather information and background data
	04 - 06 October 2022	2 nd Stakeholder engagement	Rumphi, Malawi	Situational Analysis and Gathering data
	25 Oct - 01 Nov 2022	Data gathering	Vwaza Marsh WR & Nyika NP, Malawi	Gathering and verifying spatial data
	April - June 2023	1 st Draft review	Virtual	Review of the GMP’s first draft by DNPW and KfW
	25, 27 & 28 July 2023	Final draft validation	Dowa & Rumphi, Malawi	Validation of GMP final draft by all stakeholders
	2023	Launch of GMP	Malawi	Launch of GMP
Table 28 andTable 29.				
Define issues to be discussed - this step is the crux of the consultation. This step addresses the “ <i>what</i> ” aspect.	The outcomes of these workshops were: - To introduce the project to the stakeholders and get their buy-in - To do a situation analysis (<i>challenges, opportunities</i>) and - To gather local information from the stakeholders including (<i>DNPW staff, NNP field teams, NNP surrounding communities, NVA and District officials</i>) - To understand future expectations - To gather background data and information pertaining to VMWR			
Work out the communication and dissemination arrangements - stakeholder consultations are, in many ways, about sharing accurate information, receiving	Prior to facilitating the workshops, the team prepared: - Presentation slides that were used to share known information - Cards, flip charts and writing markers were used to record group discussion notes - Through interactive discussions, a topic was introduced and discussed in plenary or groups the feedback was audio recorded by a member of the planning team. - Printed maps were taken with to the venue where stakeholder commended on the spatial location of sites - English and the local language were as a medium of communication			

feedback, and disseminating results.	
Arrange the appropriate venue and time - this is about logistics, how long and where the consultation is to take place. This step takes care of the “ when ” and “ where ” aspects.	• The 1st GMP review stakeholder engagement workshops took place at Country Annex Motel in Rumphi, 24th-26th August 2021. • The 2nd stakeholder engagement workshops took place at Landmark Executive lodge in Rumphi, 3rd-6th October 2022.
How records are to be kept? How is the consultation to be documented? These and related questions need to be answered comprehensively to take care of the “ how ” aspect of the consultation	• The stakeholder feedback has been collected and kept in these ways: • Through notes given by stakeholders on flip charts • Minutes and transcribing notes were taken by a facilitating team member • Photographs were taken during the workshop by a facilitating team member • Audio recorded minutes were collected by a facilitating team member • Printed maps were taken and correct spatial feedback was collected • Electronic spatial data was collected

ANNEXURE B: LIST OF PLANT SPECIES

CHECKLIST OF ANNOTATED PLANTSPLANT SPECIES IN VWAZA MARSH WILDLIFE RESERVE

The annotated checklist that follows summarises information about each vascular plant species recorded during the current survey. It has been presented in a table format with plant groups, families, and species all arranged alphabetically. Classification of families has followed that of Christenhusz & Chase, (2014) for the Pteridophytes; and APG IV (2016) for the Angiosperms. Species nomenclature has mainly followed that of; 1) the African Plant Database - <http://www.ville-ge.ch/musinfo/bd/cjb/africa/recherche.php?langue=en>, 2) the Global Biodiversity Information Facility (GBIF) – <https://www.gbif.org>, and 3) the Flora of Malawi website - <https://www.malawiflora.com/>.

Exotic (Alien) species are designated by an asterisk (*). Due to widespread acceptance of alternative names for some taxa, the most commonly used synonym(s) is sometimes included in square brackets. Abbreviations used in the annotated list follow immediately below:

HABITAT TYPE:

H1=IA (Western Plateau)
H2=IIA (Marsh Association)
H3=IIB (Alluvial Plains)
H4=IIC (Dambo Floodplains)
H5=IID (Alluvial Levee)
H6=IIIA (Hills and Valleys)
H7=IIIB (Pediments).

HABIT:

G = Grass
H = Herb
S = Sedge
Sh = Shrub
Sh/ST = Shrub or small tree.

IUCN STATUS:

CR = Critically Endangered
NT = Near Threatened
LC = Least Concern

FAMILY	SPECIES BOTANICAL NAME	HABIT	HABITAT YPE	IUCN STATUS	NOTES
DICOTYLEDON					
Acanthaceae	<i>Dyschoriste albiflora</i> Lindau	H	H3, H4, H5, H7	-	
"	<i>Dyschoriste hildebrandtii</i> (S.Moore) Lindau [<i>D. Fischeri</i> Lindau]	H	H3, H5, H7	-	
"	<i>Justicia phyllostachys</i> C.B.Clarke	H	H1, H3, H5, H7	-	
"	<i>Thunbergia crispa</i> Burkill	Sh	H3, H5, H7	-	
Anacardiaceae	<i>Lannea humilis</i> (Oliver) Engl.	Sh/ST	H1, H3, H5, H7	-	
"	<i>Lannea schimperi</i> (Hochst. Ex A. Rich.) Engl.	T	H1, H3, H5, H7	-	
"	<i>Mangifera indica</i> L.*	T		-	Native of East tropical Asia
"	<i>Ozoroa reticulata</i> (E.G. Baker) R. & S. Fernandes	T	H2, H4, H6, H7		
"	<i>Rhus leptodictya</i> Diels	T	H1, H5, H6, H7	LC	
"	<i>Rhus longispina</i> Engl.	Sh	H1, H4, H	LC	
"	<i>Rhus ochracea</i> Meikle var. <i>ochracea</i>	Sh	H2, H5, H7	-	
"	<i>Rhus pyroides</i> Burch. var. <i>pyroides</i> [<i>R. vulgaris</i> Meikle]	Sh/ST	H2, H5, H6, H7	LC	
"	<i>Rhus quartiniana</i> A. Rich. [<i>Searsia quartiniana</i> (A.Rich.) A.J.Mill.]	Sh	H4	-	
"	<i>Sclerocarya caffra</i> Sonder [<i>S. birrea</i>]	T	H2, H4	-	
Anisophylleaceae	<i>Anisophyllea boehmii</i> Engl. [<i>A. pomifera</i> Engl. & Brehmer]	T	H1, H5, H6, H7	-	
Annonaceae	<i>Annona senegalensis</i> Pers.	T	H1, H3, H5, H6, H7	LC	
"	<i>Artabotrys monteiroae</i> Oliv.	Sh	H4, H6, H7	LC	
"	<i>Friesodielsia obovata</i> (Benth.) Verde. [<i>Popowia obovata</i> (Benth.) Engl. & Diels]	Sh/ST	H1, H4, H5, H7	LC	
"	<i>Hexalobus monopetalus</i> (A. Rich) Engl. & Diels	Sh/ST	H1, H4, H5, H7	-	
"	<i>Uvaria lucida</i> Benth. subsp. <i>virens</i> (N.E. Br.) Verde.	Sh	H1, H4, H7	LC	
"	<i>Xylopia parviflora</i> (A. Rich.) Benth.	T	H4, H5	-	
Apiaceae (=umbellifera)	<i>Centella asiatica</i> (L.) Urb. [<i>C. coriacea</i> Nannf.]	H	H3, H4, H5	LC	
"	<i>Heteromorpha kassneri</i> H. Wolff	Sh	H3, H5	-	
"	<i>Steganotaenia araliacea</i> Hochst. [<i>Peucedanum fraxinifolium</i> Oliv.]	T	H1, H5, H6, H7	LC	
Apocynaceae	<i>Acokanthera oppositifolia</i> (Lam.) Codd	Sh/ST	H1, H3, H5, H6, H7	-	
"	<i>Carissa edulis</i> Vahl	Sh/ST	H1, H4, H5, H7	-	

FAMILY	SPECIES BOTANICAL NAME	HABIT	HABITAT YPE	IUCN STATUS	NOTES
“	<i>Ceropegia filipendula</i> K. Schum.	H	H5, H7	-	
“	<i>Diplorhynchus condylocarpon</i> (Muell. Arg.) Pichon	Sh/ST	H1, H5, H7	LC	
“	<i>Holarrhena pubescens</i> (Buch. -Ham.) Wall.	Sh/ST	H1, H5, H6, H7	LC	
“	<i>Landolphia parvifolia</i> K. Schum.	Sh	H1, H7	-	
Asteraceae (=compositae)	<i>Bidens pilosa</i> L. *. [B. <i>sundaica</i> Blume; B. <i>leucantha</i> (L.) Willd.]	H	H1, H4, H5, H7	-	Native to Americans.
“	<i>Bidens steppia</i> (Steetz) Sherff [Coreopsis <i>steppia</i> Steetz]	H	H1, H3, H4, H7	-	
“	<i>Bothriocline laxa</i> N.E.Br.	H	H1, H3, H5, H7	-	
“	<i>Brachythrix glomerata</i> (Mattf.) C. Jeffrey	H	H6, H7	-	
“	<i>Helichrysum kirkii</i> Oliver & Hiern	H	H1, H5, H7	-	
“	<i>Hirpicium gracile</i> (O. Hoffm.) Roes. [Berkheya <i>gracilis</i> O. Hoffm]	H	H3, H4, H5	-	
“	<i>Hypericophyllum compositarum</i> Steetz	H	H3, H5, H7	-	
“	<i>Vernonia amygdalina</i> Delile	Sh/ST	H2, H3, H5	-	
“	<i>Vernonia bellinghamii</i> S. Moore	Sh/ST	H1, H6, H7	-	
“	<i>Vernonia colorata</i> (Wild) Drake subsp. <i>oxyura</i> (O.Hoffm.) C. Jeffrey [V. <i>oxyura</i> O. Hoffm.; V. <i>cirrifera</i> S. Moore]	Sh/ST	H1, H4, H5, H6, H7	LC	
“	<i>Vernonia karaguensis</i> Oliv. & Hiern	H	H3, H4, H5	-	
“	<i>Vernonia melleri</i> Oliv. & Hiern var. <i>melleri</i> [V. <i>scabrifolia</i> var. <i>amplifolia</i> O.Hoffm.]	H	H3, H5, H7	-	
“	<i>Vernonia natalensis</i> Sch. Bip. Ex Walp.	H	H1, H3, H5, H7	-	
“	<i>Vernonia suprafastigiata</i> Klatt.	Sh	H1, H3, H5, H6, H7	-	
Bignoniaceae	<i>Kigelia africana</i> (Lam.) Benth.	T	H1, H4, H7	LC	
“	<i>Markhamia acuminata</i> (Klotzsch) K. Schum. [M. <i>zanzibarica</i>]	T	H1, H4, H5, H6, H7	-	
“	<i>Markhamia obtusifolia</i> (Baker) Sprague	Sh/ST	H1, H4, H6, H7	LC	
“	<i>Stereospermum kunthianum</i> Cham.	T	H1, H5, H6, H7	LC	
“	<i>Tecoma stans</i> L *	T	H7 Only at Kazuni Camp	-	Native to South America. Is one of the World's 100 Worst Invaders (GISD, 2019)

FAMILY	SPECIES BOTANICAL NAME	HABIT	HABITAT YPE	IUCN STATUS	NOTES
Bixaceae	<i>Bixa orellana</i> L. *	Sh/ST	H3, H5, H7	LC	<i>Native to tropical Americas.</i>
Boraginaceae	<i>Ehretia amoena</i> Klotzsc	Sh/ST	H1, H5, H7	LC	
Burseraceae	<i>Commiphora africana</i> (A. Rich.) Engl.	Sh	H1, H5, H7	LC	
"	<i>Commiphora caerulea</i> B.D. Burt	T	H1, H3, H6, H7	-	
"	<i>Commiphora edulis</i> (Klotsch) Engl.	Sh/ST	H1, H5, H6, H7	LC	
"	<i>Commiphora mollis</i> (Oliver) Engl.	T	H5, H6, H7	LC	
"	<i>Commiphora merkeri</i>	T	H3, H7	-	
"	<i>Commiphora mossambicensis</i> (Oliver) Engl.	T		-	
"	<i>Commiphora pyracanthoides</i> Engl.	Sh/ST	H3, H7	-	
Campanulaceae	<i>Lobelia</i> sp.	H	H4, H5, H7	-	
Capparaceae	<i>Boscia angustifolia</i> A. Rich.	T	H1, H5, H7	LC	
"	<i>Boscia salicifolia</i> Oliver	T	H1, H5, H6, H7	LC	
"	<i>Capparis tomentosa</i> Lam.	Sh/ST	Hi, H3, H5, H6, H7	-	
"	<i>Maerua angolensis</i> DC.	T	H1, H3, H5, H6, H7	LC	
"	<i>Maerua juncea</i> Pax	Sh	H1, H5, H6, H7	-	
"	<i>Maerua kirkii</i> (Oliver) F. White	Sh/ST	H1, H5, H7	-	
Caricaceae	<i>Carica papaya</i> L *	T	H1, H7	-	<i>The original habitat is believed to be Central America and southern Mexico. Around camp houses.</i>
Celastraceae	<i>Hippocratea africana</i> (Willd) Loes. [<i>Loeseneriella africana</i> (Willd.) N. Hallé var. <i>richardiana</i> (Cambess.) N. Hallé]	Sh	H4, H5, H7	-	
"	<i>Hippocratea parvifolia</i> Oliver	H	H3, H5, H7	-	
"	<i>Maytenus buchananii</i> (Loes.) Wileze. [<i>Gymnosporia buchananii</i> Loes.]	Sh/ST	H4	-	
"	<i>Maytenus heterophylla</i> (Ecklon & Zeyher) N.K.B. Robson [<i>Gymnosporia buxifolioides</i> Loes.]	Sh/ST	H3, H4	-	
"	<i>Maytenus putterlickioides</i> (Loes.) Exell & Mendonca	Sh	H4, H5	-	
"	<i>Maytenus senegalensis</i> (Lam.) Exell [<i>Gymnosporia senegalensis</i> (Lam.) Loes.]	Sh/ST	H1, H5, H7	-	
"	<i>Pleurostyliia africana</i> Loes. [<i>P. capensis</i>]	T	H1, H5, H7	-	

FAMILY	SPECIES BOTANICAL NAME	HABIT	HABITAT YPE	IUCN STATUS	NOTES
“	<i>Hippocratea buchananii</i> Loes. [<i>Reissantia buchananii</i> (Loes.) N.Hallé]	Sh/ST	H3, H7	-	
Chrysobalanaceae	<i>Magnistipula butayi</i> De Wild. subsp. <i>bangweolensis</i> F. White 0	T	H1, H5 H7	LC	
“	<i>Maranthes floribunda</i> (Baker) F. White	T	H1, H4, H5, H7	-	
“	<i>Parinari curatellifolia</i> Planch. Ex Benth. [<i>P. mobola</i> Oliv.]	T	H1, H7	LC	
Clusiaceae (guttiferae)	<i>Garcinia huillensis</i> Welw. ex Oliver [<i>G. buchananii</i> Baker]	T	H1, H4, H5, H7	-	Synonym of <i>G. buchananii</i> according to White et al. (2001).
“	<i>Garcinia livingstonei</i> T. Ander [<i>G. angolensis</i> Vesque]	Sh/ST	H2, H4, H5	-	
“	<i>Psorospermum febrifugum</i> Spach	Sh/ST	H2, H5, H7	LC	
Combretaceae	<i>Combretum adenogonium</i> Steud. ex A. Rich. [<i>C. fragrans</i> F. Hoffm.]	Sh/ST	H1, H4, H5, H6, H7	LC	
“	<i>Combretum albopunctatum</i> Suess.	Sh/ST	H1, H3, H5, H7	-	
“	<i>Combretum apiculatum</i> Sonder	T	H1, H6, H7	LC	
“	<i>Combretum collinum</i> Fresen.	Sh/ST	H1, H6, H7	LC	
“	<i>Combretum imberbe</i> Wawra	T	H1, H4, H6, H7	LC	
“	<i>Combretum microphyllum</i> Klotzsch [<i>C. paniculatum</i>]	Sh/ST	H2, H4, H5	-	
“	<i>Combretum molle</i> R. Br. ex G. Don.	T	H1, H5, H6, H7	LC	
“	<i>Combretum mossambicense</i> (Klotzsch) Engl.	Sh/ST	H3, H4, H7	LC	
“	<i>Combretum psidioides</i> Welw.	Sh/ST	H6, H7	LC	
“	<i>Combretum zeyheri</i> Sond.	T	H1, H4, H6, H7	LC	
“	<i>Terminalia sericea</i> Burch. ex DC.	T	H6, H7	LC	Protected by Law in Malawi (NEAP, 1994)
“	<i>Terminalia stenostachya</i> Engl. & Diels	T	H1, H4, H6, H7	-	
Connaraceae	<i>Rourea orientalis</i> Baill. [<i>Byrsocarpus orientalis</i> (Baillon) Baker]	Sh/ST	H1, H4, H7	LC	
Convolvulaceae	<i>Ipomoea aquatica</i> Forsk.	H	H2, H3, H4	LC	
“	<i>Ipomoea tenuirostris</i> Steud. ex Choisy subsp. <i>tenuirostri</i>	H	H3, H4, H5, H7	-	
“	<i>Turbina stenosphon</i> (Hall. F.) Meeuse	Sh	H2, H4, H5	-	

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Dioscoreaceae	<i>Dioscorea dumetorum</i> (Kunth) Pax. [<i>D. triphylla</i> Schimp. ex Kunth, non A. Rich.]	H	H1, H3, H4, H5, H7	-	
Dipterocarpaceae	<i>Monotes africanus</i> (Welw.) A.DC.	T	H1, H5, H6, H7	-	
"	<i>Monotes discolor</i> R.E.Fr. var. <i>cordatus</i> (Hutch.) Duvign.	T	H1, H5, H6, H7	-	
	<i>Monotes glaber</i> Sprague		H1, H3, H5, H7		
Ebenaceae	<i>Diospyros kirkii</i> Hiern	Sh/ST	H1, H5, H7	-	
"	<i>Diospyros lycioides</i> Desf. subsp. <i>sericea</i> (Berrh. Ex. Krauss) de Winter	Sh/ST	H1, H5, H6, H7	-	
"	<i>Diospyros mespiliformis</i> Hochst ex A.DC.	T	H1, H4, H5, H7	-	
"	<i>Diospyros squarrosa</i> Klotzsch	Sh	H4, H5, H7	-	
"	<i>Euclea natalensis</i> A. DC.	Sh/ST	H1, H3, H4, H5, H7	-	
"	<i>Euclea racemosa</i> Murr. subsp. <i>Schimperi</i> (A.DC.) F. White [<i>E. schimperi</i> (A.DC.) Dandy]	Sh/ST	H1, H4, H5, H7	-	
Ericaceae	<i>Philippia benguelensis</i> (Oliv.) Britten [<i>Erica benguelensis</i>]	Sh/ST	H3, H4, H5	-	
Euphorbiaceae	<i>Acalypha chirindica</i> S. Moore	Sh/ST	H1, H4, H5, H7	-	
"	<i>Acalypha ornata</i> A. Rich. [<i>A. moggii</i> Compton]	Sh/ST	H3, H4, H7	LC	
"	<i>Antidesma venosum</i> E. Mey. ex Tul.	Sh/ST	H3, H4, H5	LC	
"	<i>Bridelia cathartica</i> Bertol. F.	Sh/ST	H1, H5, H6, H7		
"	<i>Bridelia micrantha</i> (Hochst.) Baill.	T	H2, H3, H4		
"	<i>Croton gratissimus</i> Burch.	Sh/ST	H1, H5, H6, H7	LC	
"	<i>Euphorbia cooperi</i> (N.E.Brown ex. A. Berger	T	H1, H7	LC	
"	<i>Euphorbia ingens</i> E. Mey. Ex Boiss. [<i>E. candelabrum</i>]	T	H1, H6, H7	LC	
"	<i>Euphorbia matabelensis</i> Pax	Sh/ST	H1, H5, H6, H7	-	
"	<i>Euphorbia tirucalli</i> L.	Sh/ST	H1, H5, H7	LC	
"	<i>Hymenocardia acida</i> Tul.	Sh/ST	H1, H5, H6, H7	LC	
"	<i>Maprounea africana</i> Muell. Arg.	T	H1, H5, H7	-	
"	<i>Margaritaria discoidea</i> (Baill.) Webster [<i>Phyllanthus discoideus</i>]	T	H1, H4, H7	LC	
"	<i>Oldfieldia dactylophylla</i> (Welw. ex Oliver) J. Leonard	Sh	H1, H3, H5	-	

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“	<i>Phyllanthus engleri</i> Pax	Sh/ST	H1, H3, H5, H7	-	
“	<i>Phyllanthus reticulatus</i> Poir.	Sh/ST	H4, H5	-	
“	<i>Pseudolachnostylis maprouneifolia</i> Pax	T	H1, H5, H6, H7	-	
“	<i>Ricinodendron rautanenii</i> Schinz [Schinziophyton rautanenii]	T	H1, H5, H6, H7	-	
“	<i>Securinega virosa</i> (Roxb. ex Willd.) Pax & K. Hoffm. [Flueggea virosa]	Sh/ST	H3, H4, H7	-	
“	<i>Synadenium kirkii</i> N.E. B.r. [Euphorbia kirkii]	Sh/ST	H1, H4, H7	-	
“	<i>Uapaca kirkiana</i> Muell. Arg.	T	H7	LC	
“	<i>Uapaca nitida</i> Muel. Arg.	T	H1, H6, H7	-	
“	<i>Uapaca robynsii</i> De Wild.	T	H6, H7	-	
“	<i>Uapaca sansibarica</i> Pax	T	H1, H5, H7	LC	
Fabaceae (=legumiaos)	<i>Abrus schimperi</i> Hochst. ex Baker subsp. <i>africanus</i> (Vatke) Ver.	Sh	H4, H5	LC	
“	<i>Acacia albida</i> Del. [Faidherbia albida (Delile) A.Chev.]	T	H3, H4, H7	LC	
“	<i>Acacia ataxacantha</i> DC. Var. <i>australis</i> Burt Davy [Senegalia ataxacantha]	Sh/ST	H1, H4, H5, H7	LC	
“	<i>Acacia erubescens</i> Welw. ex Oliver [Senegalia erubescen]	Sh/ST	H1, H3, H5, H7	-	
“	<i>Acacia hockii</i> De Wild [Vachellia hockii]	Sh/ST	H2, H4, H5	-	
“	<i>Acacia karroo</i> Hayne [Vachellia Karroo]	T	H2, H3, H5	-	
“	<i>Acacia kirkii</i> Oliv. [Vachellia kirkii]	T	H2, H3, H4	LC	
“	<i>Acacia macrothyrsa</i> Harms [A. amythetephylla; Vachellia macrothyrsa]	T	H7	-	
“	<i>Acacia nigrescens</i> [Senegalia nigrescens]	T	H3, H5, H7	-	
“	<i>Acacia nilotica</i> (L) Del. subsp. <i>kraussiana</i> (Benth.) Brenan [Vachellia nilotica]	T	H1, H3, H5, H7	LC	
“	<i>Acacia pilispina</i> Pichi-Sermolli [Vachellia pilispina]	T	HH7	-	
“	<i>Acacia polyacantha</i> Willd. subsp. <i>campylacantha</i> (Hochst ex A. Rich.) Brenan. [Senegalia polyacantha]	T	H1, H4, H5, H6, H7	-	
“	<i>Acacia robusta</i> Burch. subsp. <i>clavigera</i> (E. Meyer) Brenan [Vachellia robusta]	T	H7	-	

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“	<i>Acacia sieberiana</i> DC. var. <i>woodii</i> (Burt Davy) Keay & Brenan [<i>Vachellia sieberiana</i>]	T	H3, H7	-	
“	<i>Acacia tortilis</i> (Forsk.) Hayne subsp. <i>spirocarpa</i> (Hochst. Ex A. Rich.) Brenan [<i>Vachellia tortilis</i>]	T	H1, H6, H7	-	
“	<i>Acacia xanthophloea</i> Benth. [<i>Vachellia xanthophloea</i>]	T	H2, H3, H4	LC	
“	<i>Aeschynomene abyssinica</i> (A. Rich.) Vatke	Sh	H5, H7	-	
“	<i>Aeschynomene leptophylla</i> Hars	Sh	H3, H5, H7	-	
“	<i>Aeschynomene nodulosa</i> (Baker) E.C. Baker	Sh	H1, H5, H7	-	
“	<i>Afzelia quanzensis</i> Welw.	T	H1, H5, H6, H7		Protected by Law in Malawi (NEAP, 1994)
“	<i>Albizia amara</i> (Roxb.) Boiv	T	H1, H5, H7	LC	
“	<i>Albizia anthelmintica</i> (A. Rich.) A. Brongn.	Sh/ST	H1, H3, H5, H7	-	
“	<i>Albizia antunesiana</i> Harms	T	H3, H4, H6, H7	-	
“	<i>Albizia harveyi</i> E. Fourn.	T	H1, H5, H7	LC	
“	<i>Albizia versicolor</i> Welw. ex Oliver	T	H1, H3, H7	-	
“	<i>Amblygonocarpus andongensis</i> (Oliv.) Exell & Torre	T	H1, H3, H5, H6, H7	-	
“	<i>Bauhinia galpinii</i> N.E. Brown	Sh	H1, H4, H7	-	
“	<i>Bauhinia petersiana</i> Bolle.	Sh	H1, H5, H7	LC	
“	<i>Brachystegia allenii</i> Burt Davy & Hutch.	T	H1, H5, H7	LC	
“	<i>Brachystegia boehmii</i> Taub.	T	H1, H6, H7	LC	
“	<i>Brachystegia bussei</i> Harms	T	H1, H6	LC	
“	<i>Brachystegia longifolia</i> Benth.	T	H1, H5, H6, H7	LC	
“	<i>Brachystegia manga</i> De Wild.	T	H1, H5, H6, H7	LC	
“	<i>Brachystegia microphylla</i> Harms	T	H6, H7	-	
“	<i>Brachystegia spiciformis</i> Benth.	T	H1, H5, H6, H7	-	
“	<i>Brachystegia stipulata</i> De Wild.	T	H1, H4, H5, H7	-	
“	<i>Brachystegia taxifolia</i> Harms	T	H1 H5, H6, H7	-	
“	<i>Brachystegia utilis</i> Burt Davy & Hutch.	T	H6, H7	LC	
“	<i>Burkea africana</i> Hook.	T	H1, H5, H7	-	Protected by Law in Malawi (NEAP, 1994)
“	<i>Cassia abbreviata</i> Oliver	T	H1, H5, H7	-	

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“	<i>Cassia mimosoides</i> L.	H	H1, H3, H6, H7	-	
“	<i>Cassia petersiana</i> Bolle [<i>Senna petersiana</i> (Bolle) Lock]	Sh/ST	H3, H4, H5	LC	
“	<i>Cassia siamea</i> Lam. * [<i>Senna siamea</i>]	T	H1, H7	LC	Native to South-East Asia. Recorded as both invasive and not invasive by difference sources.
“	<i>Cassia singueana</i> Delile [<i>Senna singueana</i>]	T	H1, H3, H5, H7	LC	
“	<i>Colophospermum mopane</i> (Kirk ex Benth.) Kirk ex J. Leonard	T	H3, H7	-	Protected by Law in Malawi (NEAP, 1994).
“	<i>Craibia brevipendula</i> (Vatke) Dunn.	T	H1, H4, H7	NT	
“	<i>Crotalaria alexandri</i> Baker f.	H	H1, H3, H4, H5, H7	-	
“	<i>Dalbergia arbutifolia</i> Baker	Sh/ST	H1, H3, H4, H5, H7	LC	
“	<i>Dalbergia melanoxylon</i> Guill. & Baker	Sh/ST	H3, H5, H7	NT	
“	<i>Dalbergia nitidula</i> Welw. ex Baker	Sh/ST	H1, H5, H6, H7	LC	
“	<i>Dichrostachys cinerea</i> (L.) Wight & Arn. subsp. <i>africana</i> Brenan & Brummitt.	Sh/ST	H1, H4, H5, H7	LC	
“	<i>Dolichos kilimandscharicus</i> Taub.	H	H1, H3, H5, H7	-	
“	<i>Elephantorrhiza goetzei</i> (Harms) Harms	Sh/ST	H1, H4, H5, H7	LC	
“	<i>Eriosema psoraleoides</i> (Lam.) G. Don.	H	H3, H4, H5, H7	-	
“	<i>Erythrina abyssinica</i> Lam. ex DC. [<i>E. tomentosa</i> R.Br. ex A.Rich.]	T	H1, H6, H7	LC	
“	<i>Erythrophleum africanum</i> (Benth.) Harms	T	H1, H3, H5, H7	LC	
“	<i>Indigofera atriceps</i> Hook. f. subsp. <i>atriceps</i>	H	H5, H7	-	
“	<i>Indigofera lupatana</i> Baker f.	Sh	H1, H3, H5 H7	-	
“	<i>Indigofera dendroides</i> Jacq.	H	H2, H3, H5	-	
“	<i>Isoberlinia angolensis</i> (Welw. ex Benth.) Hoyle & Brenan	T	H1, H6, H7	LC	
“	<i>Julbernardia globiflora</i> (Benth.) Troupin	T	H1, H5, H7	LC	
“	<i>Julbernardia paniculata</i> (Benth.) Troupin	T	H1, H5, H7	LC	
“	<i>Lonchocarpus capassa</i> Rolfe [<i>Philenoptera violacea</i> (Klotze) Schrire]	T	H3, H4, H6, H7	-	

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“	<i>Macrotyloma axillare</i> (E. Mey.) Verdc. var. <i>macrantha</i> (Brenan) Verdc.	H	H4, H5, H7	-	
“	<i>Mucuna poggei</i> Taub. subsp. <i>pesa</i> (De Wild.) Verdc. [<i>Mucuna pesa</i> De Wild].	Sh	H1, H4, H5, H7	-	
“	<i>Mucuna stans</i> Welw. ex Baker.	Sh	H1, H6 H7	-	
“	<i>Mundulea sericea</i> (Willd.) A.Chev.	Sh/ST	H1, H3, 57	LC	
“	<i>Ormocarpum kirkii</i> S. Moore	Sh/ST	H1, H3, H5, H7	LC	
“	<i>Peltophorum africanum</i> Sonder	T	H3, H5, H7	LC	
“	<i>Pericopsis angolensis</i> (Baker) van Meeuwen. [<i>Afrormosia angolensis</i>]	T	H1, H6, H7	LC	
“	<i>Piliostigma thonningii</i> (Schumach.) Milne-Redhead [<i>Bauhinia thonningii</i> Schumach.]	T	H1, H3, H5, H6, H7	-	
“	<i>Pterocarpus angolensis</i> DC.	T	H1, H6, H7	LC	Protected by Law in Malawi (NEAP, 1994)
“	<i>Pterocarpus rotundifolius</i> (Sonder) Druce	T	H1, H3, H5, H6, H7	LC	
“	<i>Rhynchosia buchananii</i> Harms	H	H1, H3, H5, H7	-	
“	<i>Sphenostylis stenocarpa</i> (Hochst. ex A. Rich.) Harms. [<i>S. congoensis</i> A.Chev.]	H	H1, H5, H6, H7	-	
“	<i>Swartzia madagascariensis</i> Desv.	Sh/ST	167	-	
“	<i>Tephrosia elata</i> Delfers subsp. <i>heckmanniana</i> (Harms) Brumm.	Sh	H1, H3, H5, H7	-	
“	<i>Tephrosia vogelii</i> Hook. f.	H	H5, H7	LC	
“	<i>Tylosema fassoglense</i> (Kotsch ex Schweinf.) Torre & Hillcoat	Sh	H3, H5	-	
“	<i>Xeroderris stuhlmannii</i> (Taub.) Mendonca & E.P. Sousa	T	H1, H5, H6, H7	-	
Gentianaceae	<i>Chironia laxiflora</i> Baker	H	H1, H5, H7	-	
“	<i>Faroa acaulis</i> R.E.Fr.	HH	H3, H4, H5	-	
“	<i>Swertia stellarioides</i> Ficalho	H	H2, H3, H4	-	
Lamiaceae (=labiatae)	<i>Aeollanthus rehmanii</i> Gurke	H	H1, H3, H5, H7	-	
“	<i>Clerodendrum eriophyllum</i> Gürke [<i>C. glabrum</i> E. Mey.]	Sh	H1, H5, H7	-	
“	<i>Gmelina arborea</i> Roxb.*	T	H1, H4, H7	LC	Mostly seen in old village sites

FAMILY	SPECIES BOTANICAL NAME	HABIT	HABITAT YPE	IUCN STATUS	NOTES
"	<i>Hoslundia opposita</i> Vahl	H	H1, H3, H5, H6, H7	-	
"	<i>Leonotis ocymifolia</i> (Burm.f) Iwarsson var. <i>raineriana</i> (Visiani) Iwarsson	H	H2, H5, H7	-	
"	<i>Ocimum obovatum</i> E. Mey. ex Benth. subsp. <i>obovatum</i> var. <i>obovatum</i>	Sh	H2, H5	-	
"	<i>Plectranthus esculentus</i> N.E. Br.	H	H3, H4, H5	-	
"	<i>Premna senensis</i> Klotzsch	Sh/ST	H1, H3, H5, H7	-	
"	<i>Tinnea aethiopica</i> Kotschy & Peyr.	Sh	H3, H7	-	
"	<i>Vitex doniana</i> Sweet.	T	H4, H5, H7	LC	
"	<i>Vitex madiensis</i> Oliver	T	H1, H5, H7	LC	
"	<i>Vitex payos</i> (Lour.) Merr	T	H5, H6, H7	-	
"	<i>Vitex mombasse</i> Vatke	Sh/ST	H1, H3, H5, H7	-	
Linaceae	<i>Hugonia busseana</i> Engl. [<i>H. orientalis</i> . Engl.]	Sh	H4, H5, H7	-	
Loganiaceae	<i>Strychnos cocculoides</i> Baker	Sh/ST	H1, H5, H6, H7	LC	
"	<i>Strychnos innocua</i> Delile	Sh/ST	H2, H3, H4, H7	LC	
"	<i>Strychnos madagascariensis</i> Poirét. [<i>S. innocua</i> Del.]	Sh/ST	H1, H4, H5, H7	-	
"	<i>Strychnos mitis</i> S. Moore	T	H2, H4, H5	-	
"	<i>Strychnos potatorum</i> L.f. [<i>S. stuhlmannii</i>]	T	H2, H4, H5	-	
"	<i>Strychnos pungens</i> Solered.	T	H1, H6, H7	LC	
"	<i>Strychnos spinosa</i> Lam.	Sh/ST	H1, H2, H4, H5, H7	-	
Loranthaceae	<i>Agelanthus subulatus</i> (Engl.) Polhill & Wiens	Sh	H3, H4, H5, H7	-	
"	<i>Phragmanthera cornetii</i> (Dewèvre) Polhill & Wiens	Sh	H3, H5, H7	-	
Lythraceae	<i>Ammannia prieuriana</i> Guill. & Perr.	H	H2, H4, H7	-	
Malvaceae	<i>Abutilon longicuspe</i> Hochst. ex A. Rich.	Sh	H3, H4, H6, H7	-	
"	<i>Adansonia digitata</i> L.	T	H1, H3, H7	-	
"	<i>Azanza garckeana</i> (F. Hoffm.) Exell & Hilc. [<i>Thespesia garckeana</i> F.Hoffm.]	T	H1, H5, H7	-	
"	<i>Dombeya acutangula</i> Cav.	Sh	H1, H4, H5,	CR	
"	<i>Dombeya kirkii</i> Mast.	Sh/ST	H4, H5		
"	<i>Grewia bicolor</i> Juss.	Sh/ST	H1, H3, H6, H7	-	
"	<i>Grewia flavescens</i> Juss. var. <i>flavescens</i>	Sh/ST	H1, H6, H7	-	
"	<i>Grewia herbacea</i> Welw. ex Hiern	Sh	H1, H5, H6, H7	-	
"	<i>Grewia monticola</i> Sonder	Sh/ST	H1, H5, H6 H7	-	

FAMILY	SPECIES BOTANICAL NAME	HABIT	HABITAT YPE	IUCN STATUS	NOTES
"	<i>Grewia stolzii</i> Ulbrich	Sh	H1, H5, H7	-	
"	<i>Kosteletzkya adoensis</i> (Hochst. ex A. Rich.) Mast.	Sh	H3, H4, H7	-	
"	<i>Sida alba</i> L.	Sh	H3, H5, H7	-	
"	<i>Sparrmannia ricinocarpa</i> (Eckl. & Zeyh.) Kuntze	Sh	H3, H4, H5	-	
"	<i>Sterculia africana</i> (Lour.) Fiori	T	H3, H6, H7	LC	
"	<i>Sterculia quinqueloba</i> (Garcke) K. Schum.	T	H6, H7	-	
"	<i>Urena lobata</i> L.*	Sh	H4, H5, H7	-	Probably originated in tropical Asia
"	<i>Waltheria indica</i> L.	Sh	H1, H5, H6, H7	-	
Melastomataceae	<i>Antherotoma naudinii</i> Hook. f.	H	H2, H3	-	
"	<i>Dissotis speciosa</i> Taub. [<i>D. macrocarpa</i> Gilg]	Sh	H2, H5, H7	-	
"	<i>Memecylon flavovirens</i> Baker	Sh/ST	H1, H4, H6	-	
Meliaceae	<i>Khaya nyasica</i> Stapf ex Baker f. [<i>K. anthotheca</i> (Welw.) C.DC.]	T	H2, H3	-	Protected by Law in Malawi (NEAP, 1994)
"	<i>Toona ciliata</i> M. Roem. *	T	H2, H4	LC	Native to Australia and Asia
"	<i>Trichilia capitata</i> Klotzsch	Sh/ST	H1, H4, H5	-	
"	<i>Turraea nilotica</i> Kotschy & Peyr.	Sh/ST	H1, H5, H6, H7	LC	
"	<i>Turraea robusta</i> Gürke	Sh/ST	H1, H4, H5, H7	LC	
Menispermaceae	<i>Tiliacora funifera</i> (Miers) Oliver	Sh	H4	-	
Moraceae	<i>Cardiogyne africana</i> [<i>Maclura africana</i>]	Sh/ST	H1, H3, H4, H5, H7	-	
"	<i>Ficus capensis</i> Thunb. [<i>F. sur</i> Forssk.; <i>F. mallotocarpa</i> Warb.]	T	H4, H5	-	
"	<i>Ficus ingens</i> (Miq) Miq.	Sh/ST	H6, H7	LC	
"	<i>Ficus natalensis</i> Hochst.	T	H1, H3, H4, H5, H7	LC	
"	<i>Ficus ovata</i> Vahl	T	H1, H5, H7	-	
"	<i>Ficus sansibarica</i> Warb.	T	H1, H3, H5, H7	-	
"	<i>Ficus stuhlmannii</i> Warb.	T	H1, H4, H5	-	
"	<i>Ficus sycomorus</i> L.	T	H3, H4, H5	LC	
"	<i>Ficus thonningii</i> Blume [<i>F. burkei</i> ; <i>F. petersii</i>]	T	H6, H7	LC	
Musaceae	<i>Musa sapientum</i> L.*	H	H1	-	Native to Tropical Indomalaya and Australia
Myrtaceae	<i>Eucalyptus</i> sp.*	T	H4		Native to Australia

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“	<i>Syzygium cordatum</i> Hochst. ex Krauss.	T	H1, H4, H7	LC	
“	<i>Syzygium guineense</i> (Willd.) DC. subsp. <i>guineense</i> .	T	H1, H4, H6, H7	LC	
Ochnaceae	<i>Brackenridgea zanguebarica</i> Oliver	Sh/ST	H1, H4, H5, H7	-	
“	<i>Ochna puberula</i> Hook.	Sh/ST	H1, H5, H6, H7	-	
“	<i>Ochna rovimensis</i> Gilg.	Sh/ST	H3, H4, H5	-	
“	<i>Ochna schweinfurthiana</i> F. Hoffm.	Sh/ST	H1, H5, H7	C	
Olacaceae	<i>Olax dissitiflora</i> Oliv.	Sh/ST	H1, H4, H5	C	
“	<i>Olax obtusifolia</i> De Wild.	Sh/ST	H1, H4, H5, H7	-	
“	<i>Ximenia americana</i> L.	Sh/ST	H1, H5, H7	LC	
“	<i>Ximenia caffra</i> Sonder	Sh/ST	H1, H4, H5, H7	-	
Oleaceae	<i>Jasminum fluminense</i> Vell.	Sh	H2, H4	-	
“	<i>Schrebera alata</i> (Hochst.) Welw. [<i>S. argyrotricha</i> Gilg; <i>S. mazoensis</i> S.Moore]	T	H1, H4, H6, H7	LC	
“	<i>Schrebera trichoclada</i> Welw.	Sh/ST	H1, H4, H5, H7	LC	
Passifloraceae	<i>Adenia cissampeloides</i> (Planch. ex Hook.) Harms [<i>A. gummifera</i> (Harv.) Harms var. <i>gummifera</i>]	Sh	H1, H5, H7	-	
“	<i>Adenia rumicifolia</i> Engl. & Harms	Sh	H4, H5, H7	-	
Polygalaceae	<i>Polygala usafuensis</i> Gurke	H	H3, H5, H7	-	
“	<i>Polygala albida</i> Schinz subsp. <i>stanleyana</i> (Chodat) Paiva	H	H1, H3, H5, H7	-	
“	<i>Polygala exelliana</i> Troupin	Sh	H2, H4	-	
“	<i>Polygala macrostigma</i> Chodat [<i>P. splendens</i> Exell]	Sh	H1, H5, H7	-	
“	<i>Securidaca longipedunculata</i> Fresen.	T	H1, H4, H5, H7	-	
Polygonaceae	<i>Polygonum senegalense</i> Meisn.	H	H2, H4	LC	
“	<i>Polygonum nepalense</i> Meisn. [<i>P. alatum</i> Buch. -Ham. Ex Spreng.]	H	H2, H4, H5	-	
Primulaceae	<i>Embelia schimperi</i> Vatke	Sh	H1, H5, H7	LC	
“	<i>Rapanea melanophoeos</i> (L.) Mez	T	H3, H5, H7	-	
Proteaceae	<i>Faurea saligna</i> Harvey	T	H1, H3, H5, H7	-	
“	<i>Faurea delevoiyi</i> De Wild.	T	H4	-	

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“	<i>Faurea rochetiana</i> (A. Rich.) Chiov. ex Pic.Serm. [<i>F. speciosa</i> Welw.]	T	H1, H5, H6, H7	-	
“	<i>Protea angolensis</i> Welw.	Sh/ST	H1, H4, H5, H7	-	
“	<i>Protea madiensis</i> Oliv. subsp. <i>Madiensis</i>	Sh	H5, H7	-	
“	<i>Protea rupestris</i> R.E.Fr.	T	H6, H7	-	
“	<i>Protea welwitschii</i> Engl. subsp. <i>welwitschii</i>	Sh/ST	H1, H4, H5, H7	-	
Rhamnaceae	<i>Berchemia discolor</i> (Klotzsch) Hemsley	T	H4, H5, H7	LC	
“	<i>Ziziphus abyssinica</i> Hochst. ex A. Rich.	Sh/ST	H1, H5, H7	LC	
“	<i>Ziziphus mucronata</i> Willd.	Sh/ST	H4, H7	LC	
Rhizophoraceae	<i>Cassipourea mollis</i> (R.E. Fr.) Alston	T	H1, H3, H5, H7	LC	
Rubiaceae	<i>Canthium crassum</i> Hiern [<i>Multidentia crassa</i> (Hiern) Bridson & Verdc. var. <i>crassa</i>]	Sh/ST	H1, H6, H7	LC	
“	<i>Canthium huillense</i> Hiern [<i>Psyrdrax livida</i> (Hiern) Bridson]	Sh/ST	H1, H6, H7	-	
“	<i>Canthium zanzibaricum</i> Klotzsch [<i>Keetia zanzibarica</i> (Klotzsch) Bridson]	Sh/ST	H3, H4, H5	-	
“	<i>Crossopteryx febrifuga</i> (Afzel. Ex G. Don.) Benth.	Sh/ST	H1, H5, H7	LC	
“	<i>Feretia aeruginescens</i> Stapf	Sh/ST	H2, H4, H5	-	
“	<i>Fadogia triphylla</i> Baker var. <i>triphylla</i>	H	H1, H4, H5, H7	-	
“	<i>Fadogia homblei</i> De Wild [<i>F. monticola</i> Robyns]	H	H1, H4, H7	-	
“	<i>Gardenia resiniflua</i> Hiern	Sh	H1, H3, H4, H7	-	
“	<i>Gardenia spathulifolia</i> Stapf & Hutch. [<i>G. volkensii</i>]	Sh/ST	H1, H4, H5, H7	-	
“	<i>Hymenodictyon floribundum</i> (Hochst. & Steud) B.L. Robinson	Sh/ST	H6, H7	-	
“	<i>Hymenodictyon parvifolium</i> Oliver subsp. <i>scabrum</i> (Stapf) Verde.	Sh/ST	H1, H4, H5, H7	LC	
“	<i>Leptactina benguelensis</i> (Benth. & Hook.f.) R.D.Good subsp. <i>Pubescens</i> Verdc.	Sh	H3, H5, H6, H7	-	
“	<i>Oldenlandia herbacea</i> (L.) Roxb.	H	H2, H3, H4, H7	LC	
“	<i>Oldenlandia rosulata</i> K. Schum. var. <i>parviflora</i> Bremek.	H	H1, H4, H5, H7	-	
“	<i>Otiophora scabra</i> Zucc. subsp. <i>scabra</i>	H	H4, H5	-	

FAMILY	SPECIES BOTANICAL NAME	HABIT	HABITAT YPE	IUCN STATUS	NOTES
"	<i>Pachystigma pygmaeum (Schltr.) Robyns</i>	Sh	H4, H5	-	
"	<i>Pavetta cataractarum S. Moore</i>	Sh/ST	H1, H3, H5, H7	-	
"	<i>Pavetta schumanniana K.Schum.</i>	Sh/ST	H1, H3, H5, H6, H7	LC	
"	<i>Polysphaeria dischistocalyx Brenan</i>	Sh	H3, H4, H5, H7	-	
"	<i>Psychotria kirkii Hiern</i>	Sh	H1, H3, H4, H5, H7	-	
"	<i>Psychotria mahonii C.H. Wright</i>	T	H1, H4, H5, H7	-	
"	<i>Psychotria spithamea S. Moore .</i>	Sh	H1, H3, H6, H7	-	
"	<i>Rothmannia engleriana (K. Schum.) Keay</i>	Sh/ST	H1, H4, H6, H7	-	
"	<i>Tapiphyllum cinerascens (Welw. ex Hiern) Robyns var. laevius (K. Schum.) Verdc.</i>	Sh/ST	H6, H7	-	
"	<i>Vangueria infausta Burch.</i>	T	H1, H4, H5, H7	LC	
"	<i>Vangueriopsis lanciflora (Hiern) Robyns</i>	Sh/ST	H1, H3, H6	-	
"	<i>Xeromphis obovata (Hochst.) Keay [Catunaregum spinosa]</i>	Sh/ST	H1, H3, H4, H5, H7	-	
Rutaceae	<i>Melia azedarach L. *</i>	T	H4, H5, H7	LC	<i>A native of Asia</i>
"	<i>Zanthoxylum chalybeum Engl.</i>	Sh/ST	H1, H5, H7	LC	
Salicaceae	<i>Flacourtia indica (Burm. F.) Merr.</i>	Sh/ST	H1, H5, H7	LC	
"	<i>Oncoba spinosa Forsk.</i>	Sh/ST	H2, H4, H5	LC	
"	<i>Salix mucronata Thunb. subsp. mucronata [S. subserrata Willd]</i>	Sh/ST	H2, H4	-	
Sapindaceae	<i>Allophylus africanus P. Beauv.</i>	Sh/ST	H1, H5, H6, H7	-	
"	<i>Allophylus congolanus Gilg.</i>	Sh/ST	H4, H5	-	
"	<i>Pappea capensis Ecklon & Zether</i>	T	H3, H4, H7	LC	
"	<i>Zanha africana (Radlk.) Exell</i>	T	H1, H4, H6, H7	-	
Sapotaceae	<i>Bequeartiodendron magalismontanum (Sonder) Heine & Hemsly [Englerophytum magalismontanum]</i>	T	H2, H6, H7	-	
"	<i>Manilkara mochisia (Baker) Dubard</i>	Sh/ST	H1, H3, H5, H7	LC	
"	<i>Mimusops zeyheri Sonder</i>	T	H3, H4, H6, H7	LC	
Solanaceae	<i>Capsicum annuum L. *</i>	H	H1, H7	LC	<i>Native to Southern North America and Northern south America.</i>
"	<i>Datura sp. *</i>	H	H1, H4, H5, H7	-	<i>Probably introduced from Mexico.</i>

FAMILY	SPECIES BOTANICAL NAME	HABIT	HABITAT YPE	IUCN STATUS	NOTES
“	<i>Physalis peruviana</i> L.*	H	H1, H7	-	Native of South America.
“	<i>Solanum nigrum</i> L*. [<i>S. guineense</i> (L.) Lam.; <i>S. suffruticosum</i> Schousb. ex Willd.]	H	H5, H7	-	Regarded as indigenous to Eurasia, but possibly also natural in Africa.
“	<i>Solanum panduriforme</i> Drege ex Dun.	Sh	H1, H3, H5, H7	-	Cover illustration.
Velloziaceae	<i>Xerophyta retinervis</i> Baker [<i>Vellozia retinervis</i> Baker]	Sh	H6, H7	-	
“	<i>Xerophyta equisetoides</i> Baker var. <i>pubescens</i> L.B.Smith & Ayensu	Sh	H1, H5, H6, H7	-	
Verbenaceae	<i>Duranta repens</i> L.* [<i>D. erecta</i>]	Sh/ST	H5, H7	-	Native of Central America
“	<i>Lantana camara</i> (L)*	Sh	H4, H7	-	Native to Central and South America. Is one of the World's 100 Worst Invaders (GISD, 2019)
“	<i>Lantana trifolia</i> L.*	Sh	H4, H5 H7	-	Probably from the Americas.
“	<i>Lantana rhodesiensis</i> Moldenke	Sh	H1, H4, H5, H7	-	
Vitaceae	<i>Cayratia gracilis</i> (Guill. & Perr.) Suesseng [<i>Cissus gracilis</i> Guill. & Perr.]	H	H2, H3, H4, H5	-	
“	<i>Cissus quadrangularis</i> L.	H	H1, H3, H5, H7	-	
“	<i>Cyphostemma wittei</i> (Staner) Wild & R.B. Drumm. [<i>C. hermannioides</i> Wild & R.B.Drumm.]	H	H1, H3, H7	-	
“	<i>Rhoicissus tridentata</i> (L. f.) Wild & R.B. Drumm. subsp. <i>cuneifolia</i> (Eckl. & Zeyh.) N.R.Urton	Sh	H1, H4, H6, H7	-	
Zygophyllaceae	<i>Balanites aegyptiaca</i> (L.) Delile	Sh/ST	H1, H4, H5, H7	LC	
MONOCOTYLEDONS					
Asparagaceae	<i>Asparagus plumosus</i> Baker [<i>Protasparagus plumosus</i> (Baker) Oberm.]	Sh	H1, H5, H7	-	
“	<i>Asparagus racemosus</i> Willd. [<i>Protasparagus racemosus</i> (Willd.) Oberm.]	Sh	H1, H4, H7	-	
“	<i>Chlorophytum floribundum</i> Baker	H	H1, H7	-	
“	<i>Chlorophytum zingiberastrum</i> Nordal & A.D.Poulsen	H	H4	-	
“	<i>Sansevieria downsii</i> Chahin.	H	H1, H3, H5, H7	-	

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Amaryllidaceae	<i>Scadoxus multiflorus</i> (Martyn) Raf. subsp. <i>multiflorus</i> [<i>Haemanthus multiflorus</i> Martyn]	H	H1, H3, H4, H5	-	
Araceae	<i>Pistia stratiotes</i> L.	H	H2, H3	LC	
Arecaceae (=palma)	<i>Borassus aethiopum</i> Mart.	T	H1, H4, H6, H7	LC	Protected by Law in Malawi (NEAP, 1994).
“	<i>Phoenix reclinata</i> Jacq.	T	H2, H4	LC	
Cyperaceae	<i>Ascolepis capensis</i> (Kunth) Ridl.	S	H2, H4, H5	LC	
“	<i>Bulbostylis oritrephes</i> (Ridl.) C.B. Clarke. [<i>B.</i> <i>trichobasis</i> (Baker) C.B. Clarke; <i>B. caespitosa</i> Peter; <i>Abildgaardia</i> <i>oritrephe</i> (Ridl.) Lye]	S	H3	-	
“	<i>Carex spicato-paniculata</i> C.B. Clarke	S	H1, H4, H5, H7	-	
“	<i>Coleochloa setifera</i> (Ridley) Gilly.	S	H2, H3, H4	-	
“	<i>Courtoisina cyperoides</i> (Roxb.) Soják. [<i>C. cyperoides</i> (Roxb.) Nees]	S	H3, H4, H5	LC	
“	<i>Cyperus distans</i> L.f.	S	H2, H3, H4, H7	LC	
“	<i>Cyperus esculentus</i> L. var. <i>esculentus</i>	S	H2, H3, H4, H5	LC	
“	<i>Cyperus involucratus</i> Rottb.	S	H2, H3, H4	LC	
“	<i>Cyperus papyrus</i> L.	S	H2	LC	
	<i>Eleocharis brainii</i> Svenson	S	H2, H4	LC	
“	<i>Kyllingiella microcephala</i> (Steud.) Haines & Lye	S	H4, H5	-	
“	<i>Scirpus rogersii</i> N.E.Br.	S	H2, H4, H5	-	
Dioscoreaceae	<i>Dioscorea dumetorum</i> (Kunth) Pax	Sh	H4, H5, H7	-	
Colchicaceae	<i>Gloriosa superba</i> L. [<i>G. simplex</i> L; <i>G. virescens</i> Lindl.]	H	H1, H3, H4, H5, H7	LC	
Commelinaceae	<i>Commelina africana</i> L. var. <i>africana</i>	H	H3, H5, H7	LC	
Orchidaceae	<i>Habenaria retinervis</i> Summerh.	H	H2, H4	-	
“	<i>Habenaria splendens</i> Rendle	H	H2, H4	-	
“	<i>Habenaria unicalcar</i> Summerh.	H	H2, H4	-	
“	<i>Habenaria walleri</i> Reichb.	H	H2, H4	-	
“	<i>Liparis mulindana</i> Schltr.	H	H3, H4, H5	-	
“	<i>Microcoelia globulosa</i> (Hochst.) L.Jonss	H	H4, H5	-	
“	<i>Nervilia ballii</i> G. Will.	H	H4, H5, H7	-	
“	<i>Platycoryne crocea</i> (Schweinf. ex Rchb.f.) Rolfe	H	H1, H5, H7	-	

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"	<i>Polystachya brassii</i> Summerh.	H	H1, H5, H7	-	
Poaceae (=gramineae)	<i>Andropogon amplexens</i> Nees.	G	H3, H5, H7	-	
"	<i>Andropogon schinzii</i> Halk.	G	H5, H7	-	
"	<i>Andropogon schirensis</i> Hochst. ex A. Rich. [A. schirensis A. Rich. var. <i>angustifolius</i> Stapf]	G	H1, H3, H4, H7	-	
"	<i>Arundinella nepalensis</i> Trin.	G	H2, H4, H5	-	
"	<i>Bewsia biflora</i> (Hack.) Gooss. [<i>Diplachne biflora</i> Hack.]	G	H1, H3, H5, H7	-	
"	<i>Brachiaria brizantha</i> (A. Rich.) Stapf	G	H1, H5, H7	-	
"	<i>Brachiaria humidicola</i> (Rendle) Schweickert	G	H4, H5	-	
"	<i>Brachyachne fulva</i> Stapf [B. <i>fibrosa</i> C.E. Hubb]	G	H1, H3, H4, H5, H7	-	
"	<i>Chloris gayana</i> Kunth	G	H1, H2, H3, H4, H5, H7	-	
"	<i>Chloris virgata</i> Sw.	G	H1, H3, H4, H5, H7	-	
"	<i>Cymbopogon densiflorus</i> (Steud.) Stapf	G	H2, H4, H5	-	
"	<i>Cynodon dactylon</i> Pers.	G	H1, H3, H5, H7	-	
"	<i>Echinochloa haploclada</i> (Stapf) Stapf	G	H2, H3, H4	-	
"	<i>Echinochloa pyramidaris</i>	G	H2, H3, H4	-	
"	<i>Echinochloa stagnina</i> Beauv.	G	H2, H3, H4	LC	
"	<i>Eleusine coracana</i> (L.) Gaertn. subsp. <i>africana</i> (Kennedy-O' Bryne) Hilu & De Wet. Goose	G	H1, H3, H4, H7	-	
"	<i>Eragrostis arenicola</i> C.E. Hubbard	G	H4, H5, H7	-	
"	<i>Eragrostis castellanea</i> Buscal & Muschl.	G	H3, H4	-	
"	<i>Eragrostis hispidula</i> K. Schum. [E. <i>blepharolepis</i> Hack.]	G	H2, H4, H5	-	
"	<i>Hemarthria natans</i> Stapf	G	H4, H5	-	
"	<i>Heteropogon contortus</i> (L.) Roem. & Schult.	G	H1, H3, H6, H7		
"	<i>Hyparrhenia filipendula</i> (Hochst.) Stapf. var. <i>filipendula</i>	G	H3, H4, H6, H7		
"	<i>Hyparrhenia welwitschii</i> (Randle) Stapf var. <i>macrantha</i>	G	H3, H4, H6, H7	-	
"	<i>Loudetia simplex</i> (Nees) C.E. Hubbard	G	H1, H2, H3, H5, H6, H7	-	
"	<i>Melinis ambigua</i> Hack. subsp. <i>ambigua</i>	G	H4, H5	-	
"	<i>Microchloa caffra</i> Nees	G	H3, H4, H5, H7		
"	<i>Monocymbium ceresiiforme</i> (Nees) Stapf.	G	H1, H3, H5, H7	-	
"	<i>Oryza barthii</i> A. Chev.	G	H2, H3, H4	LC	

FAMILY	SPECIES BOTANICAL NAME	HABIT	HABITAT YPE	IUCN STATUS	NOTES
“	<i>Panicum chionachne</i> Mez	G	H2, H4	-	
“	<i>Panicum maximum</i> Jacq.	G	H1, H3, H5, H7	-	
“	<i>Panicum phragmites</i> Stapf	G	H2, H4, H5	-	
“	<i>Panicum repens</i> L.	G	H2, H4, H5, H7	LC	
“	<i>Pennisetum purpureum</i> Schumach.	G	H2, H4	LC	
“	<i>Phacelurus huillensis</i> (Rendle) Clayton [<i>Thysia huillensis</i> (Rendle) Stapf; <i>Thysia undulatifolia</i> (Chiov.) Robyns]	G	H3, H5, H7	-	
“	<i>Phragmites mauritianus</i> Kunth.	G-like	H2, H4	LC	
“	<i>Poa annua</i> L.	G	H1, H5, H7	LC	
“	<i>Pogonarthria squarrosa</i> (Roem. & Schult.) Pilg.	G	H1, H3, H5, H7	-	
“	<i>Rhynchelytrum repens</i> (Willd.) C.E. Hubb. [<i>Melinis repens</i>]	G	H1, H5, H7	-	
“	<i>Sacciolepis africana</i> C.E. Hubbard ex Snowden	G	H2, H3, H5, H7	-	
“	<i>Setaria homonyma</i> (Steud.) Chiov.	G	H1, H2, H3, H5, H7	-	
“	<i>Setaria incrassata</i> (Hochst.) Hackel [<i>S. phragmitoides</i> Stapf; <i>S. palustris</i> Stapf]	G	H2, H3	-	
“	<i>Setaria pumila</i> (Poir.) Roem. & Schult. [<i>S. pallida-fusca</i> (Schumach.) Stapf & C.E.Hubb.; <i>S. ustilata</i> de Wit]	G	H2, H3, H5, H7	-	
“	<i>Setaria sphacelata</i> (Schum.) Moss [<i>S. anceps</i> Stapf; <i>S. trinervia</i> Stapf]	G	H2, H3, H4	-	
“	<i>Setaria verticillata</i> (L.) Beauv.	G	H2, H4	-	
“	<i>Sorghastrum bipennatum</i> (Hack.) Pilg.	G	H4, H5, H7	-	
“	<i>Sporobolus mollier</i> Hack.	G	H4, H7	-	
“	<i>Sporobolus pyramidalis</i> P. Beauv.	G	H2, H3, H5	-	
“	<i>Sporobolus sanguineus</i> Rendle	G	H1, H3, H5, H7	-	
“	<i>Stereochlaena comeronii</i> (Stapf.) Pilg.	G	H1, H3, H5, H7	-	
“	<i>Themeda triandra</i> Forsk.	G	H1, H3, H4, H5, H7	-	
“	<i>Tristachya superba</i> (De Not.) Schweinf. & Aschers	G	H3, H4, H5	-	
“	<i>Vossia cuspidata</i> (Roxb.) Griff.	G	H2, H4, H5	LC	
“	<i>Zonotriche inamoena</i> (K. Schum.) Clayton [<i>Tristachya inamoena</i> K. Schum; <i>Piptostachya</i>	G	H1, H4, H5, H7	-	

FAMILY	SPECIES BOTANICAL NAME	HABIT	HABITAT YPE	IUCN STATUS	NOTES
	<i>inamoena</i> (K. Schum.)				
Typhaceae	<i>Typha australis</i> (Schum. & Thonn.) Vatke	H	H2, H4, H5	LC	
Zingiberaceae	<i>Siphonochilus aethiopicus</i> (Schweinf.) B.L. Burt. [Kaempfe	H	H1, H5, H7	-	
PTERIDOPHYTA					
Dennstaedtiaceae	<i>Pteridium aquilinum</i> (L.) Kuhn var. <i>aquilinum</i>	H	H1, H5, H7	LC	<i>Considered invasive sometimes</i>
Equisetaceae	<i>Equisetum ramosissimum</i> Desf.	H	H3, H4	LC	
Isoetaceae	<i>Isoetes schweinfurthii</i> A.Braun	H	H3, H4, H5, H7	LC	
Pteridaceae	<i>Aspidotis schimperi</i> (Kunze) Pic.Serm.	H	H3, H5, H6, H7	LC	
"	<i>Pellaea dura</i> (Willd.) Hook. var. <i>dura</i>	H	H1, H4, H6, H7	-	
"	<i>Pellaea pectiniformis</i> Baker	H	H1, H3, H6, H7	-	
"	<i>Pteris friesii</i> Hieron. [<i>P. catoptera</i> Kunze var. <i>friesii</i> (Hiern.) Verdc.]	H	H1, H3, H6, H7	-	

ANNEXURE C: LIST OF FAUNAL SPECIES

CHECKLIST OF FISHES FOUND ON THE NYIKA PLATEAU AND IN VWAZA MARSH WILDLIFE RESERVE

This checklist is compiled from sampling by Denis Tweddle, supplemented by collections by

W. Kadye for the slopes of the Nyika Plateau. Species are listed in accepted scientific order under family (in bold). Nomenclature follows Bill Eschmeyer, Catalog of Fishes (www.calacademy.org/scientists/projects/catalog-of-fishes).

The four columns reflect the different localities and habitats. Only two species occur on top of the plateau, but other species penetrate the boundaries of the Nyika National Park on the lower slopes in the tributaries of the North Rukuru River and South Rukuru River flowing from the plateau. The two rivers have marked differences in species composition and are therefore presented in separate columns. The Vwaza Marsh is on the South Rukuru system but has very different slow-flowing streams, in contrast to the fast-flowing tributaries of the Nyika slopes.

Abundance is indicated as follows: + = present, ++ = common, +++ = abundant, ? = absent from the marsh streams and Lake Kazuni but likely to be present in the fast-flowing outflow from the lake.

Scientific Name	English Name	Nyika Plateau Streams	N Rukuru Upland tributaries	S Rukuru Upland tributaries	Vwaza Marsh
SALMONIDAE					
Oncorhynchus mykiss	Rainbow trout	++			
MORMYRIDAE					
Hippopotamyrus cf. ansorgii	Nyika stonebasher		+		
CYPRINIDAE					
Opsaridium tweddleorum	Dwarf sanjika		+		
Labeobarbus johnstonii	Malawi short-barbel yellowfish		++		
Labeobarbus nthuwa	Nthuwa, South Rukuru yellowfish			+	?
'Barbus' trimaculatus	Threespot barb		+	+	+
'Barbus' kerstenii	Redspot barb			++	+++
'Barbus' lineomaculatus	Linespot barb			++	++
'Barbus' sp. (new species, small spotted)				++	++
'Barbus' paludinosus	Straightfin barb			++	++
'Barbus' radiatus	Beira barb			++	++
'Barbus' seymouri	Seymour's barb			+	+
Labeo cylindricus	Redeye labeo			++	++
MASTACEMBELIDAE					
Mastacembelus shiranus	Malawi spiny eel		+		
AMPHILIIDAE					
Amphilius cf. uranoscopus	Mountain catfish	++	++	+++	?
Zaireichthys maravensis	Malawi sand catlet			+	+
Zaireichthys monomotapa	Monomotapas and catlet			+	+
MOCHOKIDAE					
Chiloglanis sp. (new species)	Suckermouth catfish		++	++	?
CLARIIDAE					
Clarias gariepinus	Smoothhead catfish			+	+
Clarias liocephalus	Smoothhead catfish			+	?
CICHLIDAE					
Astatotilapia calliptera	Eastern River bream			+	+
Pseudocrenilabrus philander	Southern mouthbrooder			++	++
Oreochromis shiranus shiranus	makumba			++	++

LIST OF AQUATIC MACROINVERTEBRATES FROM NYIKA NATIONAL PARK AND VWAZA MARSH WILDLIFE RESERVE

This checklist covers aquatic macroinvertebrates recorded from the Nyika National Park and Vwaza Marsh Wildlife Reserve. It was compiled by Harold Sungani and others from their study (Sungani, H., Ngochera, M., Genner, M., Kamtamba, K. & Chiwanda, V., 2022. Distribution and diversity of aquatic macroinvertebrate assemblages in Nyika and Vwaza Reserves in Malawi. Research Report. Nyika-Vwaza Trust (UK), Mzuzu, Malawi).

The list is arranged in zoological order under Phylum by Class, Order, Family, along with common names. The species presence in the two reserves are denoted by letters (N = Nyika, V= Vwaza, NV = Nyika and Vwaza).

Class	Order	Family	Common Names	Location
Annelida				
Clitellata	Oligochaeta	-	Worms	NV
Arthropoda				
Euchelicerata	Araneae	Tetragnathidae	Orb weaver or long jawed spiders	V
Insecta	Coleoptera	Dytiscidae	Predaceous diving beetles	NV
Insecta	Coleoptera	Gyrinidae	Whirligig beetles	N
Insecta	Coleoptera	Halplidae	Crawling water beetles	N
Insecta	Coleoptera	Hydrochidae	Crawling aquatic beetles	NV
Insecta	Coleoptera	Hydrophilidae	Water scavenger beetles	NV
Insecta	Coleoptera	Limnichidae	Minute marsh loving beetles	NV
Insecta	Coleoptera	Noteridae	Burrowing water beetles	NV
Insecta	Coleoptera	Psephenidae	Water penny beetles	N
Insecta	Coleoptera	Scirtidae	Marsh beetles	N
Insecta	Diptera	Ceratopogonidae	Biting midges	NV
Insecta	Diptera	Chironomidae	Chironomids, nonbiting midges, lake flies	NV
Insecta	Diptera	Culicidae	Gnats	N
Insecta	Diptera	Dixidae	Meniscus midges	N
Insecta	Diptera	Simuliidae	Black flies	NV
Insecta	Diptera	Tipulidae	Crane flies	N
Insecta	Ephemeroptera	Baetidae	Small mayflies, small minnow mayflies	NV
Insecta	Ephemeroptera	Caenidae	Small squaregill mayflies	V
Insecta	Ephemeroptera	Heptageniidae	Flat-headed mayflies	N
Insecta	Hemiptera	Belostomatidae	Giant water bugs	NV
Insecta	Hemiptera	Corixidae	Water boatmen	N
Insecta	Hemiptera	Gerridae	Water striders, pond skaters	NV
Insecta	Hemiptera	Nepidae	Water scorpions	V
Insecta	Hemiptera	Notonectidae	Backswimmers	NV
Insecta	Hemiptera	Pleidae	Pygmy backswimmers	V
Insecta	Hemiptera	Veliidae	Riffle bugs	NV
Insecta	Lepidoptera	Crambidae	Aquatic caterpillars, snout moths	N
Insecta	Odonata	Aeshnidae	Aeshnid, hawkler or darner dragonflies	N
Insecta	Odonata	Calopterygidae	Broad-winged, demoiselles, or jewel-wing damselflies	N
Insecta	Odonata	Corduliidae	Emerald or green-eyed skimmer dragonflies	N
Insecta	Odonata	Gomphidae	Club-tailed dragonflies	
Insecta	Odonata	<i>Macromiidae</i>	Cruiser dragonflies	V
Insecta	Plecoptera	Nemouridae	Brown stoneflies	N
Insecta	Plecoptera	Perlidae	Common stoneflies	N
Insecta	Pterygota	Elmidae	Riffle beetles	NV
Insecta	Trichoptera	Calamoceratidae	Sleeping bag caddisflies	V

Class	Order	Family	Common Names	Location
Insecta	Trichoptera	Hydropsychidae	Net-spinning caddisflies	NV
Insecta	Trichoptera	Leptoceridae	Long-horned caddisflies	N
Insecta	Trichoptera	Philopotamidae	Finger-net caddisflies	NV
Insecta	Trichoptera	Polycentropodidae	Tube-making caddisflies	N
Malacostraca	Decapoda	Potamonautidae	African freshwater crabs	N
Malacostraca	Isopoda	Asellidae	Common water slaters	V
Mollusca				
Bivalvia	Sphaeriida	Sphaeriidae	Pea clams	NV
Bivalvia	Unionoida	Unionidae	Freshwater mussels	NV
Gastropoda	-	Lymnaeidae	Pond snails	N
Gastropoda		Ampullariidae	Apple snails	N
Gastropoda	Architaenioglossa	Viviparidae	River or mystery snails	V

ANNEXURE D: CULTURAL AND HISTORICAL SITE

NO	LOCATION	SIGNIFICANCE	HOLDER	REMARKS
1	Mizguzgu WD 503004	Zolokere Chieftainship Burial Site	Sub Chief Zolokere	Zolokere Chieftainship Burial Site since the year 1500 Year Name 1500 Zolokere Panku 1586 Zolokere Chiwulukutu 1664 Zolokere Kamunoli 1725 Zolokere Mughanje 1790 Zolokere Mujilembe 1804 Zolokere Chilinyungu 1879 Zolokere Chiteche 1927 Zolokere Zakayo 1986 Zolokere Godfrey Spiritual Chieftainship prayer site to date
2	Mizguzgu WD 499003	Mphinda Factory where rings (metal) were produced	Sub Chief Zolokere	The production of metal rings was done by the Wawiza tribe which was a composition of the Zimba Ng'oma and Mvula. It was during the time of Zolokere Chiwulukutu (1586)
3	Mathebwe WC 480990	Fort (Linga)	Sub Chief Zolokere	The fort was built during the Ngoni wars. It was during the time of Zolokere Chilinyungu (1804). All the people of the Hewe during this time were protected by the fort. The marsh was used to create a water barrier and ant hills for housing.
4	Vwaza Dam WC 428910	Production of big mud fish	Sub Chief Zolokere	The dam was used once every year during the month of November/ December. The chief Zolokere of that year opened fishing by calling all the Hewe people to Vwaza to say the prayers and everyone could follow the chief. Some fish was contributed to the chief at the end by all participants.
5	Themba Hills WC 305956	Precious stones	GVH Kalindamawe	The hill holds precious stones
6	Kawiya Hills WC 575956	Cave	GVH Chitungulu	There is an old cave where people used to hide during the Ngoni wars. There were also old remains of human beings.
7	Kapata Hills	Precious stones	GVH Chitungulu	Sometime back some Europeans stated that the hills have some precious stones.
8	Chihame WC 465952	Fort (Linga)	VH Chondoka	A fort was built after the Ngoni wars. This protected the Chondoka.
9	Chihame WC 4460945	Khutamaji Burial Site	GVH Khutamaji	Khutamaji family used to hold spiritual prayers from the graveyard.