



# **MANA POOLS NATIONAL PARK**



## **GENERAL MANAGEMENT PLAN**

### **PART 2: BACKGROUND**

**July, 2009**

**This is the final draft of the background documentation for the Mana Pools National Park planning process. The time scheduling of the planning process has meant that this document was written while the actual planning was underway, not before, as is the usual strategy. The GIS was developed at the same time and the results of this show up as maps in this document.**



AFRICAN WILDLIFE FOUNDATION®

---

# CONTENTS

<b>CHAPTER 1: LEGAL AND ADMINISTRATIVE FRAMEWORK .....</b>	<b>1</b>
1.1 POLICY AND ACT FOR NATIONAL PARKS AND WILDLIFE.....	1
1.1.1 Policy .....	1
1.1.2 Act and Regulations.....	2
1.2 OTHER IMPORTANT POLICIES AND ACTS .....	3
1.3 INTERNATIONAL POLICIES AND AGREEMENTS .....	4
1.3.1 World Heritage Site.....	4
1.3.2 Biosphere Reserve .....	5
1.4 MANAGEMENT OF PWMA.....	6
1.4.1 Management Structure .....	6
1.4.2 Strategic Plan – PWMA Vision, Mission and Values.....	7
1.4.3 Strategic Plan - Goals and Strategies .....	7
1.5 AREA DESCRIPTIONS .....	10
1.5.1 Mana Pools National Park .....	10
1.5.2 Chewore Safari Area .....	10
1.5.3 Sapi Safari Area.....	11
1.5.4 Hurungwe Safari Area .....	11
1.5.5 Mukwichi Communal Land .....	12
<b>CHAPTER 2: NATURAL RESOURCE INVENTORY .....</b>	<b>13</b>
2.1 INTRODUCTION .....	13
2.2 LOCATION, BOUNDARIES AND AREA .....	13
2.3 HISTORICAL BACKGROUND.....	16
2.3.1 Establishment History .....	16
2.3.2 Human use prior to proclamation .....	17
2.4 PHYSICAL FEATURES, DRAINAGE, GEOLOGY AND SOILS.....	19
2.4.1 Physical Features and Drainage .....	19
2.4.2 Geology, Soils and Fossil Occurrences.....	23
2.5 CLIMATE.....	26
2.5.1 Rainfall.....	26
2.6 VEGETATION .....	28
2.6.1 Vegetation Description .....	28
2.6.2 Albida Woodlands.....	31
2.6.3 Exotic Plants .....	32
2.6.4 Fire .....	33
2.7 WILDLIFE POPULATIONS.....	35
2.7.1 Invertebrates .....	35
2.7.2 Fish .....	35
2.7.3 Reptiles .....	35
2.7.4 Birds .....	35
2.7.5 Large Mammals .....	36
2.8 REGIONAL RESOURCES.....	41
2.8.1 Zimbabwe Parks and Wildlife Estate .....	41
2.8.2 Mukwichi Communal Land .....	42
2.8.2 Zambian Protected Areas .....	45
<b>CHAPTER 3: CURRENT MANAGEMENT STATUS .....</b>	<b>47</b>
3.1 COMMUNICATIONS, INFRASTRUCTURE, EQUIPMENT AND STAFFING .....	47
3.1.1 Access and Communications .....	47
3.2.2 Infrastructure And Facilities .....	49
3.2.3 OTher Equipment .....	50
3.2.4 Staffing and Enforcement Activities.....	52
3.2.5 Research and Monitoring .....	53
3.2.6 Cropping and Other Consumptive Utilisation .....	54

3.3	USE AND INCOME OF THE NATIONAL PARK.....	56
3.3.1	Background To Tourism.....	56
3.3.2	Current Administration of Tourism .....	58
3.3.3	Current Zoning for Mana Pools.....	73
3.3.4	Rukomechi Research Station .....	74
3.3.5	Other Government Departments.....	76
3.3.6	Non-Governmental Organisations .....	76
3.4	USE AND INCOME OF THE SAFARI AREAS .....	77
3.4.1	Photographic Tourism.....	77
3.4.2	Safari Hunting – Quotas, Use and Income .....	77
<b>CHAPTER 4: MANAGEMENT PROBLEMS AND ISSUES .....</b>		<b>81</b>
4.1	INTRODUCTION.....	81
4.2	IDENTIFICATION.....	81
4.3	DESCRIPTION.....	81
4.3.1	Biodiversity Issues and Concerns.....	81
4.3.2	Tourism Issues and Concerns .....	85
4.3.3	Management issues and Concerns .....	88
4.3.4	Neighbours Issues and Concerns.....	92
<b>REFERENCES .....</b>		<b>95</b>

## APPENDICES

<b>Appendix 1</b>	Policy Extracts	
<b>Appendix 2</b>	Climatic Data	
<b>Appendix 3</b>	Detailed Vegetation Description	
<b>Appendix 4</b>	Checklist Of Plants Collected In Mana Pools National Park, Sapi Safari Area And Chewore Safari Area	
<b>Appendix 5</b>	Catch and Release Guidelines for Anglers	
<b>Appendix 6</b>	Fish checklist for Mana Pools	
<b>Appendix 7</b>	Amphibian Checklist for Mana Pools	
<b>Appendix 8</b>	Reptile Checklist for Mana Pools	
<b>Appendix 9</b>	Research and Conservation Priorities for Birds in the mid Zambezi valley	
<b>Appendix 10</b>	Bird Checklist for Mana Pools	
<b>Appendix 11</b>	Mammal Checklist for Mana Pools	
<b>Appendix 12</b>	Research Publications List from Rukomechi Research Station	
<b>Appendix 13</b>	Respect the Wild – A Code of Conduct	
<b>Appendix 14</b>	Zambezi Society Leaflet	
<b>Appendix 15</b>	Previous Mana Pools Park Plan	

## FIGURES

Figure 1: Structure of the Parks and Wildlife Management Authority .....	6
Figure 2: Location of Mana Pools National Park in Zimbabwe .....	13
Figure 3: Land classification in the vicinity of Mana Pools National Park.....	14
Figure 4: Boundary status for Mana Pools National Park.....	15
Figure 5: 1:50,000 map sheetfall for the mid-Zambezi valley .....	15
Figure 6: Protected areas in the Zambezi valley in 1960.....	16
Figure 7: Protected areas in the Zambezi valley in 1963.....	17
Figure 8: Diagrammatic representation of the ethnography in the Zambezi Valley.....	18
Figure 9: Physical Features and Drainage.....	19
Figure 10: Full supply level of the proposed Mupata Gorge hydro-electric scheme.....	20
Figure 11: Monthly flows through the Kariba Dam Wall.....	21
Figure 12: Monthly flows through the Kafue Gorge .....	21
Figure 13: Physical features of Mana Pools NP .....	24
Figure 14: Water sources of the Mana Pools National Park .....	25
Figure 15: Monthly rainfall at Nyamepi Station – Mana Pools NP .....	26
Figure 16: Rainfall records from Nyamepi .....	26
Figure 17: Rainfall recorded from the Rukomechi Research Station .....	27
Figure 18: Average monthly temperatures for Nyamepi .....	27
Figure 19: Vegetation types of Mana Pools National Park .....	30
Figure 20: Pod production from a single <i>F. albida</i> .....	29
Figure 21: Vegetation exclusion plot at Nyamepi .....	32
Figure 22: Water Hyacinth <i>Eichornia crassipes</i> in Mana Pools .....	32
Figure 23: Fires recorded during 2008.....	31
Figure 24: Vegetation of Mana Pools National Park .....	34
Figure 25: Elephant estimates for Mana Pools and the survey area (Zimbabwe) .....	37
Figure 26: Elephant density in 2003 .....	37
Figure 27: Density of buffalo in 2003 .....	38
Figure 28: Location of hippo pods along the Mana Pools shoreline in 2002 .....	39
Figure 29: Main features of the Mukwichi Communal Land.....	42
Figure 30: Aspects of Mukwichi Communal Land.....	43
Figure 31: Current extent of cleared ground in the northern Mukwichi CL .....	43
Figure 32: Areas affected by gold panning in Mukwichi CL and Mana Pools NP .....	44
Figure 33: Zambian protected areas adjacent to Mana Pools National Park .....	45
Figure 34: Roads and Airstrips in Mana Pools NP .....	47
Figure 35: Roads and river crossings in Mana Pools NP .....	48
Figure 36: Facilities and equipment for Mana Pools National Park .....	51
Figure 37: Elephants removed from Mana Pools National Park.....	54
Figure 38: Impala removed from Mana Pools National Park .....	54
Figure 39: Buffalo removed from Mana Pools National Park.....	55
Figure 40: Visitor numbers to Mana Pools National Park .....	56
Figure 41: Visitor numbers 1999 to 2008 indicative of recent trends .....	57
Figure 42: Daily cars recorded at Nyamepi over a one year period .....	57
Figure 43: Canoe safaris.....	59
Figure 44: Exclusive zones leased inside Mana Pools National Park .....	66
Figure 45: Tourism facilities along the Zambezi river .....	67
Figure 46: Tourism facilities in the sensitive alluvial floodplains at Nyamepi .....	68
Figure 47: Tourism Facilities at Chitake Springs .....	69
Figure 48: Tourism facilities in Mana Pools National Park .....	72
Figure 49: Current Zone Plan for Mana Pools .....	73
Figure 50: Rukomechi Research Station in the context of Mana Pools .....	74
Figure 51: Rukomechi Research Station .....	75
Figure 52: Hunting Blocks in the Mana Pools Area .....	77

## TABLES

Table 1: Important policies and acts relevant for the planning of Mana Pools National Park.....	3
Table 2: International policies and agreements .....	4
Table 3: Criteria for the Mana/Chewore/Sapi World Heritage Site .....	4
Table 4: Strategic Objectives and Operational Strategies for the PWMA.....	8
Table 5: Protected land within the vicinity of Mana Pools .....	14
Table 6: Vegetation Types found in Mana Pools.....	28
Table 7: Density of crocodiles along the “middle” Zambezi river .....	35
Table 8: Estimates of major herbivores in Zambezi Valley protected areas, 2003.....	36
Table 9: Adjacent protected areas in Zimbabwe .....	41
Table 10: Adjacent protected areas in Zambia .....	45
Table 11: Summary of staff housing and other buildings in Mana Pools .....	49
Table 12: Equipment and Plant for Mana Pools National Park.....	50
Table 13: Staff establishment for Mana Pools National Park.....	52
Table 14: Research projects carried out in Mana Pools .....	53
Table 15: Types of operator permit issued for Mana Pools .....	58
Table 16: Summary of the canoe safari business in Mana Pools .....	58
Table 17: Fees for Mana Pools National Park .....	60
Table 18: Income scenarios based on new fees (January, 2009) .....	61
Table 19: Summary of accommodation types and capacities in Mana Pools.....	63
Table 20: Types of camps found in Mana Pools .....	64
Table 21: Leases in and adjacent to Mana Pools National Park .....	65
Table 22: Fatalities during unescorted walking in Mana Pools .....	70
Table 23: Summary of accommodation facilities in Mana Pools .....	71
Table 24: Non-Governmental Organisations with interests in Mana Pools.....	76
Table 25: Quotas for Nyakasanga and Sapi Sections .....	78
Table 26: Chewore North and South quotas for main species .....	79
Table 27 : Biodiversity threats, issues and concerns .....	81
Table 28 : Tourism threats, issues and concerns .....	85
Table 29: Park Management Issues and Concerns .....	88
Table 30: Neighbours Issues and Concerns .....	92

# CHAPTER 1: LEGAL AND ADMINISTRATIVE FRAMEWORK

The management of wildlife and the Parks and Wildlife Estate in Zimbabwe is governed and guided by the laws of the country. The most important legislation is the Parks and Wildlife Act and its regulations while the Policy for Wildlife is the most important guiding document. In addition, there are a number of other Zimbabwean Acts and policies that must be taken into account when planning. Finally Zimbabwe is signatory to a number international conventions and agreements which can affect management of the Estate and hence planning for it. These are summarised in this chapter.

## 1.1 POLICY AND ACT FOR NATIONAL PARKS AND WILDLIFE

### 1.1.1 POLICY

The Policy for Wildlife in Zimbabwe was published in 1992. The Statement of Intent is reproduced below.

*In accordance with its commitment to conservation and its resolve to promote enhanced sustainable rural prosperity and a more equitable apportionment of the benefits from the proper use of the nation's wild life resources, Government intends to:*

- A. *Maintain the Parks and Wild Life Estate for the conservation of the nation's wild resources and biological diversity.*
- B. *Ensure the adequate protection of major ecosystems or key species and habitats which are not represented in the Estate through various measures including Biosphere Reserves.*
- C. *Encourage the conservation of wild animals and their habitats outside the Estate recognising that this is only likely to be successful if wild life can be used profitably and the primary benefits accrue to people with wildlife on their land.*
- D. *Insist upon environmental impact assessments for all developments that threaten to affect wild life arid protected land adversely.*
- E. *Use the Estate to promote a rurally based wild life industry,*
- F. *Harmonise the management of the Parks and Wild Life Estate with the efforts of neighbouring communities who are developing wild life as a sustainable form of land use.*
- G. *Transform land use in the remote communal lands of Zimbabwe through its Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) under which rural peoples have the authority to manage their wild life and other natural resources and benefit directly from so doing.*
- H. *Ensure that wild life is not undervalued to the people living with it by permitting them to use it sustainably for their own gain as they are able to do with other natural resources and agricultural products.*
- I. *Promote public awareness of wild life issues.*
- J. *Take the necessary legal and enforcement measures to prevent the illegal use of wild life.*
- K. *Maintain its commitment to wild life research.*
- L. *Participate in those international treaties and conventions which are consistent with Zimbabwe's policies for conservation and sustainable use of wild life.*
- M. *Examine and develop a cost-effective and adaptive institutional framework for managing wild life and protected areas in terms of this policy.*

*N. Draw up management plans arising from this policy for approval by the Minister.*

The Statement of Policy consists of 10 sections several of which are specific about the Parks and Wildlife Estate. Section 2 deals with the objectives of the Estate, its management, public use and physical developments. The objectives are as follows:

- 2.1.1. *Preserve representative examples of Zimbabwe's aquatic terrestrial flora and fauna and their physical environments;*
- 2.1.2. *Protect areas of scenic beauty and special interest;*
- 2.1.3. *Preserve rare, endangered and endemic species;*
- 2.1.4. *Conserve water catchments;*
- 2.1.5. *Provide opportunities for public education and the advancement of scientific knowledge;*  
*and, without prejudice to any of the above*
- 2.1.6 *Encourage public use related to the enjoyment and appreciation of these areas; and*
- 2.1.7. *Generate economic activity within the Estate and surrounding areas to enhance rural development.*

The more important relevant sections are reproduced in Appendix 1.

## **1.1.2 ACT AND REGULATIONS**

The 1974 Act, consisting of in 17 sections and ten schedules, was revised and reprinted in 1996. Important subsidiary amendments are contained in Act 19 of 2001 and Act 22 of 2001.

For the management of National Parks, Section 23 describes the powers of the Minister in relation to parks. These powers are quite considerable for management, tourism and other utilisation.

Important for the day-to-day management of the National Parks are the Parks and Wildlife (General) Regulations, 1990 (SI 362 of 1990). This has been amended by the Parks and Wildlife (General) (Amendment) Regulations (SI 114 of 1993).

Section 11 specifies the length of time that a tourism facility may be used continuously. It has been set at three weeks and this has a direct bearing on the development of the tourism industry in the Park.

## 1.2 OTHER IMPORTANT POLICIES AND ACTS

A brief review of other important Zimbabwean policies and Acts is shown below (Table 1).

**Table 1: Important policies and acts relevant for the planning of Mana Pools National Park**

Policy/Act	Brief Description
Wildlife Based Land Reform Policy	The policy aims to facilitate wildlife-based land reform to ensure profitable, equitable and sustainable use of wildlife resources, particularly in areas where agricultural potential is limited.
Mines and Minerals Act	The Mines and Minerals Act defines prospecting rights and mining leases. Rights to minerals are vested in the President. All State Land, which includes the Parks and Wildlife Estate, is open to prospecting.
National Museums and Monuments Act	Through the Act the Minister may declare National Monuments. The discovery of any ancient monument or relic must be declared to the National Museums and Monuments Board by the discoverer or the owner or occupier where the relic occurs. The state can acquire the land on which the monument or relic occurs for its preservation or analysis.  This Act may have a bearing on the fossil remains found within Mana Pools
Environmental Management Act	The Act provides for sustainable management of natural resources and protection of the environment; the prevention of the pollution and environmental degradation; the preparation of a National Environmental Plan and other plans for the management and protection of the environment. EIAs are required for specified developments
Communal Land Act	The Act is implemented through the Rural District Councils (RDC), these councils are responsible for the planning and administration of the districts. They are the legal representation of government at grassroots level. RDCs are responsible for the management of all natural resources on behalf of the producer communities applying the Environmental Management Act. It will be relevant for the Mukwichi Communal Land
Water Act	The Act is for the monitoring and management of all surface and underground water resources. Use of water from designated river systems is controlled through the National Water Authority. This includes underground water.
Zambezi River Authority Act	The Zambezi River Authority Act details the agreement between Zambia and Zimbabwe regarding the shared use of water. The agreement is relevant to Mana as one of the functions of the Zambezi river Authority is to investigate new dam sites. They are also responsible for the management of the Kariba Complex and the release of waters from the dam.
Inland Waters Shipping Act	The Act provides for the registration, survey and safety of all vessels used on inland waters in Zimbabwe, which includes the Zambezi river in Mana Pools

## 1.3 INTERNATIONAL POLICIES AND AGREEMENTS

Zimbabwe is signatory to a number of international policies and agreements relating to wildlife and the environment and these are briefly outlined below as they need to be considered when planning a protected area.

**Table 2: International policies and agreements**

CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora. Essentially member states regulate trade in endangered or threatened species. Of importance are elephant, crocodile and leopard
CBD	Convention on Biological Diversity signed in 1992.
SADC	The treaty of the Southern African Development Community (SADC) 1992
Sustainable Use of Biodiversity	The Addis Ababa Principles and Guidelines for Sustainable Use of Biodiversity adopted at the 7 <sup>th</sup> Conference of the Parties of the CBD, (Principle 11 and 12)

### 1.3.1 WORLD HERITAGE SITE

The Mana Pools National Park was declared a World Heritage site in 1983, along with the Chewore and Sapi Safari Areas. Several criteria were used for the site designation and these are shown below (Table 3)

**Table 3: Criteria for the Mana/Chewore/Sapi World Heritage Site**

Category	Specific assets
Ongoing Geological Processes	Sand banks and alluvium
Exceptional Natural Beauty	Animals, riparian parkland and the Zambezi river
Habitats of Rare and Endangered Species	Black rhino, leopard, cheetah, wild dog, crocodile

The following statements about the benefits of being a World Heritage Site are taken from the UNESCO documentation:

*The overarching benefit of ratifying the World Heritage Convention is that of belonging to an international community of appreciation and concern for universally significant properties that embody a world of outstanding examples of cultural diversity and natural wealth. The States Parties to the Convention, by joining hands to protect and cherish the world's natural and cultural heritage, express a shared commitment to preserving our legacy for future generations. The prestige that comes from being a State Party to the Convention and having sites inscribed on the World Heritage List often serves as a catalyst to raising awareness for heritage preservation.*

*A key benefit of ratification, particularly for developing countries, is access to the World Heritage Fund. Annually, about US\$1 million is made available to assist States Parties in identifying, preserving and promoting World Heritage sites. Emergency assistance may also be made available for urgent action to repair damage caused by human-made or natural disasters. In the case of sites included on the List of World Heritage in Danger, the attention and the funds of both the national and the international community are focused on the conservation needs of these particularly threatened sites. Today, the World Heritage concept is so well understood that sites on the List are a magnet for international cooperation and may thus receive financial assistance for heritage conservation projects from a variety of sources.*

### **1.3.2 BIOSPHERE RESERVE**

The Zimbabwean side of the mid Zambezi valley is preparing an application for Biosphere Reserve status. A biosphere reserve is a voluntary, cooperative, conservation reserve created to protect the biological and cultural diversity of a region while promoting sustainable economic development. It is a place of cooperation, education and experimentation, where scientists and managers can share research data to better understand man's impact on nature, and where local communities, environmental groups, and economic interests can work collaboratively on conservation and development issues.

Biosphere reserves are established under the auspices of United Nations Educational, Scientific, and Cultural Organization (UNESCO) Programme on Man and the Biosphere (MAB). The mission of the MAB Programme, as established in 1974, is to achieve a sustainable balance between the sometimes-conflicting goals of conserving biological diversity, promoting economic development, and maintaining cultural values. Biosphere reserves are the sites where this objective is tested, refined, demonstrated and implemented.

In order to be designated a biosphere reserve, a candidate ecosystem must be nominated by a national government and approved by the UNESCO's Man and Biosphere Programme. In order to satisfy UNESCO's program requirements, each biosphere reserve must contain three elements:

**Core Areas:** These areas are securely protected sites for conserving biological diversity, monitoring minimally disturbed ecosystems, and undertaking non-destructive research and other low-impact uses (such as education).

**Buffer Zones:** These areas must be clearly identified, and usually surround or adjoin the Core Areas. Buffer Zones may be used for cooperative activities compatible with sound ecological practices, including environmental education, recreation, ecotourism and applied and basic research.

**Transition, or Cooperation, Zones:** These areas may contain towns, farms, fisheries, and other human activities and are the areas where local communities, management agencies, scientists, non-governmental organizations, cultural groups, economic interests, and other stakeholders work together to manage and sustainably develop the area's resources.

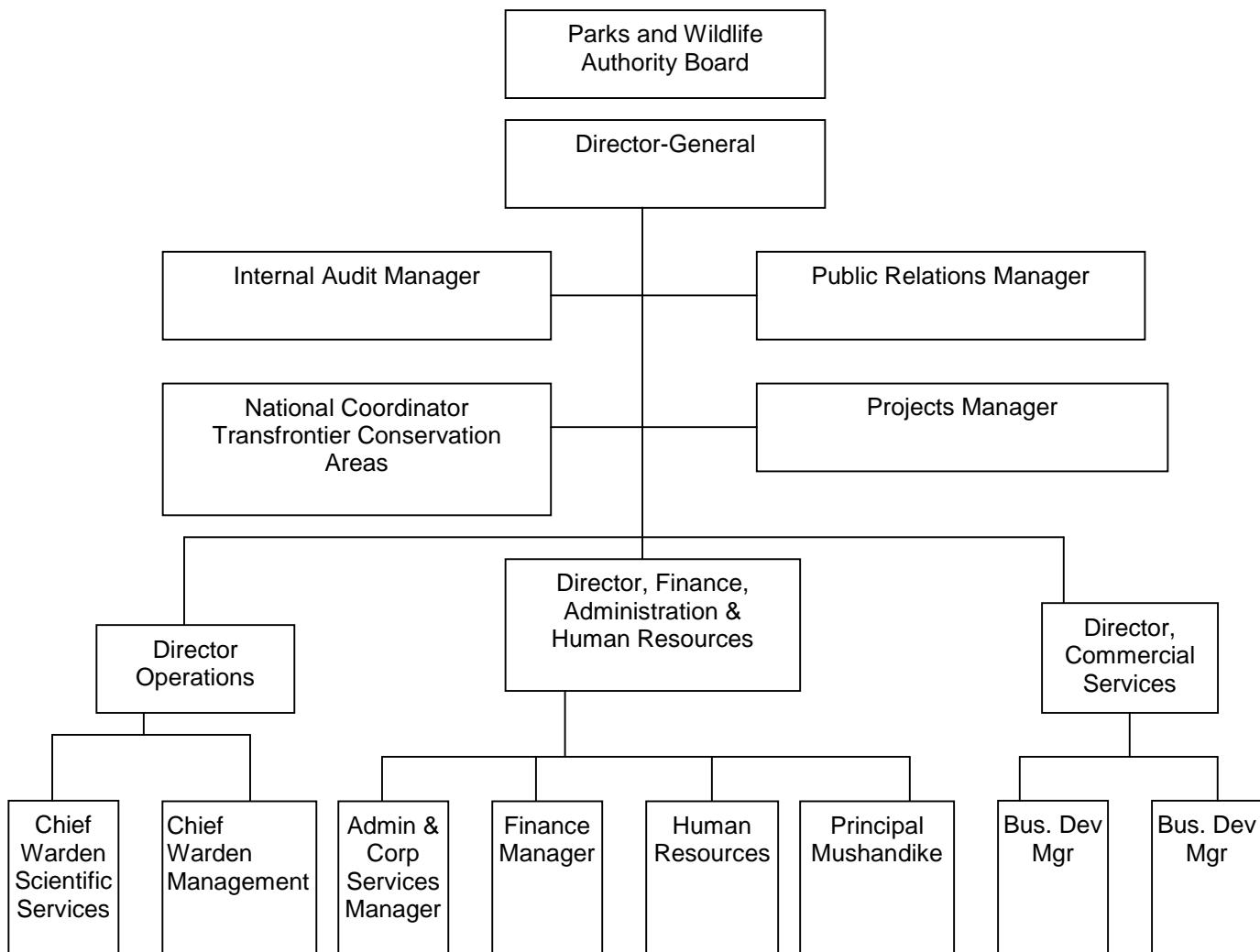
The proposed site extends from Matusadona National Park to the Mozambican border.

## 1.4 MANAGEMENT OF PWMA

### 1.4.1 MANAGEMENT STRUCTURE

The Zimbabwe Parks and Wildlife Management Authority was established in 2001? and takes over from the former Department of National Parks and Wildlife Management. The organisation is run through the Corporate Centre (the Head Office in Harare) which controls the two “portfolios” – the **Conservation Division** and the **Commercial Division**. The Corporate Centre is constituted by the Director General, staff in the Director General’s Office and all support services branches of the Finance, Administration and Human Resources Division. The broad structure of the organisation is shown below (Figure 1).

**Figure 1: Structure of the Parks and Wildlife Management Authority**



## 1.4.2 STRATEGIC PLAN – PWMA VISION, MISSION AND VALUES

The PWMA has developed a strategic plan which outlines its direction. The Authority has the following vision, mission and core values.

**Vision:** To be the world leader in sustainable conservation

**Mission:** To conserve Zimbabwe's wildlife heritage through effective, efficient and sustainable protection and utilization of natural resources for the benefit of present and future generations and stakeholders.

**Core Values:**

- Teamwork
- Commitment
- Transparency
- Professionalism
- Fairness
- Integrity
- Accountability
- Creativity
- Environmentally Ethical
- Integrity

## 1.4.3 STRATEGIC PLAN - GOALS AND STRATEGIES

**Conservation Division:** To restore and maintain the Parks Estate and wildlife resources in general to their prime condition as the sanctuary of the nation's wildlife heritage and biodiversity. Management and Scientific Services sub-units will drive the Division

**Commercial Services Division:** To attain the Authority's financial self-sufficiency and corporate growth for the consolidation of the core function of conservation. The Division will focus on achieving growth by pursuing commercial activities that will exploit the vast untapped business opportunities available to the Authority within the limits of resources available

**Corporate Centre:** To achieve adequate institutional capacity, optimal allocation of resources and effective performance management through results based management, to support conservation and commercial activities

### Strategic Goals

Six strategic goals have been identified by the plan. These are:

- 1 *To restore the Parks Estate and Wildlife Resources in general, to their prime condition as the sanctuary of the nation's wildlife heritage and bio diversity.*
- 2 *To attain Financial Self-sufficiency and Corporate Growth for the consolidation of the core function of Conservation*
- 3 *To achieve adequate institutional capacity to support Conservation and the Commercial activities*
- 4 *To achieve optimal allocation of resources for sustenance of the Authority's Conservation and Commercial activities*
- 5 *To attain an effective Performance Management System*
- 6 *To contribute to the Authority's vision and mission through the provision of requisite skills and competences in wildlife management on a self-sustenance basis.*

The operational strategies and activities that the Authority will use to achieve these strategic objectives are outlined in the Strategic Plan. The operational strategies are summarised below

**Table 4: Strategic Objectives and Operational Strategies for the PWMA  
 (Conservation and Commercial Divisions)**

<b>CONSERVATION DIVISION</b>	
<b>Management Services</b>	
<b>Strategic Objective</b>	<b>Operational Strategies</b>
To reduce and maintain total illegal off take below 0.1% of total population to ensure adequate protection of the nation's wildlife heritage.	<ul style="list-style-type: none"> <li>Enhance the gathering and utilization of anti-poaching intelligence</li> <li>Enhance anti-poaching operations</li> <li>Weed out internal corruption</li> <li>Increase cooperation with national law enforcement agents</li> <li>Enlist community support through education and awareness campaign.</li> <li>Upgrade infrastructure</li> <li>Ensure proper maintenance of infrastructure and equipment</li> </ul>
To support and promote the indigenization process by creating a sustainable community-based tourism and wildlife management.	<ul style="list-style-type: none"> <li>Enhance the CAMPFIRE concept</li> <li>Increase Private/Public sector partnerships</li> <li>Develop innovative products and markets for the rural based wildlife industry in partnership with rural and resettlement communities.</li> <li>Facilitate training of community people in tourism and wildlife management</li> </ul>
<b>SCIENTIFIC SERVICES</b>	
To ensure optimal biodiversity through the maintenance of viable population habitat and ecological integrity.	<ul style="list-style-type: none"> <li>Conduct contemporary globally benchmarked and continuous research.</li> <li>Generate technical information to support wildlife management</li> <li>Enforce timely, consistent and systematic Environmental Impact Assessment (EIA) for all development work and projects in the Parks Estate and beyond.</li> <li>Initiate effective and integrated wildlife planning and management systems that involve local</li> </ul>
<b>TRANSFRONTIER CONSERVATION AREAS</b>	
To improve capacity to implement multilateral treaties	<ul style="list-style-type: none"> <li>Facilitate the formation of institutional framework to run TFCAs</li> <li>Engage and manage the involvement of local communities in TFCA programmes</li> <li>Provide momentum for the running of TFCA programmes</li> <li>Ensure exchange of information for planning purposes</li> </ul>

<b>COMMERCIAL DIVISION</b>	
To develop profitable business units from existing and new opportunities identified in the environment in line with the Authority's resource capabilities	Develop two commercially viable SBUs (Strategic Business Units) from the current hospitality and safaris operations.  Establish three new SBUs from opportunities in Tours and Travel, Fisheries and Floriculture  Improve the commercially viability/profitability of current operations  Develop and instil a business orientation in the SBUs
To achieve 25% of the market share in every SBU by 2010.	Develop and exploit synergistic relationships between SBU's  Benchmark and refurbish existing tourism infrastructure to meet and exceed the minimum grading requirements spelt out in SI 128 and customer needs  Identify and enter into strategic alliances that promote new distinctive competences and enhance existing ones  Develop effective Corporate and product brands  Enter into strategic joint marketing partnerships  Build capacity for effective customer and competitor responsiveness  Develop and implement a local and international image building programme

## 1.5 AREA DESCRIPTIONS

The following are transcripts from the Schedules and Statutory Instruments.

### 1.5.1 MANA POOLS NATIONAL PARK

The park boundaries are shown in Map 1 and the following description is taken from the Land Tenure (Repeal) Act, 1979, as referred to in Part II of the First Schedule of the Parks and Wildlife Act No. 14 of 1975; Revised 1996.

**Item 5: Mana Pools Area:** **219600 hectares**

*The area of land bounded by a line drawn from a point on the mouth of the Sapi River at map reference 35LQN763665 on the 1 : 50000 map Mana Pools 1529C2, and Chikwenya Island 1529D1, Edition 1, up the Sapi River to its intersection by a road at map reference 35LQN793524 on the 1 : 50 000 map Sapi 1529D3, published 1968, and generally southwards along the road to its intersection by another road at map reference QN723256 on the 1 : 50 000 map Manganyi 1628B1, Edition 1; thence generally eastwards along that road to a point on the Chewore River at map reference 35KQN934223; thence up that river to a point on the north-eastern boundary of Mukwichi Communal Land at map reference 35KQM907972 on the 1 : 50 000 map Manyangau 1629B3, Edition 2; thence north-westwards along the north-eastern boundary of Mukwichi Communal Land to the highest point on hill Chitanga and westwards direct to the highest point on an unnamed hill 3,2 kilometres due east of the confluence of the Rukomechi and Fundundi rivers; thence westwards direct to the confluence of those rivers and down the Rukomechi River to its confluence with the Nyacharara River; thence up the Nyacharara River to its confluence with an unnamed River at map reference 35KQN561083 on the 1 : 50 000 map Rekometie Research station 1629A2, Edition 1 and up that unnamed river to a point on that river to a point on that river at map reference QN533079 on that map; thence westwards direct to a point on another unnamed River at map reference QN 526080 on that map and down that unnamed river to its confluence with the Mashayani River at map reference QN480105 on that map; thence northwards direct to a point on a gravel road at map reference QN479146 on that map and north-eastwards direct to a point at map reference QN495189 on that map; thence north-eastwards direct to a point on the Matupa River at map reference QN519219 on that map and north-eastwards direct to a point 365 metres west of the course of the Rukomechi River at map reference QN553247 on that map; thence generally north westwards along the western edge of the riverine vegetation of the Rukomechi River; but not closer to the river than a line parallel to and 365 metres west of the course of the Rukomechi River to a point at map reference 35KQN301474 on the 1: 50 000 map Nyakasanga 1529C3, published 1959, and north-westwards to a point on the Zimbabwe/Zambia international boundary on the Zambezi River, approximately 4,8 kilometres downstream from the intersection of that international boundary by the Deeds Registry district boundary line of Kariba; thence north-eastwards downstream along that international boundary to a point to a point approximately 1,6 kilometres from the mouth of the Sapi River on an approximate bearing of 196 , measured in a clockwise direction from true north at that point) and southwards to the starting point.*

*Map references quoted in this description are given to the nearest hundred metres.*

### 1.5.2 CHEWORE SAFARI AREA

Urungwe District

**Item 14: Chewore** **Area 339 000 hectares**

*The area of land bounded by a line drawn from a point on the Rhodesia-Zambia international boundary on the Zambezi river due north of Trigonometrical Beacon No. 219/P, on hill Kapsuku; thence proceeding generally south-eastwards through that beacon on hill Kapsuku and the highest points on hills Chiruwe and Kariwaya to the highest point on hill Membge and south-westwards through the highest point on hill Chimanje to the confluence of the Mkanga river and an unnamed tributary at map reference 36LST844301 on the 1:50 000 map Chimanje 1530C3, Edition 1; thence down the Mkanga River to its confluence with the Angwa River; thence up the Angwa, Mukwishe, Sapi and Horonga rivers to the commencement of the last-mentioned river, at map reference*

*35KRM003920 on the 1:50 000 map Matsikita 1629B4, Edition 1, and north-westwards direct to the highest point on hill Chitangazuva to the Chiwore River; thence down that river to the Rhodesia-Zambia international boundary on the Zambezi River; thence eastwards along that boundary to the starting-point.*

*Map references quoted in this description are given to the nearest hundred metres.*

### **1.5.3 SAPI SAFARI AREA**

**Item 14: Sapi**

**Area:118 000 hectares**

*The area of land bounded by a line drawn from the confluence of the Zambezi and Chiwore rivers, up the Chiwore river to its intersection by a road at Map Reference 35KQN934223 on the 1:50,000 map Manganyai 1629B1, Edition 1; thence generally westwards along that road to its intersection by another road at Map Reference QN723256 on that map and generally northwards along that road to its intersection by the Sapi river at Map Reference 35LQN793523 on the 1:50, 000 map Sapi 1529D3 published 1968; thence down that river to a point on the mouth of the Sapi river at Map Reference 35LQN763665 on the 1:50,000 map Mana Pools 1529C2, Chikwenya Island 1529D1, Edition 1, and on an approximate bearing of 16° measured in a clockwise direction from true north to a point on the Zambezi river approximately 1.6 kilometres from the mouth of the Sapi river, thence down the Zambezi river along the Rhodesia-Zambia international boundary to the starting point.*

*All map references quoted in this description are given to the nearest hundred metres.*

### **1.5.4 HURUNGWE SAFARI AREA**

**Item 9: Hurungwe**

**Area: 289 400 hectares**

*The area of land bounded by a line drawn from the confluence of the Rukomechi and Fundundi rivers down the Rukomechi River to its confluence with the Nyacharara River; thence proceeding up that river to its confluence with an unnamed river at map reference 35KQN561083 on the 1:50,000 map Rekometje Research Station 1629A2 and up that unnamed river to a point at map reference QN533079 on that map; thence westwards direct to a point on another unnamed river at map reference QN526080 on that map and down that unnamed river to its confluence with the Mashayenyi river at map reference QN480105 on that map; thence northwards direct to a point on a gravel road at map reference QN471146 on that map and north-eastwards direct to a point at map reference QN495189 on that map; thence north-eastwards direct to a point on the Matupa river at map reference QN519219 on that map and north-eastwards direct to a point 365 metres west of the course of the Rukomechi river at map reference QN553247 on that map; thence generally north-westwards along the western edge of the riverine vegetation of the Rukomechi river, but not closer to the river than a line parallel to and 365 metres west of the course of that river to a point at map reference 35LQN301474 on the 1:50,000 map Nakasanga 1529C3 and north-westwards to a point on the Zimbabwe-Zambia international boundary on the Zambezi river approximately 4.8 kilometres downstream from the intersection of that boundary by the Deeds Registry district boundary-line of Kariba; thence up the Zambezi river to a point on that river at map reference 35KPM923753 on the 1:50,000 map Nyamuomba Island 1628B4 and eastwards direct to a point on the Kassesse river at map reference 35KPM981750 on the 1:50,000 map Kariba 16282; thence down that river to its intersection by the Makuti-Kariba road and generally eastwards and north-eastwards along that road to its junction with the Karoi-Chirundu road; thence south-eastwards along the Karoi-Chirundu road to its intersection by the western boundary of the former Vuti Purchase Land and generally north-eastwards along its western and northern boundaries to the Fundundi river and down that river to the starting point.*

*This description excludes:*

- i. An area of land comprising the properties Chirundu Sugar Estates A and Chirundu Landing Ground, as shown on diagrams S.G. Nos. 1023/60 and 1896/62 respectively, filed in the offices of the Surveyor General, Salisbury
- ii. An area of land bounded by a line drawn from a point on the right bank of the Zambezi River at map reference 35KPN995268 on the 1:50,000 map Chirundu 1628B2 south eastwards, southwards, south-westwards and westwards along a series of straight lines through points at

map references QN002259, QN 002252 and PN992243 on that map to a point on the right bank of the Zambezi river at Map reference PN989243 on that map and generally northwards along the right bank of that river to the starting point.

- iii. That portion of Makuti Township Reserve falling within this area

Map references quoted in this description are given to the nearest 100 metres.

### 1.5.5 MUKWICHI COMMUNAL LAND

SI 169 of 1985

#### Item 160: Mukwichi

**Area 128 900 hectares**

The area of land bounded by a line drawn from the confluence of the Mukwishe and Angwa rivers up the Angwa river to its confluence with the Mwami river; thence proceeding up that river to its intersection by the eastern boundary of Rockwood Extension and northwards and south-westwards along its eastern and north-western boundaries to the south-eastern beacon of Eureka; thence northwards along the eastern boundaries of Eureka and Kachichi to the Nyakachichi River and down that river to its intersection by the southern boundary of Miami 3; thence generally north-westwards along the boundaries of the following, so as to exclude them, the southern and eastern boundaries of Miami 3, the eastern and northern boundaries of Chigangas, the northern boundaries of Miami 3 and 1 and the eastern and northern boundaries of Nyahoja to the north-western beacon of the last-named property and northwards along the prolongation of the western boundary of Nyahoja to its intersection by a line drawn from the confluence of the Angwa and Mpusi rivers direct to the eastern beacon of Wirral; thence westwards along that line to the eastern beacon of Wirral and generally north-westwards along the boundaries of the following properties, so as to exclude them: Wirral, Rhukwedza, Vuti, 107, 108, 106, 105, 104, 103 and 151 to the north-eastern beacon of the last named property; thence direct to hill Kashumba at map reference 35KQM792906 on the 1:50,000 map Manyangau 1629B3, Edition 1, and direct to an unnamed hill at map reference 35KQN666015 on the 1:50,000 map Vuti 1629A4, Edition 1; thence eastwards direct to the highest point on hill Chitangazuva and south-eastwards direct to the highest point on hill Matsikita ; thence direct to the commencement of the Horonga River, at map reference 35KRM003920 on the 1:50,000 map Matsikita 1629 B4, Edition 1, and down that river to its confluence with the Sapi River; thence down the Sapi and Mukwishe rivers to the starting point

Map references quoted in this description are given to the nearest 100 metres.

## CHAPTER 2: NATURAL RESOURCE INVENTORY

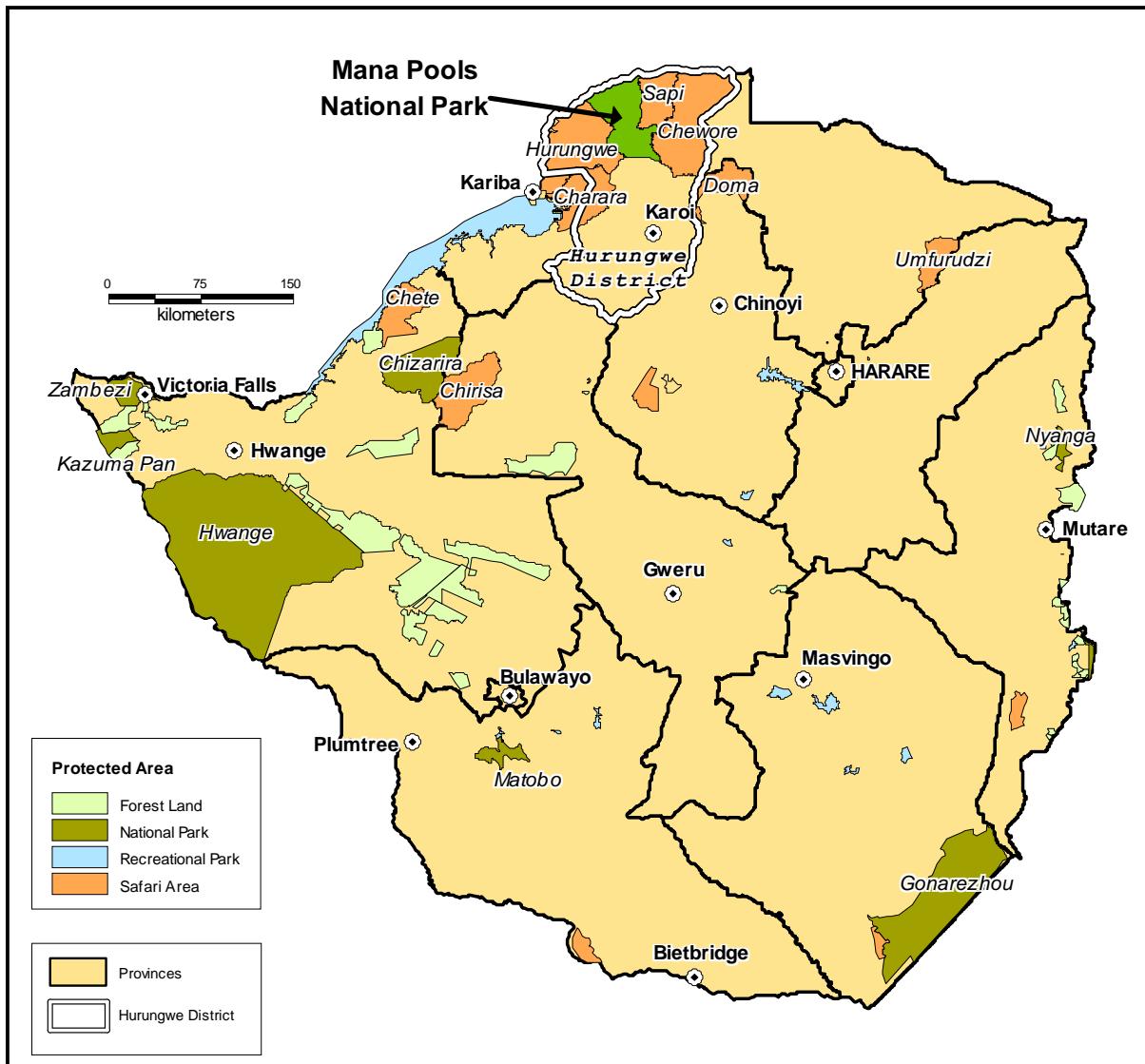
### 2.1 INTRODUCTION

This chapter provides a summary of information pertaining to the natural resources in the Mana Pools National Park and surrounding areas. Given that the area is a World Heritage site and one of the more popular national parks in the country there was relatively little detailed information available.

### 2.2 LOCATION, BOUNDARIES AND AREA

Mana Pools National Park is located in northern Zimbabwe in the Zambezi river rift valley (Figure 2).

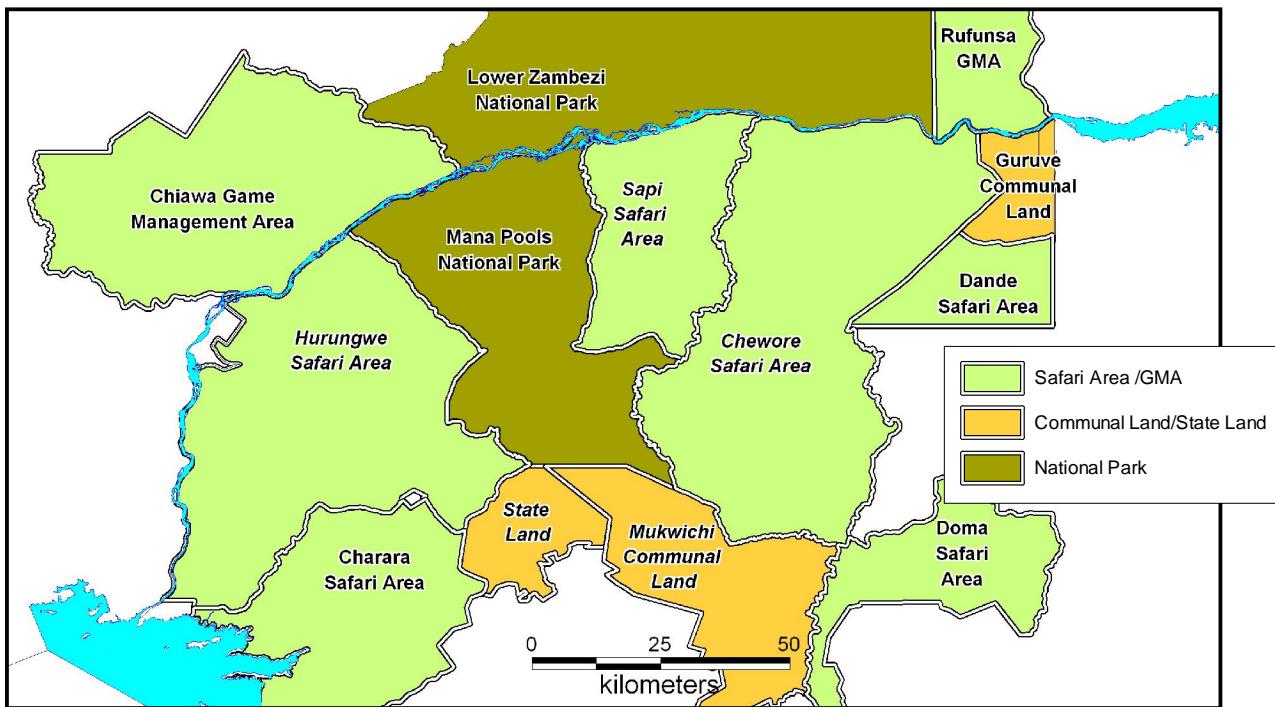
Figure 2: Location of Mana Pools National Park in Zimbabwe



The park is in the centre of a network of protected areas in Zimbabwe which stretch from Kariba to the Mozambique border. In addition, a significant portion of the Zambian bank has protected status (Figure 3).

The park is located in Mashonaland West Province and falls under the ambit of the Hurungwe Rural District Council for higher level administrative purposes.

**Figure 3: Land classification in the vicinity of Mana Pools National Park**



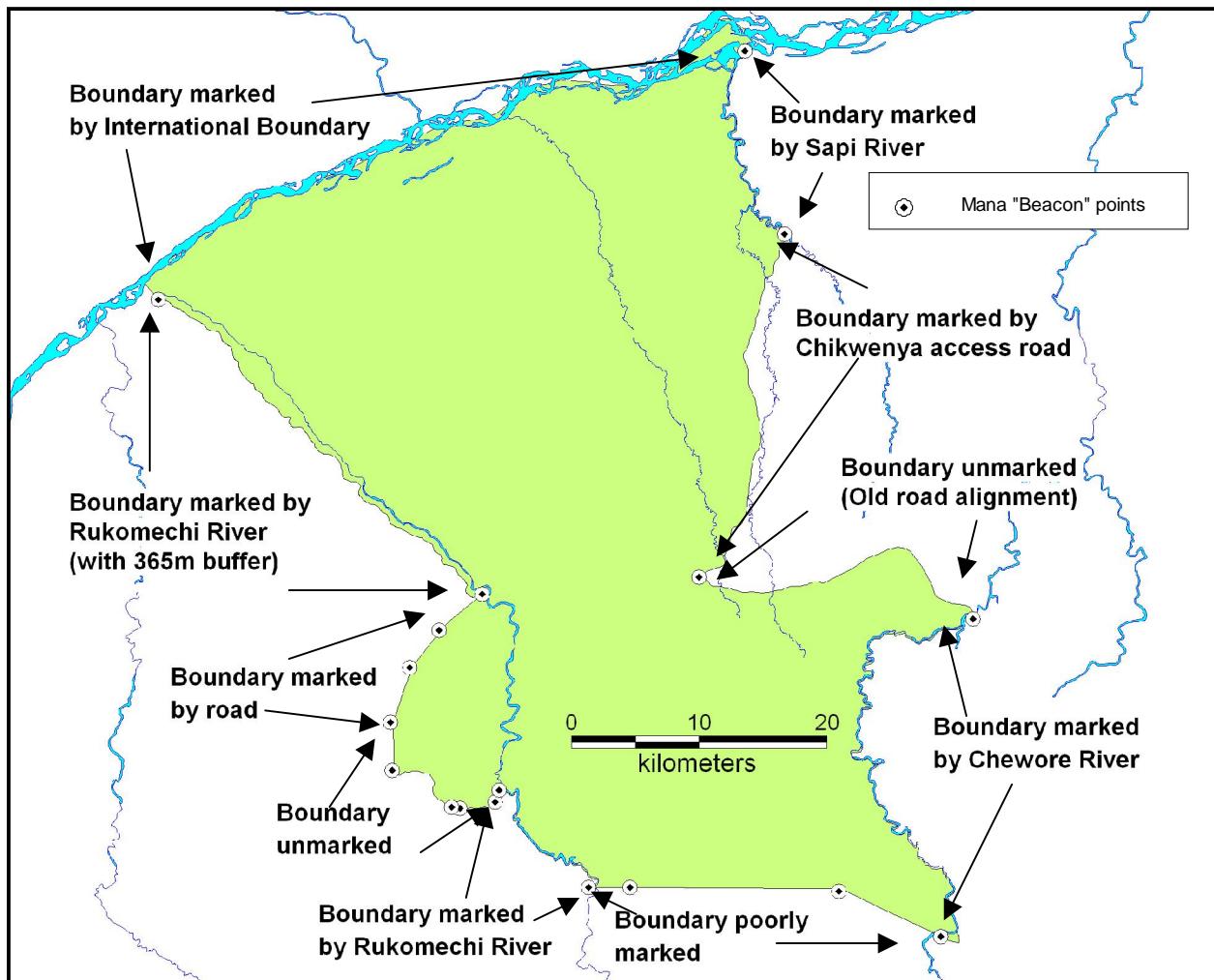
There are over 20 000 km<sup>2</sup> of land in the vicinity of Mana Pools with protected status. The Mana Pools and Lower Zambezi National Parks account for over 6 000 km<sup>2</sup> of this (Table 5).

**Table 5: Protected land within the vicinity of Mana Pools**  
 (Data from GIS)

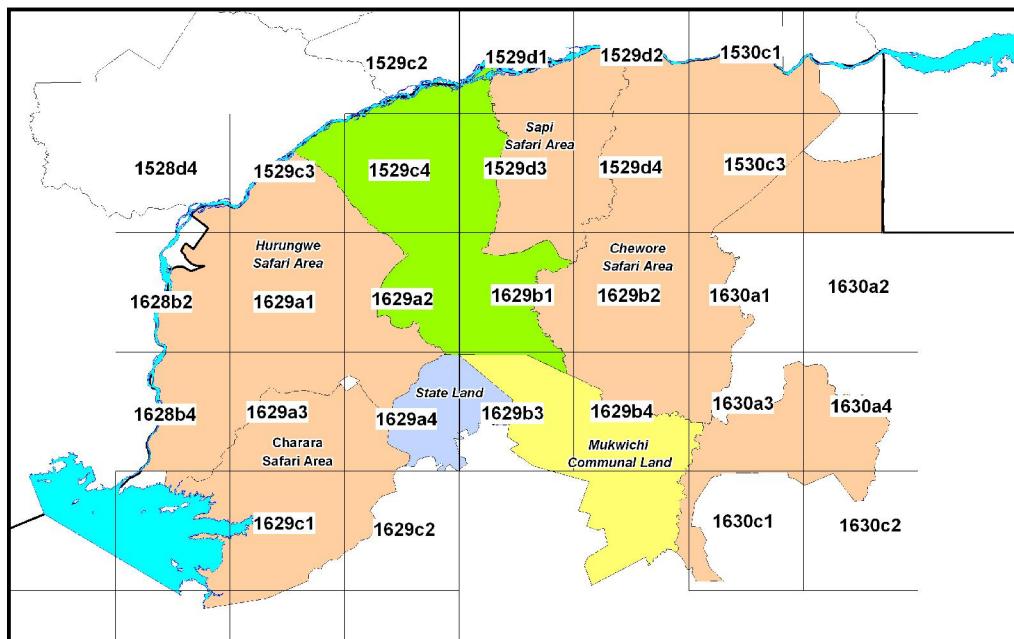
Zimbabwe	Area km <sup>2</sup>	Zambia	Area km <sup>2</sup>
Mana Pools National Park	2 208	Lower Zambezi National Park	4 115
Charara Safari Area	1 671	Chiawa Game Management Area	2 413
Hurungwe Safari Area	2 885	Rufunsa Game Management Area	3 241
Sapi Safari Area	1 181		
Chewore Safari Area	3 390	<b>Total Zimbabwe</b>	<b>13 024</b>
Doma Safari Area	959	<b>Total ZAMBIA</b>	<b>9 888</b>
Dande Safari Area	520	<b>Total</b>	<b>22 912</b>

Much of the boundary of the national park is marked by rivers or roads and the northern boundary is the international boundary between Zambia and Zimbabwe. However, there are some places where there is doubt about the exact alignment of the park boundary as it follows old road alignments or other unclear features (Figure 4).

**Figure 4: Boundary status for Mana Pools National Park**



**Figure 5: 1:50,000 map sheetfall for the mid-Zambezi valley**



## 2.3 HISTORICAL BACKGROUND

### 2.3.1 ESTABLISHMENT HISTORY

Prior to 1958, the area was occupied at low density by people living a subsistence lifestyle. In 1958 the area was proclaimed for wildlife and these people were relocated. In 1960 most of the valley floor section of the Park, to the East of the Rukomechi River, was included in the Urungwe Non-Hunting Reserve (Wildlife Conservation Act 1960 - Schedule 2).

In 1963, the Urungwe Non-Hunting Reserve was split up; The area between the Sapi and Rukomechi Rivers became the Mana Pools Game Reserve, with its southern boundary about 25 Km south of the Zambezi River (Southern Rhodesian Proclamation No.17) an area 334 square miles (865 Km<sup>2</sup>). The area west and south of Mana Pools Game Reserve was included in the Rukomechi East Controlled Hunting Area (Southern Rhodesian Government Notice No.197). The area between the Nyakasanga and Rukomechi Rivers formed the Rukomechi West Controlled Hunting Area. An area south east of the park was included in the Sapi Controlled Hunting Area.

In 1964, Mana Pools Game Reserve was extended to include most of the Rukomechi East Controlled Hunting Area (Southern Rhodesian Government Notice No.517) an area 744 square miles (1927 Km<sup>2</sup>). 24 square miles (62 Km<sup>2</sup>) in the north west of the Reserve were still hunted as part of the Nyakasanga Controlled Hunting Area. F-Hunting Camp was the present Vundu Camp.

In 1968 the Western boundary of the Game Reserve was extended westwards to include the Rukomechi River alluvium and an area to the west of Rukomechi Research Station. The current boundary west of the Rukomechi river and south of Nyakasikana follows a line that shows the Rukomechi Research Station research area (see section x.x).

In 1975 Mana Pools Game Reserve was gazetted as the Mana Pools National Park (Parks and Wildlife Act 1975, Schedule 1). Mana Pools National Park, along with Sapi and Chewore Safari Areas was proclaimed a World Heritage Site in 1983.

**Figure 6: Protected areas in the Zambezi valley in 1960**

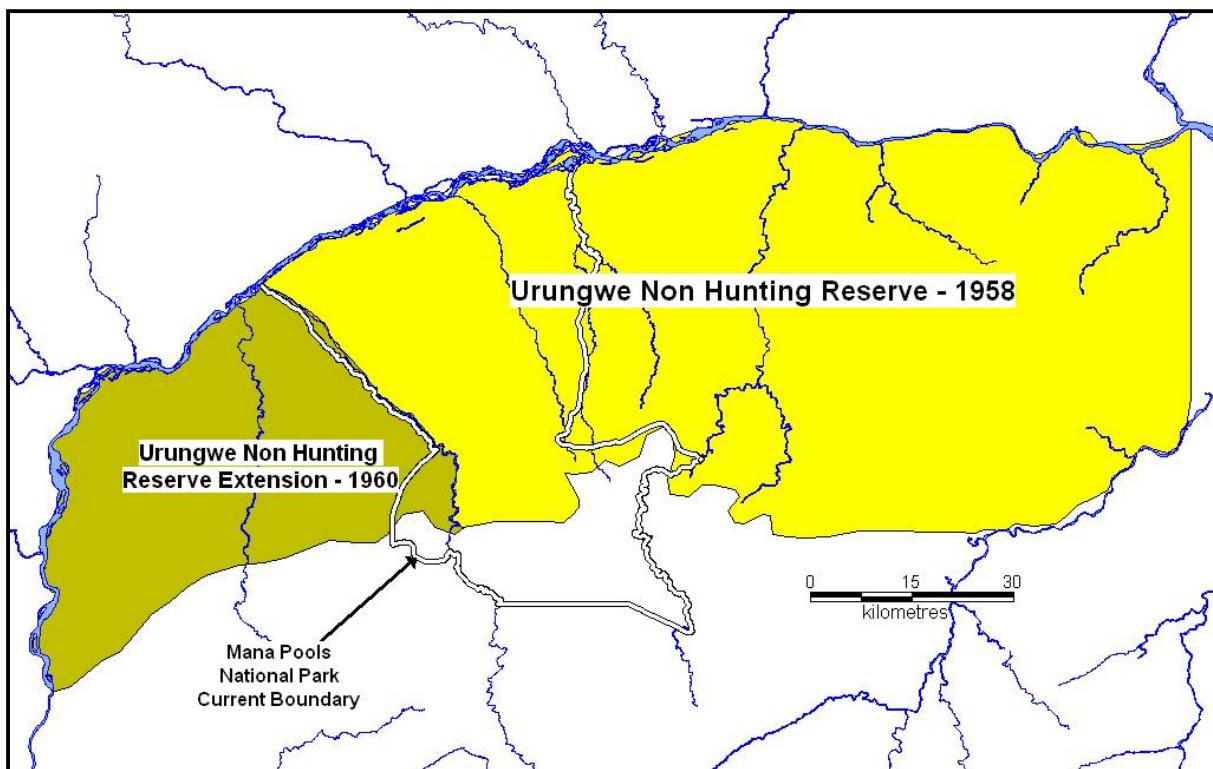
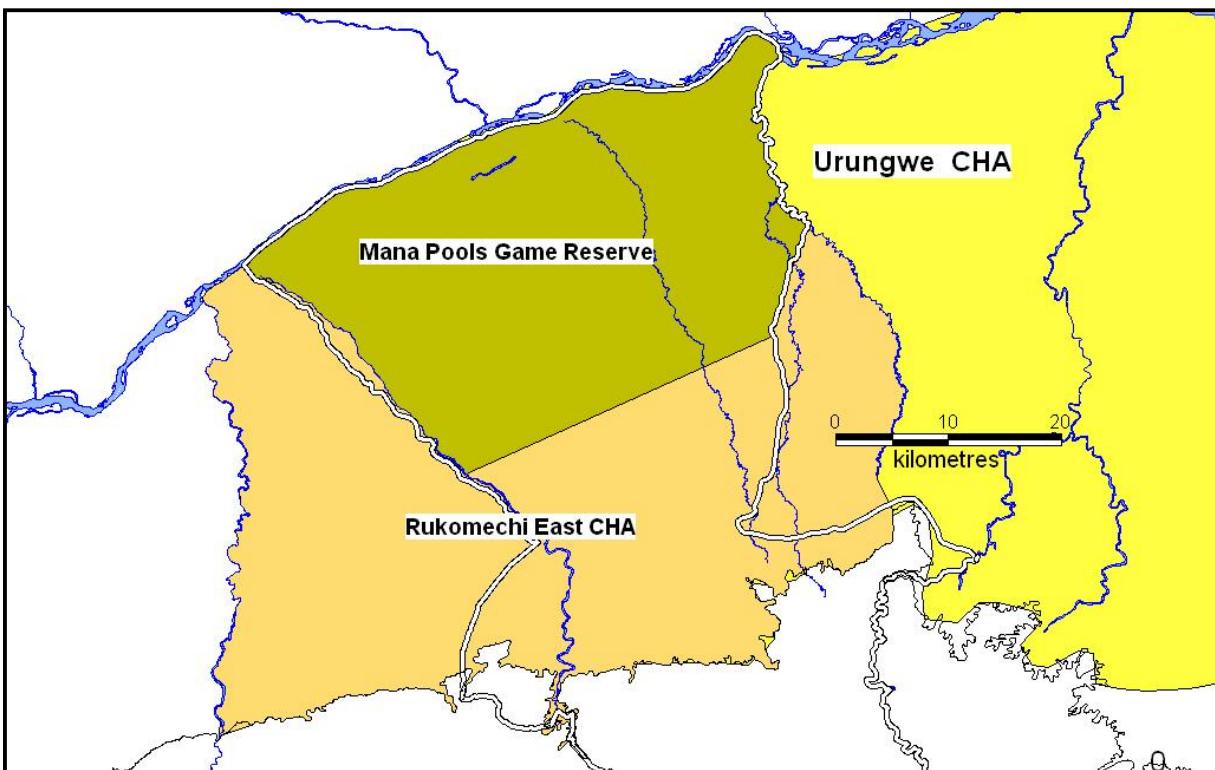


Figure 7: Protected areas in the Zambezi valley in 1963



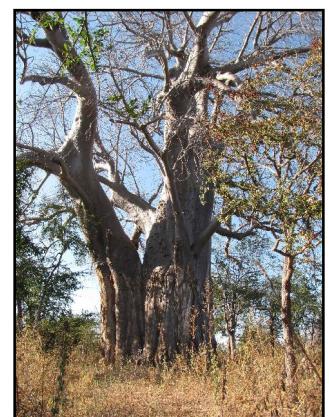
### 2.3.2 HUMAN USE PRIOR TO PROCLAMATION

(Much of the information presented here is taken from Hughes, 1971)

The area was probably used by San hunter-gatherers as at least four sites with paintings have been found in the Karoi and Mukwichi areas (White, 1971). It is likely that there was a migration of Va-Mbara people from Zambia in the 17<sup>th</sup> Century who were known for their skills with metal working. Later influxes, and including the present-day valley chiefs (Chundu and Dandawa in the case of Mana Pools), probably moved to the area during the last 150 years (Hughes, 1970). The availability of salt was an important driving force for this immigration and the Rumwa Salt Spring could have been a focal point. Chundu's people probably originated from north of the Zambezi while Dandawa's people probably came from south of the escarpment.

Dandawa's coming displaced people who were led by Chidzere. The people under Chidzere had settlements along the Zambezi river (e.g. some were located in the vicinity of "E" Camp and under the Headmen Nyamahawe and Kaparangwa). Chidzere is said to have died and turned into a baobab tree (located on the Chavava river/Mana Access road intersection) and ceremonies were held at this tree before resettlement in the early 1960s. Chidzere's sister (Changamuchiri) is reputed to have been turned into a stone which has been seen near the Chavava and Rukomechi river confluence. The stone is said to move through the area as far as the Mana Pools. In addition a senior member of Chidzere's people (Kandare) was buried near a large strangler fig on the south side of Long Pool.

Dandawa's people settled along the Rukomechi and Chavava rivers (essentially by displacing Chidzere's people). In 1912 there were a recorded 440 male taxpayers which had risen to 1095 in 1937 (62 kraals) and 2 230 by 1957, just prior to resettlement. In the early 1900s a woman called Nyakasikana was given land at the present-day site of the Rukomechi Research Station. Her name lives on in the Mana entrance gate. In 1958 Dandawa's people were

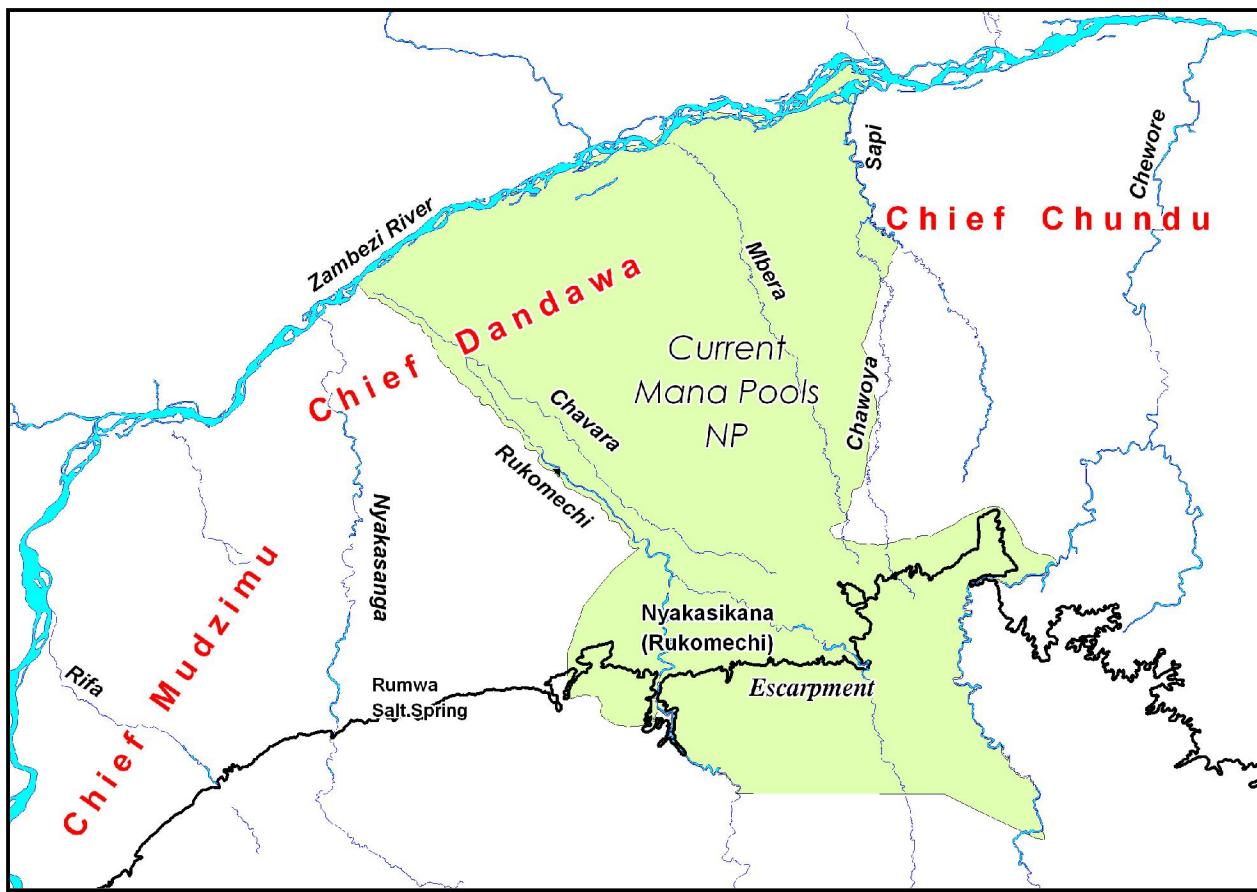


moved to the Rengwe Communal Land on the Sanyati river, some 200 kilometres to the west of the Chavava river.

It appears that the bulk Chundu's people were more likely to have settled east of the Sapi river and some may have lived on Chikwenya island. In 1912 there were 133 adult males under Chief Chundu which had risen to 397 in 1957. Chundu's people were moved to Mukwichi after the area was proclaimed as a wildlife reserve and the Chundu chieftaincy is still strong in this area.

There has been much debate about the settlement near the Chitake Springs. There is evidence of grave sites according to some people south of the Chitake river and at the Chitake 2 campsite. Others believe that there was a substantial settlement north of the river in the "badlands" and that the cleared areas seen on imagery are a result of this. The dates of this settlement are unknown but there are theories that it could have been in the early 1800s.

**Figure 8: Diagrammatic representation of the ethnography in the Zambezi Valley**



It is on record that people were reluctant to move but that they accepted "defeat" and adjusted to their new areas. The original valley groups have since become diluted through assimilation of people from other areas (du Toit, 1984). Although a number of ceremonies were important (e.g Chidzere's tree) some of these have fallen away as they either related specifically to life in the valley or else alternative sites have been found. There are still some ceremonies that have to be held in the valley (**Do we know what these are?**)

## 2.4 PHYSICAL FEATURES, DRAINAGE, GEOLOGY AND SOILS

### 2.4.1 PHYSICAL FEATURES AND DRAINAGE

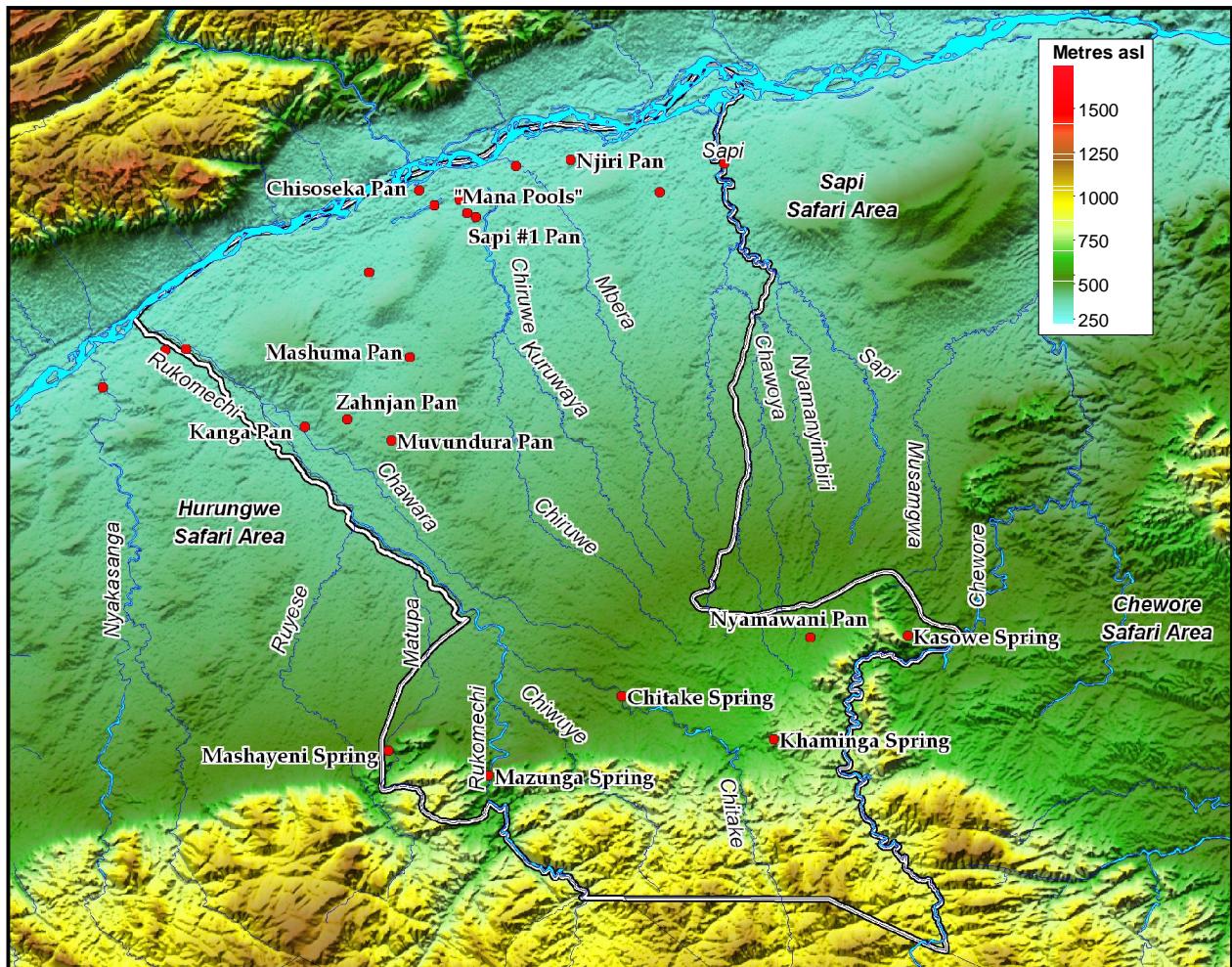
The Zambezi rift valley is approximately 55 km wide in the Mana Pools Area. As the river is close to the northern escarpment most of Mana Pools National Park lies on the valley floor. Generally the relief of the park is flat with the Zambezi river falling 12 meters over the 50 km of frontage along the park (359 m. asl at Rukomechi and 347 m. asl at Chikwenya). There is a gentle rise of approximately 200 meters between the river and the Chitake springs area at the base of the escarpment. The escarpment rises abruptly from the valley floor to nearly 1 000 m.asl, an increase in elevation of around 300 meters.

Two rivers in the park have their sources in the upland escarpment areas (Rukomechi and Chewore), all others are seasonal streams starting from the base of the escarpment. The three major seasonal streams are the Sapi, Chiruwe and the Mbera and their associated tributaries.

The alluvial floodplain contains the “Mana Pools” and these are likely remnants of former channels. The largest is “Long Pool” and the Chiruwe and Mbera rivers are important feeders for these pools as they only fill from the Zambezi at exceptionally high water. Several of the pools will hold water throughout the year.

Numerous pans are found through out the park, both in the Mopane and Jesse bush areas. All of these will dry up but are important for wildlife in the early part of the dry season. The well known pans include Mashuma, Zahnjan, Muvundura, Kanga, Njiri, Sapi # 1Lungfish and Nyamawani. A number of springs are found near the escarpment and these include Chitake, Kasowe, Khaminga, Mazunga and Mashayeni (Figure 9). These are perennial water sources and are vital for the ecology of the park. It has been recorded that there was no water at Chitake in 1985 (Broderick, pers. comm..).

**Figure 9: Physical Features and Drainage**

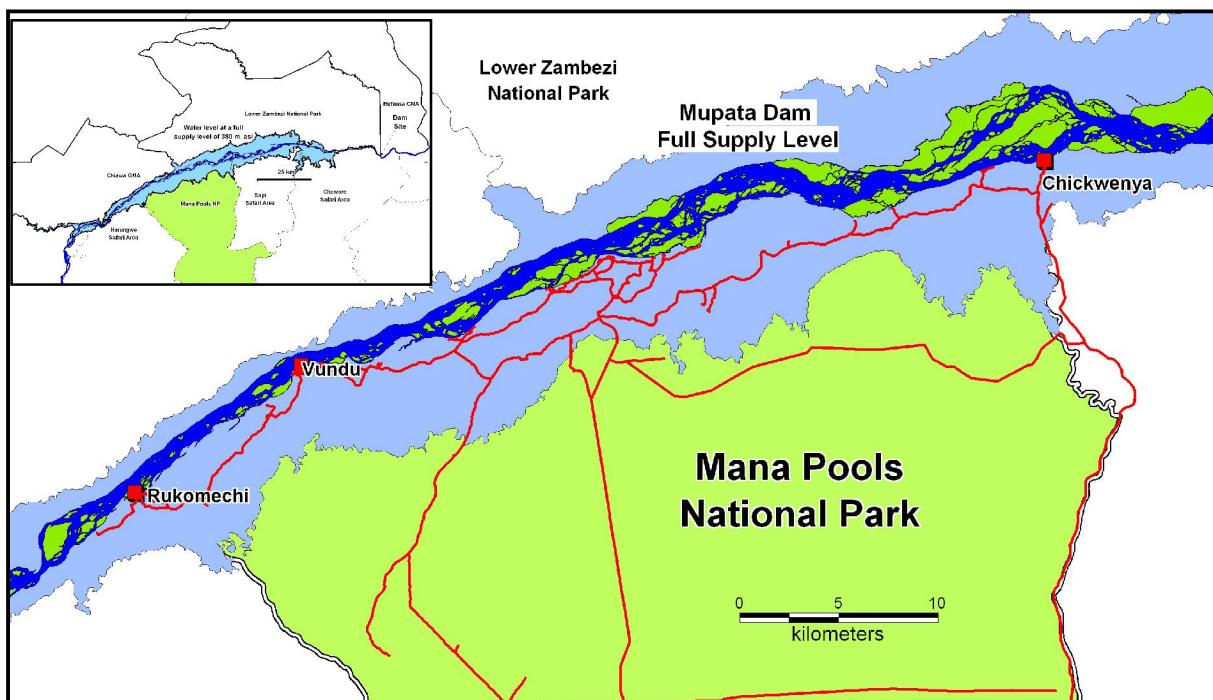


The Chimuti dam at the base of the escarpment near Marongora was breached in early 2009. This dam was an important water source away from the Zambezi River for wildlife to the west of Mana Pools. Although a spring is found nearby (Rumwa Spring) it is sulphurous may not have sufficient water drinkable to support the wildlife that was previously using Chimuti Dam. This may mean that some wildlife will find its way to the Mana Springs (e.g Chitake) in the next dry season.

### The Zambezi River

The Zambezi river is the 4<sup>th</sup> largest river in Africa and has a basin area of approximately 1.4 million km<sup>2</sup>. Draining eight countries, the river is an important waterway that affects development along its banks. It has been dammed in two places (Kariba and Cahora Bassa) and several other sites have been discussed at length (Katombora, Batoka Gorge, Devil's Gorge and Mupata Gorge). Damming the river at Mupata gorge<sup>1</sup> would have disastrous consequences for the Mana Pools World Heritage Site (Figure 10). Although this project appears to have been shelved, the development needs of both Zambia and Zimbabwe may see its resuscitation at some point in the future.

**Figure 10: Full supply level of the proposed Mupata Gorge hydro-electric scheme**



The Zambezi river was dammed at Kariba in 1952 and this has resulted in major hydrological impacts downstream. Prior to the damming of the river the river apparently had two floods a year. The first (known locally as gumbura) was in February and was the smaller of the two. The water was usually dirty and was probably caused by runoff from rivers below the Victoria Falls. The second (known as murorwe) was in April and usually lasted about two week. This larger flood was made up of clearer water coming down from the upper Zambezi catchment and the Kafue (du Toit, 1994).

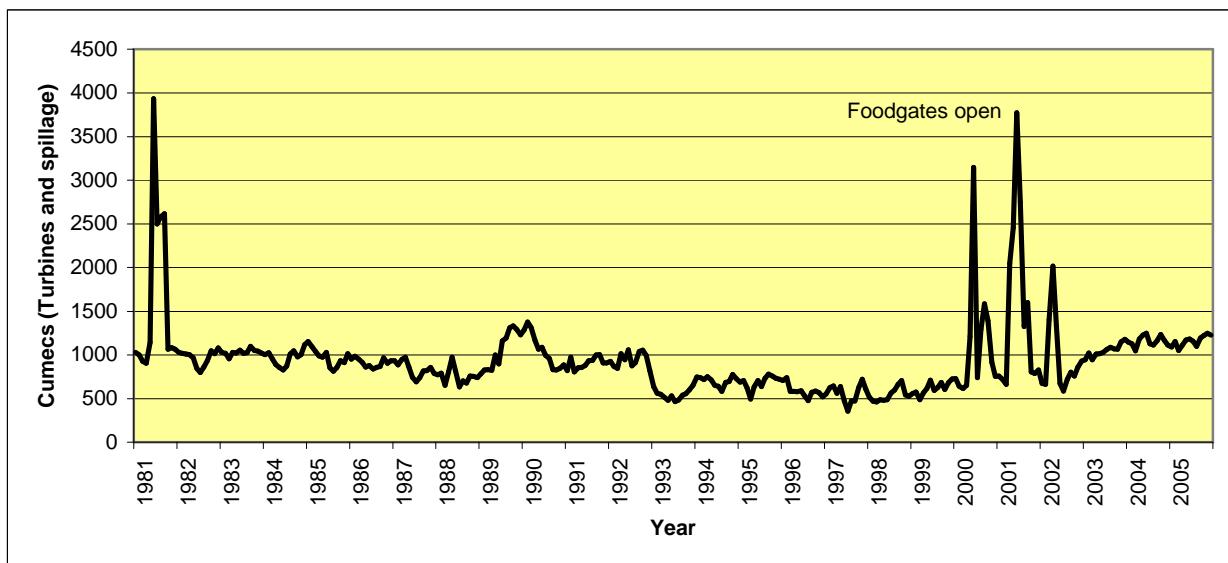
Since the dam wall was closed the flow of the river has been regulated. Water exits through the turbines and there is a weekly fluctuation in response to power demands. This fluctuation is in the usually less than one metre and usually is seen in the LZNP on Monday/Tuesday of each week. The other way in which water enters the mid-Zambezi system from Kariba is through the flood control gates. These are opened in response to water levels in the lake and forecasts of future inputs. Lake Kariba experienced low levels between 1981 and 1999 and, during this period, the gates were not opened at all. There was a recorded decrease in wildlife densities at Mana Pools after the closure of the gates (Dunham, 1994). However, after the El Nino rains in 2001 the gates were opened for several months.

<sup>1</sup> Installed capacity of between 640 to 1200 MW. Suggested Full Supply Level of 381 m. asl

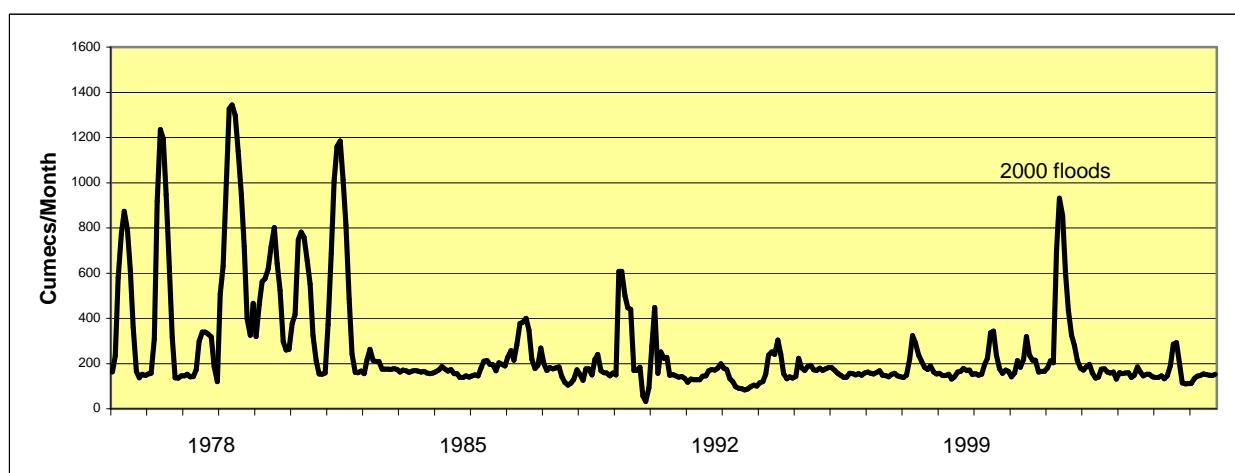
What has been the effect of this on the river in Mana Pools? Firstly Lake Kariba is a sediment trap which means that there is less sediment reaching the mid-Zambezi. This has led to increased erosion and since the damming of the river the river has widened by as much as 300 metres along the Mana front (Nugent, 1986). Hydrological models show that change in the system would fluctuate but would eventually reach a new equilibrium (between erosion and deposition). How long would this take? Evidence suggests that equilibrium may have been reached on certain sections of the river but not on others (Nugent, 1986). The situation is also complicated by the sporadic release of water through the floodgates.

The “artificial flood” in 2000, caused by *El Niño*, resulted in some changes in Mana Pools. Aquatic macrophytes were cleaned out of many of the channels and there would have been increased erosion which may have resulted in channel changes and changes in the shape of islands.

**Figure 11: Monthly flows through the Kariba Dam Wall**  
Data from Zambezi River Authority



**Figure 12: Monthly flows through the Kafue Gorge**  
Data from ZESCO



As the river is continually migrating across the valley floor new islands and channels will be opened. One of the important habitats in the area are the islands and associated alluvial terraces, which support a variety of vegetation types. The oldest terraces (usually the furthest from the river support a diverse riparian community; Muller and Pope, 1982). Those close to the river bank – and therefore the most likely to be eroded – support only a few pioneer species, the most notable of these being *F. albida*.

There is some disagreement in the literature regarding the extent of flooding of the alluvial terraces prior to the impoundment being built at Kariba. Some texts (Attwell?) maintain that the flooding was almost an annual event while others (Hughes, 19xx) maintain that it was relatively rare. Other texts (such as the previous management plan document) state that it was at approximately 15 year intervals (but without any supporting documentation).

## 2.4.2 GEOLOGY, SOILS AND FOSSIL OCCURRENCES

### Geology

The oldest rocks in the area are those of the Proterozoic Zambezi Metamorphic Belt forming the Zambezi Escarpment. These rocks are mainly highly metamorphosed and deformed gneisses (Anderson 1981 in Du Toit 1982). The Zambezi Valley is part of the early African Rift Valley system of fault-bounded, sediment-filled grabens of Karoo age. Sediment depth may reach 4000m in the Mana Pools Basin and folding, tilting and faulting may have continued into post-Cretaceous times. The greater part of the Valley floor within the park is covered by Pebby Arkose and Forest Sandstone fluvial and aeolian sequences of the Upper Karoo Group of Triassic to Jurassic age overlain by post-Karoo Red Beds close to the Escarpment foot. Across interfluves adjacent to the Zambezi River is a belt of Pleistocene to Recent Kalahari-type beds, the Jesse Sands, originally of aeolian origin but recently redistributed and reduced in extent by erosion. Other later deposits are pebble lag deposit and areas of local riverine alluvium, the largest extent of which occurs along the Rukomechi River (Bennet et al 1985, T.J. Broderick, pers comm, 2009).

### Soils

The Zambezi alluvium is locally very variable, consisting of deep, poorly consolidated, stratified deposits. One widely occurring feature is a poorly structured and relatively heavy textured surface which reduces rainfall infiltration causing surface wetness. Away from the Zambezi, the Kalahari-type Jesse Sands exhibit deep, well-drained, poorly consolidated red sandy loams, formed in strongly pre-weathered material, which are very acidic and are in marked contrast to the immediately adjacent upper Karoo soils. These are compact and poorly permeable, medium textured soils with strong alkalinity. The most sodic soils, which are also highly saline, occur above the southern edge of the floodplain. The Karoo beds are often masked by colluvium and many, narrow deposits of recent alluvium in an intricate pattern following the closely spaced drainage system. Soils developed on older alluvial outwash fans, are found in the Escarpment foothill zone (Bennet et al 1985). Lithosols occur within the Escarpment country.

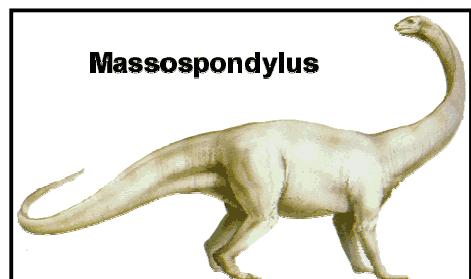
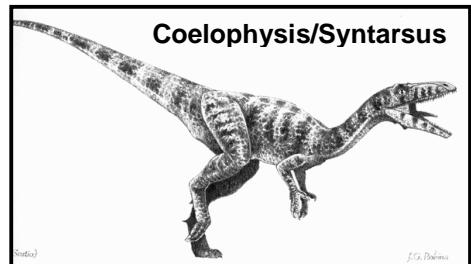
### Fossil Occurrences

Although the more famous sites for dinosaur remains and footprints are known from the Chewore Safari Area, a significant site was discovered in 1972 in Mana Pools National Park. Remains of two dinosaurs are found there. A small scavenging dinosaur (*Coelophysis/Syntarsus*) from the Triassic/Jurassic boundary and a larger (4m approx) omnivorous (prosauropod) dinosaur (*Massospondylus*) from the Triassic age. The *Coelophysis* remains are more locally concentrated and were the topic of a doctoral thesis in the 1970s (Raath, 1977).

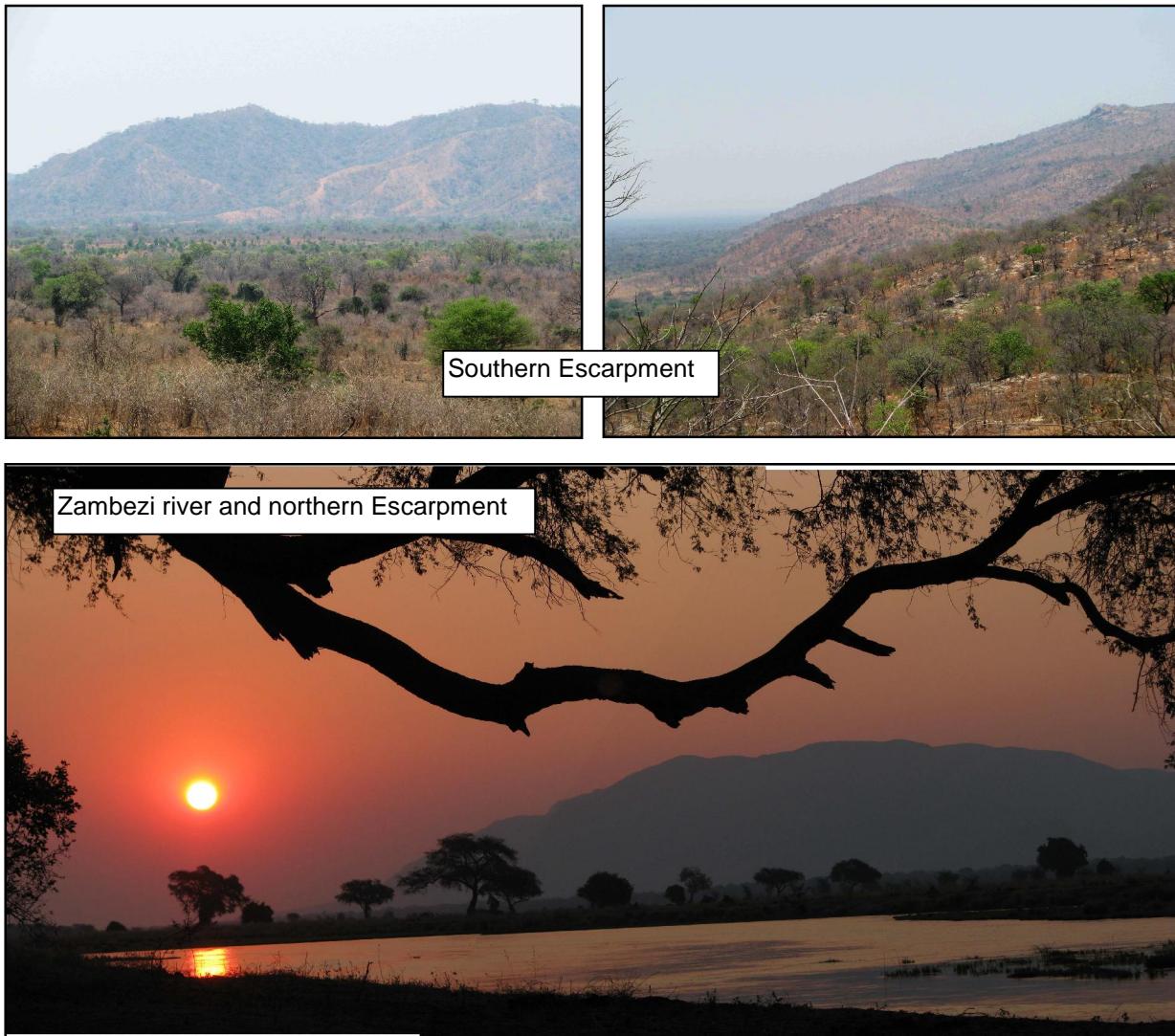
The Mana fossils are found in strata exposed by a river in the Forest Sandstone Formation of the Upper Karoo. The beds exhibits significant rifting and faulting and the annual floods remove and re-expose new remains meaning that the site is not static. For example, no remains were visible during 1985 or 2001 visits but there were significant discoveries in 2007.

The site was investigated by permit with the co-operation of National Museums in 2007 and almost an entire skeleton of *Coelophysis* was removed for detailed study. This investigation is ongoing.

Figure 13: Mana dinosaurs

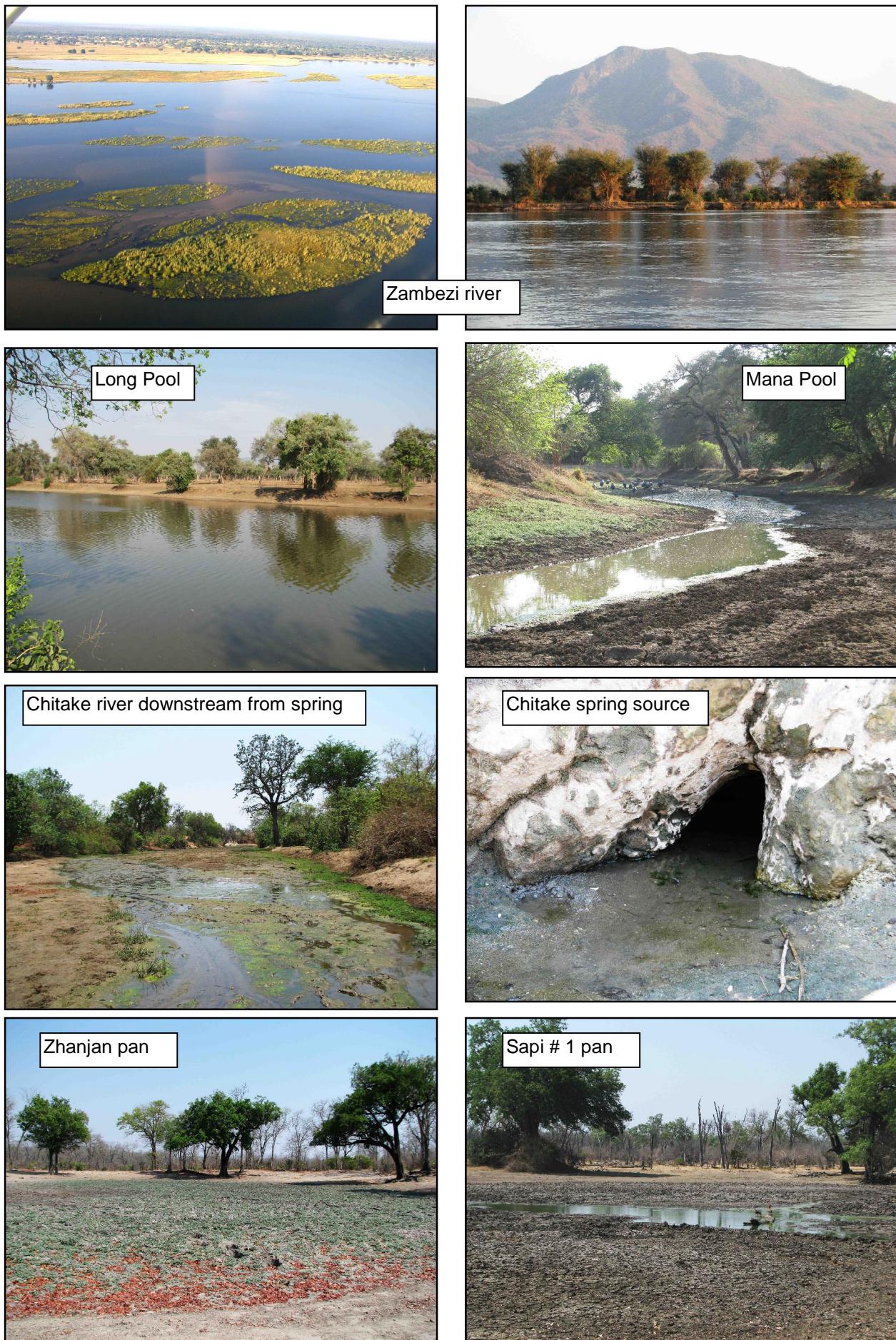


**Figure 14: Physical features of Mana Pools NP**



River gorges  
Sand deposits  
Zambian escarpment?

**Figure 15: Water sources of the Mana Pools National Park**

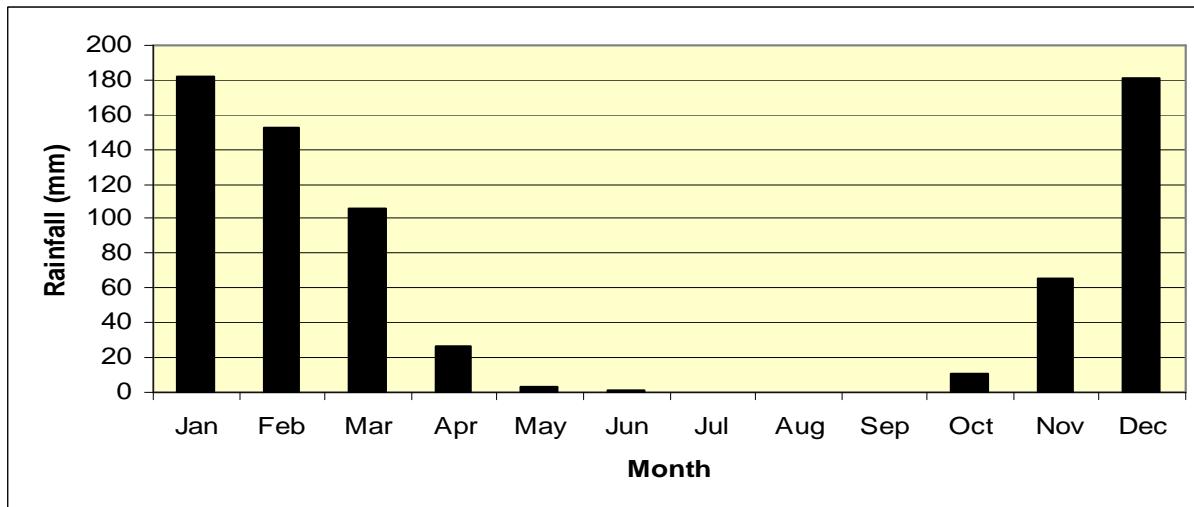


## 2.5 CLIMATE

### 2.5.1 RAINFALL

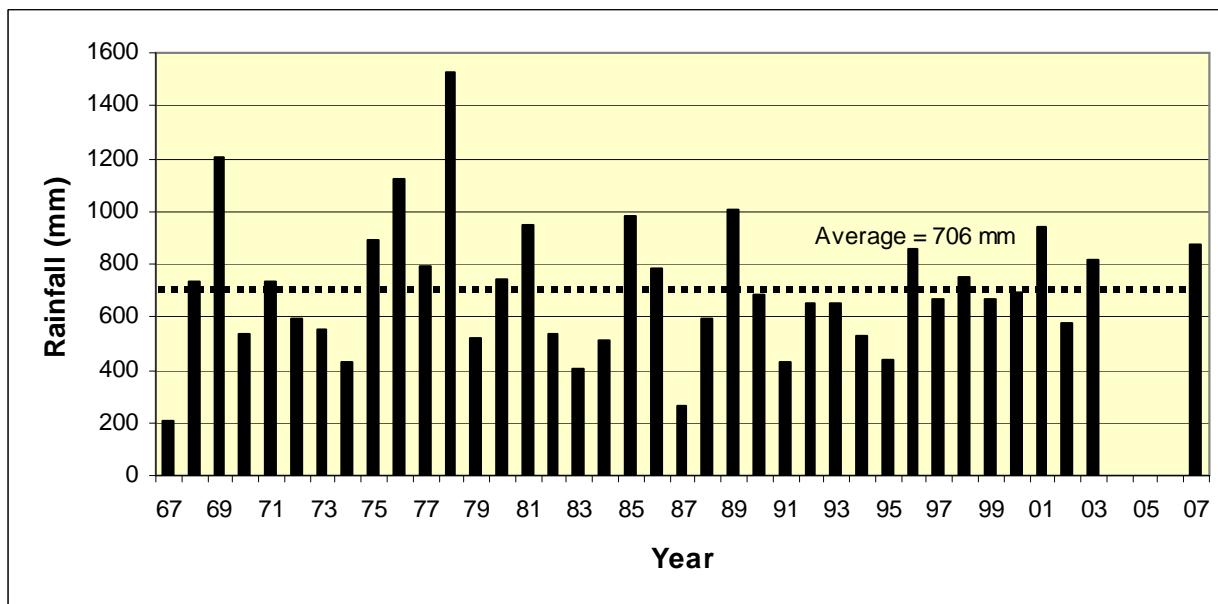
Rainfall in the mid-Zambezi valley follows the regional mono-modal pattern with the bulk of the annual average of 706 mm falling between November and March. December and January have an average of 180 mm each and these two months account for almost half of the annual average in a normal year (Figure 16).

**Figure 16: Monthly rainfall at Nyamepi Station – Mana Pools NP**  
(PWMA data; 1967 to 2007)



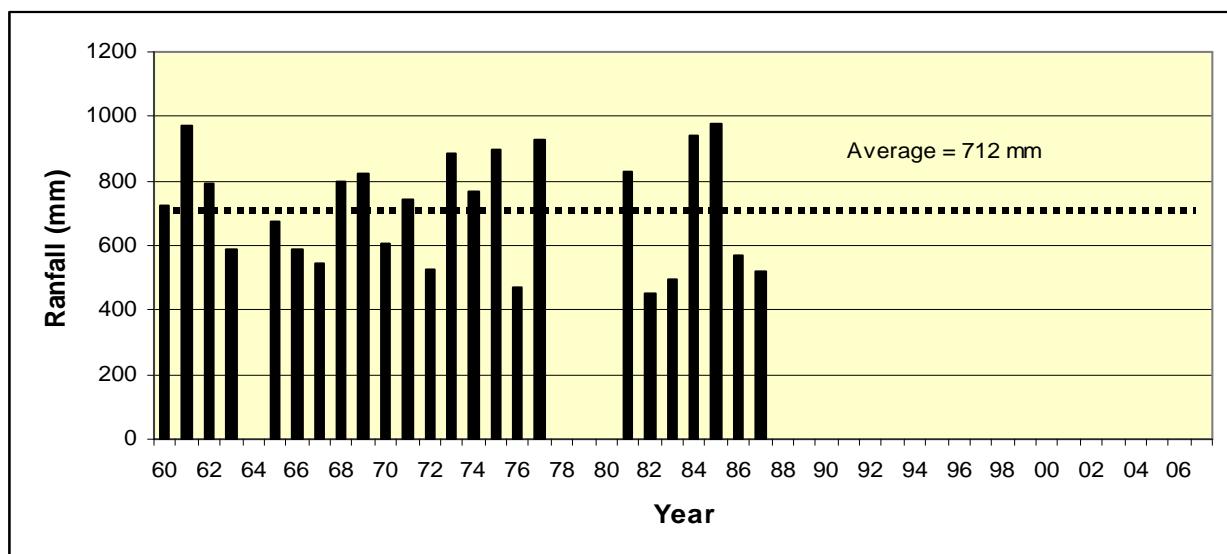
However, rainfall between years and between months is highly variable. An analysis of the annual rainfall data for Nyamepi shows a high of over 1 500 mm in 1978 and a low of 200 mm in 1967 (and a little more than 200 mm in 1987 (Figure 17). This rainfall variability has a marked effect on the primary productivity of the area and hence the wildlife that it can support. Long-term rainfall data for Kariba indicates a general decrease in rainfall and this will affect the ecology of Mana Pools.

**Figure 17: Rainfall records from Nyamepi**  
(PWMA data; 1967 to 2007)



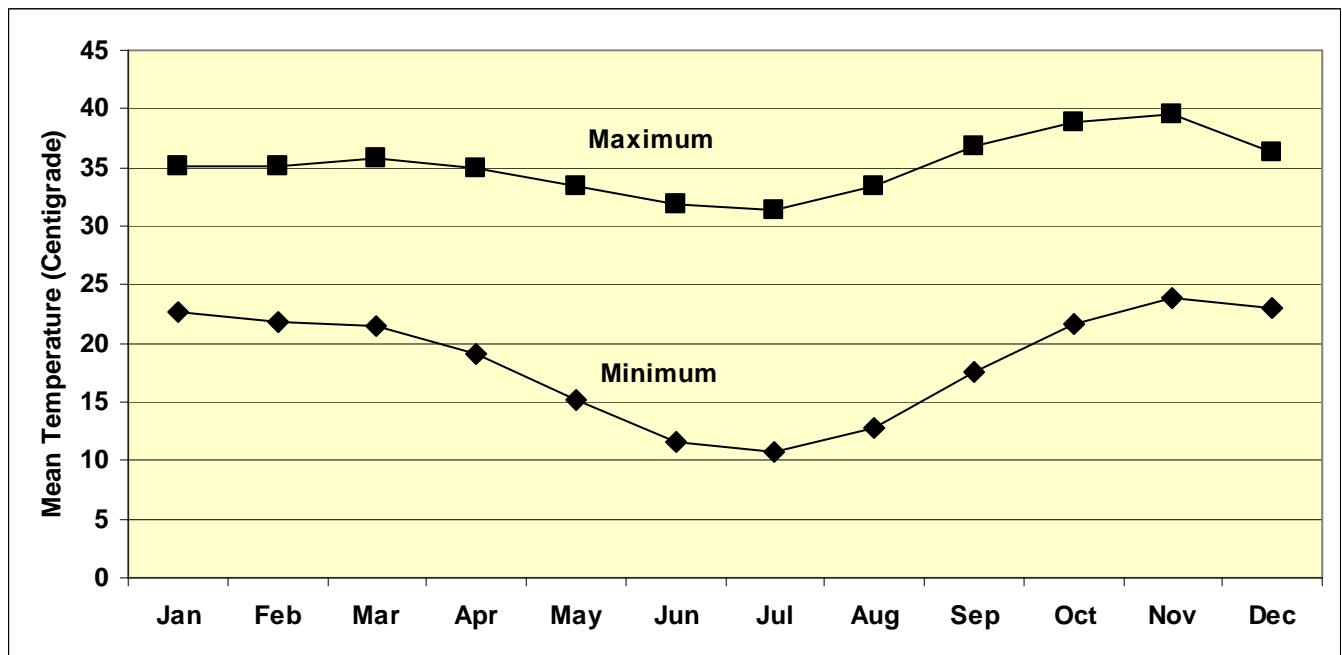
Rainfall data for the Rukomechi Research Station at the base of the escarpment, although incomplete, shows less variability and, as expected, a slightly higher average (712 mm; Figure 18).

**Figure 18: Rainfall recorded from the Rukomechi Research Station**



Temperature in the area are high with monthly means approaching  $40^{\circ}\text{C}$  prior to the rains. Mean minimum temperatures remain above  $10^{\circ}\text{C}$  (Figure 19). There are indications that temperatures are rising in the Zambezi valley as a result of global warming and the long-term consequences of this Mana Pools are unknown.

**Figure 19: Average monthly temperatures for Nyamepi**  
Data from PWMA



## 2.6 VEGETATION

### 2.6.1 VEGETATION DESCRIPTION

The vegetation of the entire park was described by Guy (1977) who identified ten types (see Appendices). For the purposes of this document four main types are used:

1. *Colophospermum mopane* woodland
2. *Faidherbia albida* woodland
3. *Brachystegia - Julbernardia* woodland
4. *Commiphora - Combretum* thicket

Broad scale mapping of the units was carried out in 2004 and although there are some discrepancies between these two sources, they are similar enough to present a picture of the vegetation of the park.

**Table 6: Vegetation Types found in Mana Pools National Park**  
(based on Guy, 1977)

Vegetation Type	Description
<i>Colophospermum mopane</i> woodland	<p>This is the most extensive of the vegetation types occurring throughout the valley floor. The soils are shallow, usually sodic and mopane assumes complete dominance on these soils. In other vegetation types it occurs to a greater or lesser extent as a sub-dominant.</p> <p>Species that may be associated with <i>C. mopane</i> are <i>Kirkia acuminata</i>, <i>Diospyros quiloensis</i>, <i>Sterculia africana</i>, <i>Erythroxylum zambesiacum</i>, <i>Balanites aegyptiaca</i>, <i>Acacia nigrescens</i> and <i>Terminalia prunoides</i>. The shrub layer is comprised mainly of <i>Combretum elaeagnoides</i>, <i>Courbarilia glauca</i> (now <i>Maerua edulis</i>), <i>Boscia angolensis</i>, <i>B.matabensis</i>, <i>Freisodielsia obovata</i> and <i>Cleistochlamys kirkii</i>.</p> <p>The herb layer is poorly developed but the grasses are generally <i>Aristida</i> spp., especially <i>A.rhinochloa</i>, <i>A.adscensionis</i> and <i>A.hordeacea</i>; <i>Eragrostis</i> spp.; <i>Sporobolus</i> spp., especially <i>S.ioclados</i> and <i>S.cordofanus</i>; and other species such as <i>Enteropogon macrostachyon</i> and <i>Dactyloctenium giganteum</i>. Among the more important herbs are <i>Achyranthes aspera</i>, <i>Elytraria acaulis</i>, <i>Melanthera scandens</i>, <i>Kalanchoe lanceolata</i> and <i>Barleria ameliae</i>.</p> <p><i>Acacia robusta</i> subsp. <i>clavigera</i> usually lines the watercourses within the mopane woodland, and most of the seasonal pans may be lined with species such as <i>A.roberta</i>, <i>Gardenia spatulifolia</i>, <i>Diospyros mespiliformis</i>, <i>Adansonia digitata</i> and <i>Drypetes mossambicensis</i>, as well as having the fringing scrub layer species such as <i>Feretia aeruginascens</i> and <i>Combretum obovatum</i>.</p> <p>With varying soil conditions, mopane density often varies considerably over short distances and division into savanna or woodland becomes very difficult to apply. In most of the areas mapped as <i>C.mopane</i> woodland the dominant species occurs in almost pure stands with a closed canopy and trees up to 16m tall, whereas, elsewhere, the trees may be widely spaced, have many associated co-dominants, and are recognisable as mopane woodland only because of the slightly greater proportion of <i>C. mopane</i> compared with other species. The ground herb layer also varies with soil. In some areas a well developed herb layer is found whereas in others the forbs and grasses are very widely spaced and extensive erosion has occurred.</p>

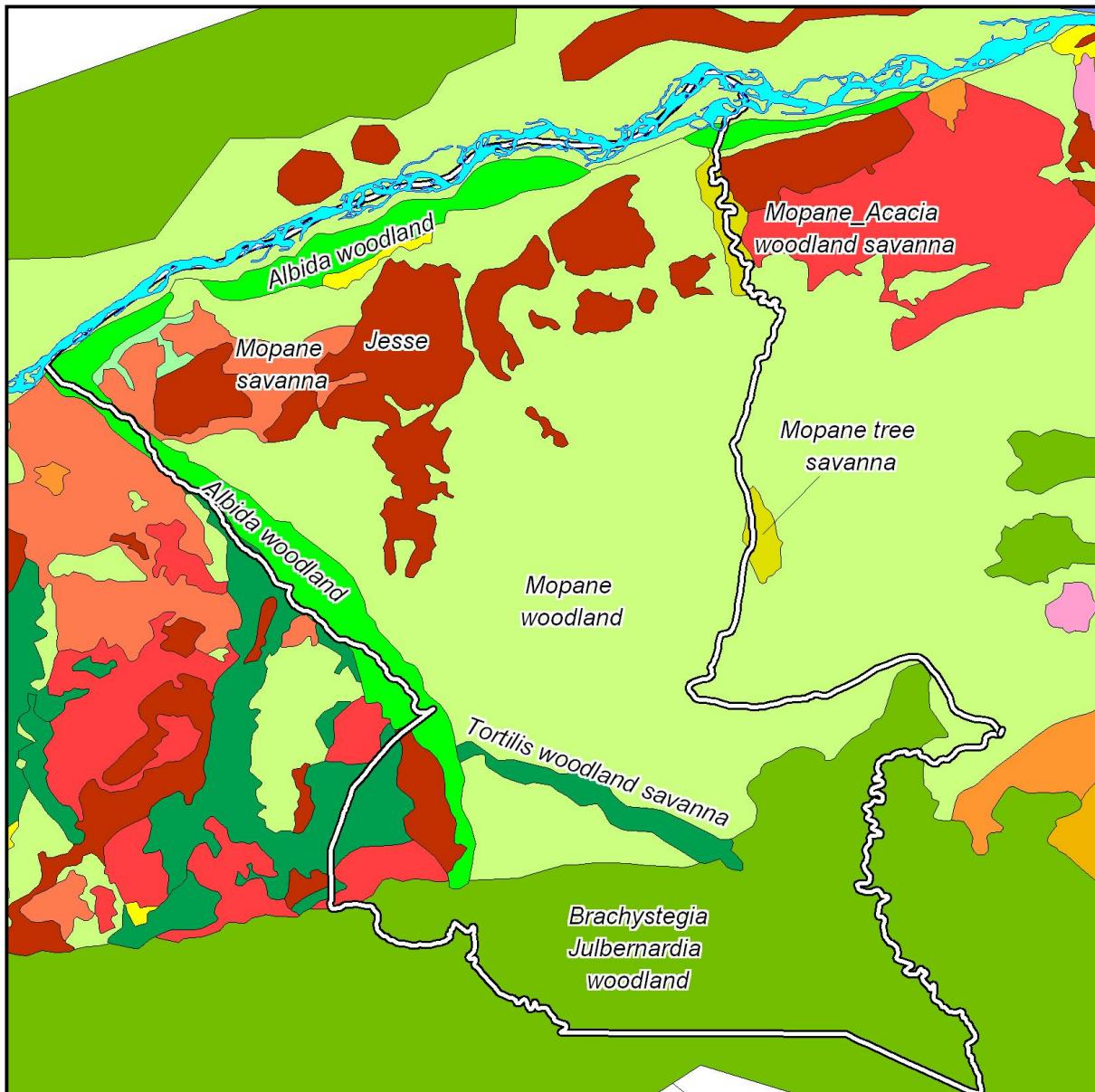
**Table 6: Vegetation Types found in Mana Pools National Park**  
(based on Guy, 1977)

<b>Vegetation Type</b>	<b>Description</b>
<i>Faidherbia albida</i> woodland	<p><i>Faidherbia albida</i> woodland type is found on the alluvial soils of the large rivers of the Zambezi Valley, in Mana Pools this includes the Rukomechi and Sapi. The Rukomechi has this woodland type along its length from the base of the escarpment to the Zambezi. Along the Zambezi it shows a discontinuous distribution with large areas being found in the west near Kariba Gorge, at the mouth of the Rukomechi and either side of it, whilst slightly east of this is an isolated area on the Mana Pools floodplain. The latter is the largest area carrying this type of vegetation and is about 150 km<sup>2</sup> in area. At the mouth of the Sapi River there is another extensive stand.</p> <p><i>Faidherbia albida</i> woodland is found only on recently deposited alluvial soils, hence its close association with the rivers. The soils of these alluvial plains are sharply demarcated from those of adjacent vegetation types and may be separated by a vertical rise of up to 5 m. Trees that are found in the alluvial deposits include <i>Faidherbia albida</i> (usually the dominant species), <i>Kigelia africana</i>, <i>Lonchocarpus capassa</i>, <i>Trichelia emetica</i>, <i>Tamarindus indica</i>, <i>Ficus zambesiaca</i>, <i>Garcinia livingstonei</i> and <i>Cordyla africana</i>. The understorey is less well developed and includes species such as <i>Combretum mossambicense</i>, <i>C. obovatum</i>, <i>Diospyros senensis</i>, <i>Gardenia spatulifolia</i>, <i>Grewia flavescens</i> and <i>Cardiogyne africana</i>. The herb layer consists mainly of annual grass species, in particular <i>Panicum maximum</i>, <i>Rottboellia exaltata</i>, <i>Echinochloa colonum</i> and <i>Urochloa trichopus</i>, and various annual forbs. Perennial species usually line the watercourses which drain the floodplain, with <i>Vetiveria nigritana</i> and <i>Setaria shacefata</i> especially well represented.</p> <p>The trees grow up to 20 m tall and in some areas can form a closed canopy shading out the herb layer. Very few trees with canopies between about 6 m and 20 m are found, and there are few young trees of any of the canopy species within the woodland.</p>
<i>Commiphora - Combretum</i> thicket	<p>This is the vegetation type more commonly known as "Jesse". The word "jesse" as used here, refers to a dense, sometimes impenetrable formation, and is often applied to indicate scrub and thorn-bush areas with a high density of plants. The actual composition of jesse thickets is difficult to define but <i>Combretum</i>, <i>Commiphora</i> and <i>Acacia</i> species are always found within them. This vegetation type consists particularly of various <i>Commiphora</i> and <i>Combretum</i> spp., but the number of species of each of the two dominant genera varies from thicket to thicket. Many different species are associated with the various <i>Commiphora</i> and <i>Combretum</i> species, the most important ones being <i>Schrebera trichoclada</i>, <i>Meiostemon tetandrus</i>, <i>Pteleopsis myrtifolia</i>, <i>Acacia ataxacantha</i>, <i>A. nigrescens</i>, <i>A. tortilis</i> subspecies <i>heteracantha</i>, <i>Croton scheffleri</i>, <i>Friesodielsia obovata</i>, <i>Xylia torreana</i>, <i>Maerua kirkii</i> and <i>Dalbergia martinii</i>. The most important <i>Commiphora</i> spp. are <i>C. pyracanthoides</i> subsp. <i>glandulosa</i>, <i>C. merkeri</i>, <i>C. karibensis</i>, <i>C. ugogensis</i> and <i>C. caerulea</i>; the most important <i>Combretum</i> spp. are <i>C. elaeangnoides</i>, <i>C. celastroides</i>, <i>C. obovatum</i> and <i>C. padoides</i>.</p> <p>The grass layer is sparse and consists of short-lived annual grasses. Associated herbs, similarly, are almost completely absent in the thickets, but may include, especially, species of Acanthaceae and Compositae such as <i>Crossandra spinescens</i>, <i>Ruspolia decurrens</i>, <i>Barleria kirkii</i>, <i>Justicia betonica</i> and <i>Erlangea misera</i>. Occasionally trees such as <i>Adansonia digitata</i>, <i>Pterocarpus antennas</i>, <i>Lannea stuhlmannii</i> and <i>Kirkia acuminata</i> may rise above the thicket which is seldom more than 6 m tall.</p> <p>The soils of these areas are fine to medium grained deep sands which have limited water holding capacities, with the result that trees in the thicket lose their leaves at the end of the rainy season, except for a few evergreen species such as <i>Maerua kirkii</i>. With the advent of the rains the trees respond and come out in full leaf very quickly. Several small seasonal pans can be found in these thickets. Associated trees are usually <i>Diospyros mespiliformis</i>, <i>Balanites maughamii</i>, <i>Euphorbia ingens</i>, <i>Gardenia spatulifolia</i> and often <i>Adansonia digitata</i>.</p>

**Table 6: Vegetation Types found in Mana Pools National Park**  
 (based on Guy, 1977)

Vegetation Type	Description
<i>Brachystegia - Julbernardia</i> woodland	<p>Typical species of this vegetation type are <i>Brachystegia spiciformis</i>, <i>B.boehmii</i>, <i>Julbernardia globiflora</i>, <i>Burkea africana</i>, <i>Piliostigma thonningii</i> (now <i>Bauhinia thonningii</i>), <i>Diplorhynchus condylocarpon</i>, <i>Pseudolachnostylis maprouneifolia</i>, <i>Pterocarpus angolensis</i>, <i>P.rotundifolius</i>, and various <i>Combretum</i> spp.</p> <p>The grass cover is poorly developed and rather sparse, but in vlei areas the amount of grass increases. Common species of the grass layer are <i>Hyparrhenia filipenula</i>, <i>H.dissoluta</i>, <i>Tristachya superba</i>, various <i>Eragrostis</i> spp., <i>Pogonarthria squarrosa</i>, <i>Themeda triandra</i> and <i>Brachiaria brizantha</i>.</p> <p>This woodland type is usually between 5 m and 13 m tall with a poorly developed shrub layer. It usually occurs above the 800 m contour, being found in the escarpment areas in the south of the area.</p>

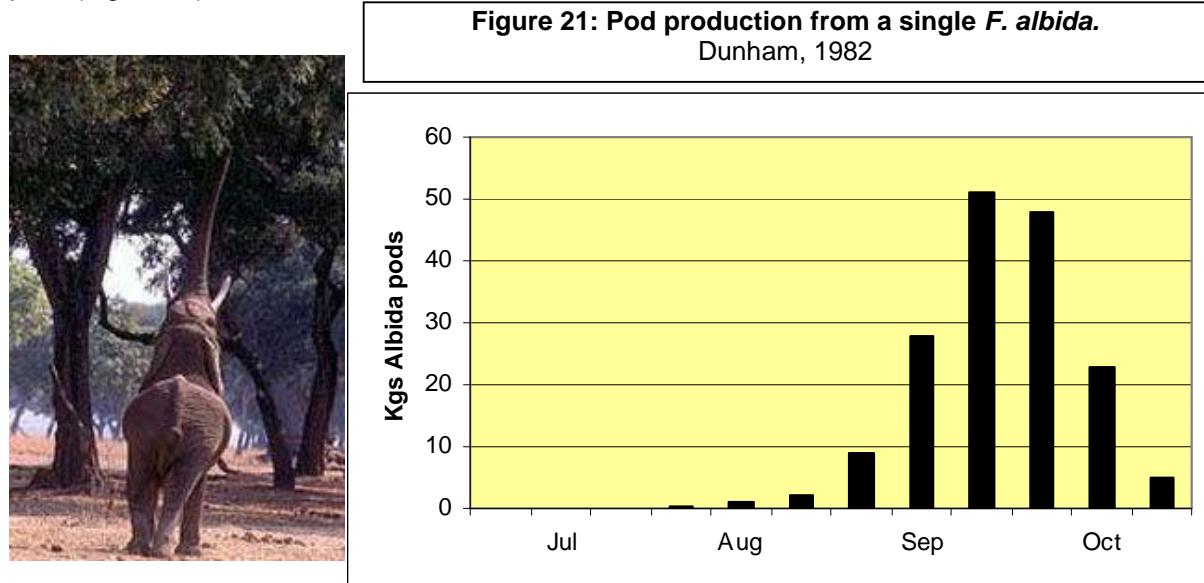
**Figure 20: Vegetation types of Mana Pools National Park**  
 (Mapping by D. Kwesha)



## 2.6.2 ALBIDA WOODLANDS

The *Faidherbia albida* woodlands are one of the symbols of Mana Pools and it is in this area where most visitors will spend their time. However, there are some serious concerns about this vegetation type. There is very little regeneration of the woodland and many of the trees are believed to be much the same age. If this is true, there are concerns that the trees will begin to die and that the woodlands as they are known today will cease to exist.

What are the reasons for this? The most obvious and logical one is that the high concentrations of wildlife on the floodplain in the dry season effectively remove and sprouting albida trees. *F. albida* pods (which are high in protein) provides the food source which supports these wildlife concentrations. *F. albida* is unusual in that it carries its leaves during the dry season and the seeds ripen towards the end of this period. A single tree on the Zimbabwean side was recorded to produce over 160 kg of pods (Figure 21).



Another contributing factor may be the altered flooding pattern caused by Kariba Dam. As discussed in section 2.4 there is disagreement about the extent of flooding of the alluvium floodplain prior to the completion of Kariba Dam, with opinions varying from annually to almost never. However, changes in the main channel appear to have occurred. The river has become shallower and new islands have been formed as the scouring effect the annual floods has dissipated. In addition, it is believed that there has been a general trend for the deep water channel to move towards the Zambian side with a gradual drying up of the Zimbabwean side.

It is believed that this gradual drying up has contributed towards the low regeneration rates of *Faidherbia albida* and has also resulted in an increase in weeds???. Periodic flooding of the alluvium served to recharge the area with nutrients and replenish the water table. It has also been stated that there has been a significant increase in termite mounds since the 1950s (Mana Management Document). However, Dunham (1991) established that although *F. albida* roots have permanent access to the water table they are also strongly influenced by rainfall.

An exclusion plot was established on the floodplain in the 1980s. Wildlife was excluded from a small area using fences and the results are noteworthy. Essentially the exclusion plot shows the effect that herbivore grazing and browsing pressure will have on the vegetation. Inside the plot the vegetation was denser with a far thicker understorey layer (Figure 22). *F. albida* numbers increased mainly through root suckers rather than seeding propagation. Unfortunately the plot was breached in 2006 when the energiser and solar panels were stolen but records were taken just before this happened. Plans are underway to re-establish the plot boundaries.

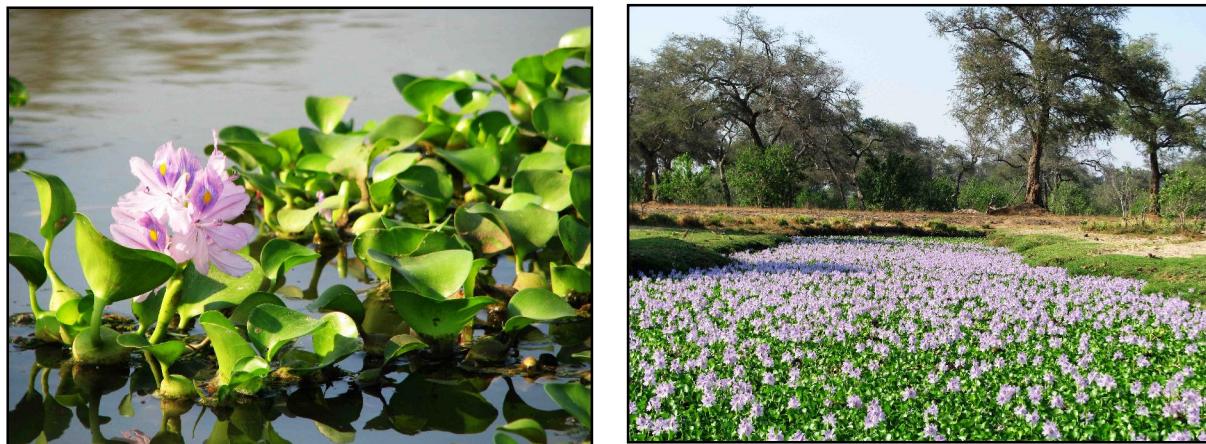
**Figure 22: Vegetation exclusion plot at Nyamepi**  
(Photo probably taken a year after it had been breached)



### 2.6.3 EXOTIC PLANTS

The most obvious exotic plants in the park are the aquatics. The water hyacinth *Eichornia crassipes* is the most common and has taken over from Kariba weed *Salvinia molesta* which is currently very rare in the area. Some pans may be colonized by *Azolla filiculoides*.

**Figure 23: Water Hyacinth *Eichornia crassipes* in Mana Pools**



A list of terrestrial exotic plants has been compiled by Hull (*pers. comm.*) and is reproduced below. No exotic tree species have been recorded from the area

<i>Acanthospermum australe</i> – Eight seeded starburr	<i>Boerhavia diffusa</i> - Spiderling
<i>Acanthospermum hispidum</i> – Upright starburr	<i>Datura stramonium</i> – Thorn Apple
<i>Altenanthera pungens</i> - Paperthorn	<i>Desmodium triflora</i> -
<i>Argemone mexicana</i> – Yellow-flowered Mexican poppy	<i>Hyptis spicigera</i> -
<i>Bidens pilosa</i> - Blackjack	<i>Senna occidentalis</i> - Wild Senna
<i>Boerhavia coccinea</i> - Spiderling	<i>Tridax procumbens</i> - Aster

## 2.6.4 FIRE

Mana Pools NP is unusual in that fire has been a rare occurrence on the valley floor since the 1960s. Although records of fires prior to this date do not exist there is some anecdotal evidence that they were more frequent than they are now (Nyschens, 1997).

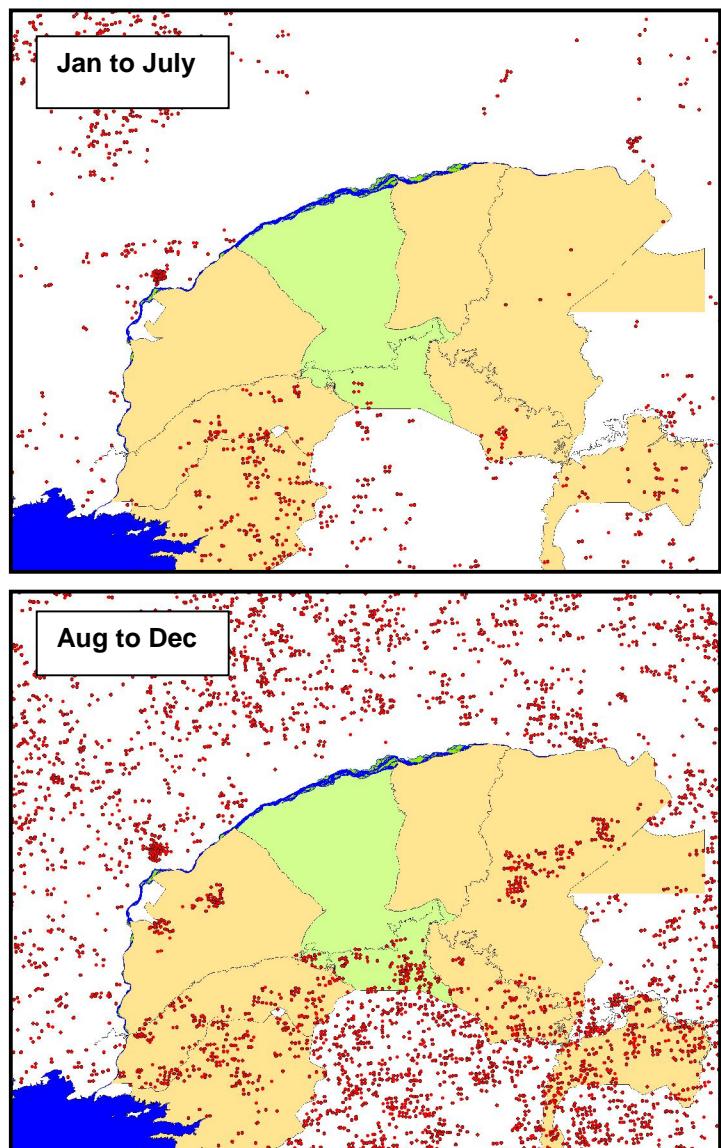
Examination of satellite records for fire, which have been available since 2004 show that there have been very few fires in the area between the Nyakasana and Chewore rivers on the valley floor (and probably none at all in this section of Mana Pools). The “fire-free” zone extends into the alluvium on the Zambian side as well (Figure 24).

What are the reasons for this? Firstly the area is not inhabited and people were moved out in the 1950s. This led to far fewer fires being lit in the course of farming and hunting and gathering activities (e.g. honey collection). Since the gazettlement of the park and safari areas there would have also been more control by the authorities and fire would have been prevented where possible. Another reason, especially on the alluvial plains is that the seasonal grazing pressure has removed the burnable load and hence there is not enough combustible material to feed a fire.

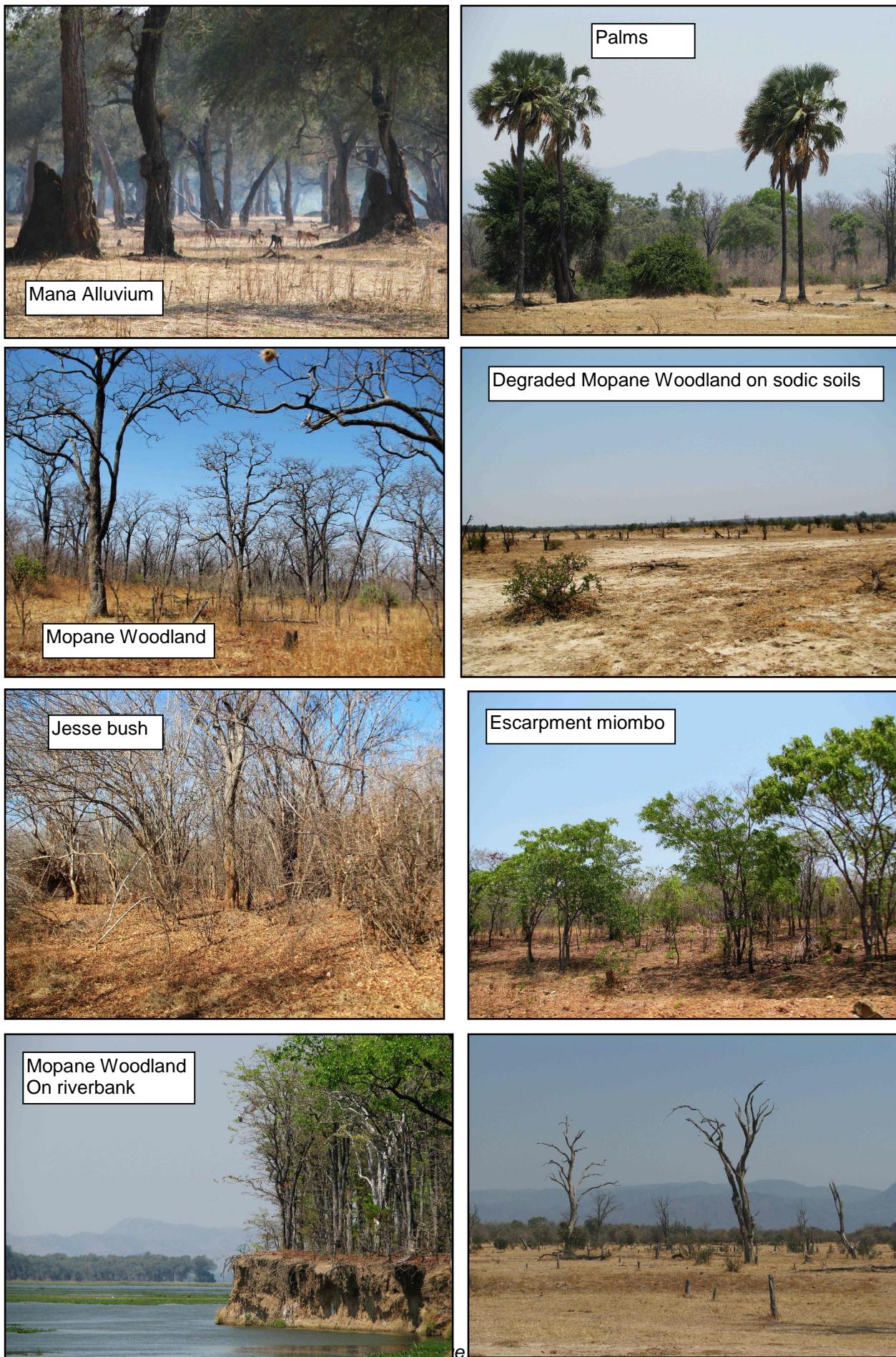
More importantly, what are the implications of this? It is generally believed that fire helps to maintain more open habitat and that excluding fire will lead to bush encroachment. It will also allow build-up of flammable material and when a fire does eventually occur it will be huge and intense, and, by implication, catastrophic. In addition fires will affect insect populations and this may have implications for *F. albida* regeneration.

At present Mana Pools does not have a clearly defined objective for fire management. It was believed that more information was needed prior to formulating this objective.

**Figure 24: Fires recorded during 2008**  
(Data from Modis satellites)



**Figure 25: Vegetation of Mana Pools National Park**



## 2.7 WILDLIFE POPULATIONS

### 2.7.1 INVERTEBRATES

Obviously the most important invertebrates in the area are the mosquito and the tsetse fly. Both of these insects have played their part in ensuring that the mid-Zambezi valley was lightly settled. This poor use of the area allowed large parts of it to be declared as Parks and Wildlife Estate between the 1950s and 1970s, which included the Mana Pools. Tsetse have never been controlled on the valley floor between the Kariba escarpment and the eastern boundary of the Chewore Safari Area. Another important, but unquantified, group of invertebrates are the termites (mostly *Macrotermes* sp). Their mounds are highly visible in the alluvial floodplain and they probably consume significant amounts of biomass. Termites may be a contributing factor to the low levels of burnable fuel load for fires in the alluvium.

### 2.7.2 FISH

The Zambezi river and its tributaries are host to over 30 species of fish (Appendix 5). The most important of these for the sport fishing industry include the Tiger Fish (*Hydrocynus vittatus*) and the breams belonging to the family Cichlidae. Concern has been expressed about the health of the fish stock in the Zambezi and, although there is no empirical evidence to back it up, many feel that stocks are declining through overexploitation. In addition, *Tilapia nilotica*, which has escaped from fish breeding initiatives upstream has apparently become well established in the Zambezi river.

### 2.7.3 REPTILES

The largest reptile in the area is the Nile crocodile. A number of other species are known from the area (Appendix 7) but this list is certainly not comprehensive as little research work has been done in the area.

The Nile crocodile is a commercially important species and eggs and adults have been removed from the area since the 1960s. As the Zambezi river is a shared resource exploitation levels differ in Zimbabwe and Zambia, as does the dataset accompanying this exploitation. Several surveys have been carried out, both by Zambian and Zimbabwean researchers and there are an estimated 700 adult crocodiles between the exit of the river from Kariba gorge (Nyamumba) and the Zambezi-Luangwa confluence. However, the survey methodology may have yielded a lower population estimate than the reality (Fergusson, 2007).

**Table 7: Density of crocodiles along the “middle” Zambezi river**  
(Fergusson, 2007)

Section of river	Est. Adults	Adults as a % of population
Exit Kariba Gorge (Nyamumba) to Rukomechi river	63	34%
Rukomechi river to Kanyemba	627	35%
Totals “Middle Zambezi”	<b>690</b>	

### 2.7.4 BIRDS

*(Most of this information is taken from the Birdlife Important Bird Areas Factsheet ZW012)*

Relatively little work has been done on the birds of Mana Pools but more than 400 species of birds have been recorded from the area. It is an important staging post for migratory birds and the mid Zambezi Valley (including Mana Pools) has been listed as an Important Bird Area (IBA). The IBAs are recognised key sites for bird conservation.

The mid-Zambezi valley is the only known locality in Zimbabwe for Shelley's Sunbird (*Nectarinia shelleyi*). It is also a particularly important location for Lilian's lovebird (*Agapornis lilianae*) (many thousands thought to be more than 1% of the global population) and for the Ground Hornbill (*Bucorvus cafer*) which occurs at a very high density. Other unusual species that occur here are the Livingstone's Flycatcher (*Erythrocercus livingstonei*) and the Crested Guineafowl (*Guttera pucherani*).

Species richness for waterbirds in the mid-Zambezi valley is high (around 90 species) but with low relative abundance. The sandbanks are important nesting sites for the carmine bee-eaters (*Merops nubicoides*), estimated at over 10,000.

Other notable species include the Rock Pratincole (*Glareola nuchalis*), the African Skimmer (*Rynchops flavirostris*), the Racket-tailed Roller (*Coracias spatulatus*), Meves's Glossy-starling (*Lamprotornis mevesii*), the White-headed Black-chat (*Myrmecocichla arnoti*), the White-breasted Sunbird (*Nectarinia talatala*) and the Broad-tailed Paradise-whydah (*Vidua obtusa*).

The sandbanks and sandy islands are an essential habitat for the African skimmer (*Rynchops flavirostris*), and in 1986 a survey estimated 136 birds on the stretch of river in the valley. In the same year, about 320 Rock pratincole (*Glareola nuchalis*) were counted in the Kariba and Mupata gorges. Also of special interest are the Squacco Heron (*Ardeola rufiventris*), the Woolly-necked stork (*Ciconia episcopus*), the White-Crowned plover (*Vanellus albiceps*), the Glossy Ibis (*Plegadis falcinellus*), the Pygmy Goose (*Nettapus auritus*) and the Water Dikkop (*Burhinus vermiculatus*). Numbers of the first three species exceed the 1% threshold of their global populations.

At least 52 species of raptor (including owls) have so far been recorded in the valley, including large numbers of Fish Eagles (*Haliaeetus vocifer*; around 1 pair per 3 km frontage) and an unknown number of Pel's Fishing Owl (*Scotopelia peli*). Being such a huge wildlife area, there is a good representation of vultures (six species) and eagles (12 species).

The draft text of a paper detailing research and conservation priorities for birds and their habitats in the mid Zambezi Valley is presented in the Appendices (Cizek, *in prep*).

## 2.7.5 LARGE MAMMALS

A major factor in the ecology of the large mammals of the Mana Pools National Park is the seasonal dry-season concentration of wildlife on the valley floor. This is largely due to water availability but also to the presence of *Faidherbia albida* on the alluvial floodplains which is a major food source for many animals during the dry season. In addition, plant productivity is prolonged on the floodplain and shade is more plentiful. However, as soon as the rains start, most animals move out into the mopane and jesse woodlands. Primary productivity of these woodlands fluctuates with the rainfall and water can remain well into the dry season, especially in the mopane.

In recent years several aerial surveys for large mammals have been carried out in the Mana Pools area. These surveys usually cover the entire valley floor between the Kariba Gorge and Kanyemba and, significantly, some have included wildlife estimates for the escarpment areas as well. Numerically, elephant, buffalo and impala make up the bulk of the larger herbivore in Mana Pools (Table 8). Notably absent below the Zambezi escarpment are wildebeest and giraffe.

**Table 8: Estimates of major herbivores in Zambezi Valley protected areas, 2003**  
(Data from Dunham, 2004)

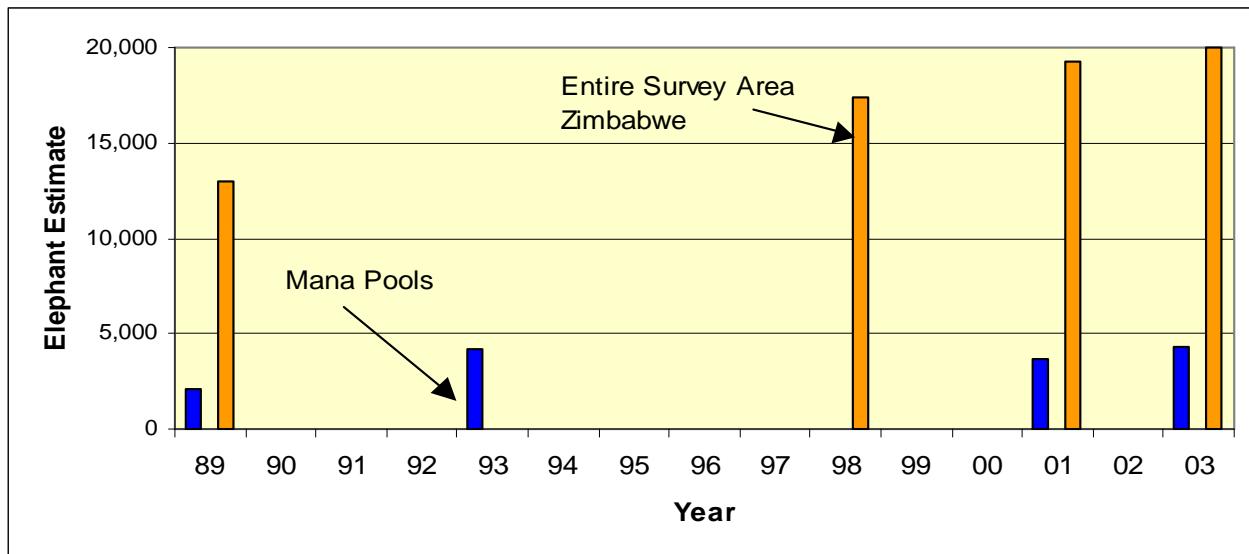
	Elephant	Buffalo	Sable	Wbuck	Kudu	Eland	Roan	Zebra	Impala
<b>Mana Pools</b>	4 285	4 971	23	463	168	38	0	544	2 492
<b>Hurungwe</b>	4 732	710	196	140	208	110	0	209	3 569
<b>Sapi</b>	2 190	606	58	55	27	72	0	55	473
<b>Chewore</b>	4 111	5 077	48	116	127	64	0	177	723
<b>Totals</b>	15 318	11 364	325	774	530	284	0	985	7 257

There are some major differences of numbers of the smaller herbivores (e.g. impala) between the 2001 survey and the 2003 survey. Impala numbers in Mana Pools were estimated at over 5 000 in 2001 and there has been an apparent halving of the population. Whether this is real or an artefact of the survey needs to be investigated.

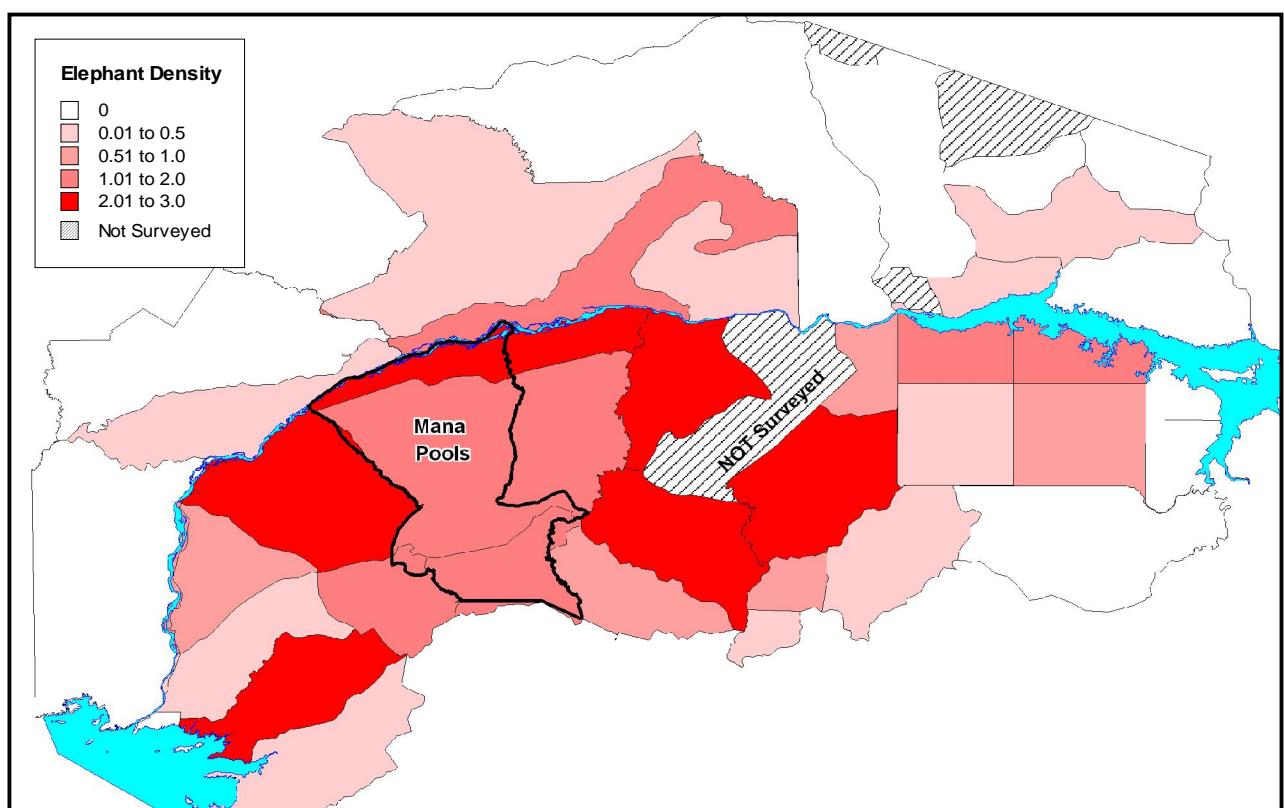
### **Elephants**

Elephants are a major determinant of the vegetation in the Mana Pools National Park and are believed to be responsible for opening up areas of both the floodplains and the inland woodlands. Surveys indicate that the Mana Pools population may be between 3 and 4 thousand individuals and that of the entire survey area in Zimbabwe is close to 20 000 (Figures 25 and 26).

**Figure 26: Elephant estimates for Mana Pools and the survey area (Zimbabwe)**



**Figure 27: Elephant density in 2003**



Several studies have been carried out to determine the extent of elephant movement and that of Kerr and Fraser (1975) concluded that elephants were widely distributed during rains but with preferences for the larger Zambezi tributaries. By September elephants were concentrated on the Mana and Sapi alluvial plains and along the lower Rukomechi river. The alluvial plains supported an estimated 50% of the elephant herd for around 4 months.

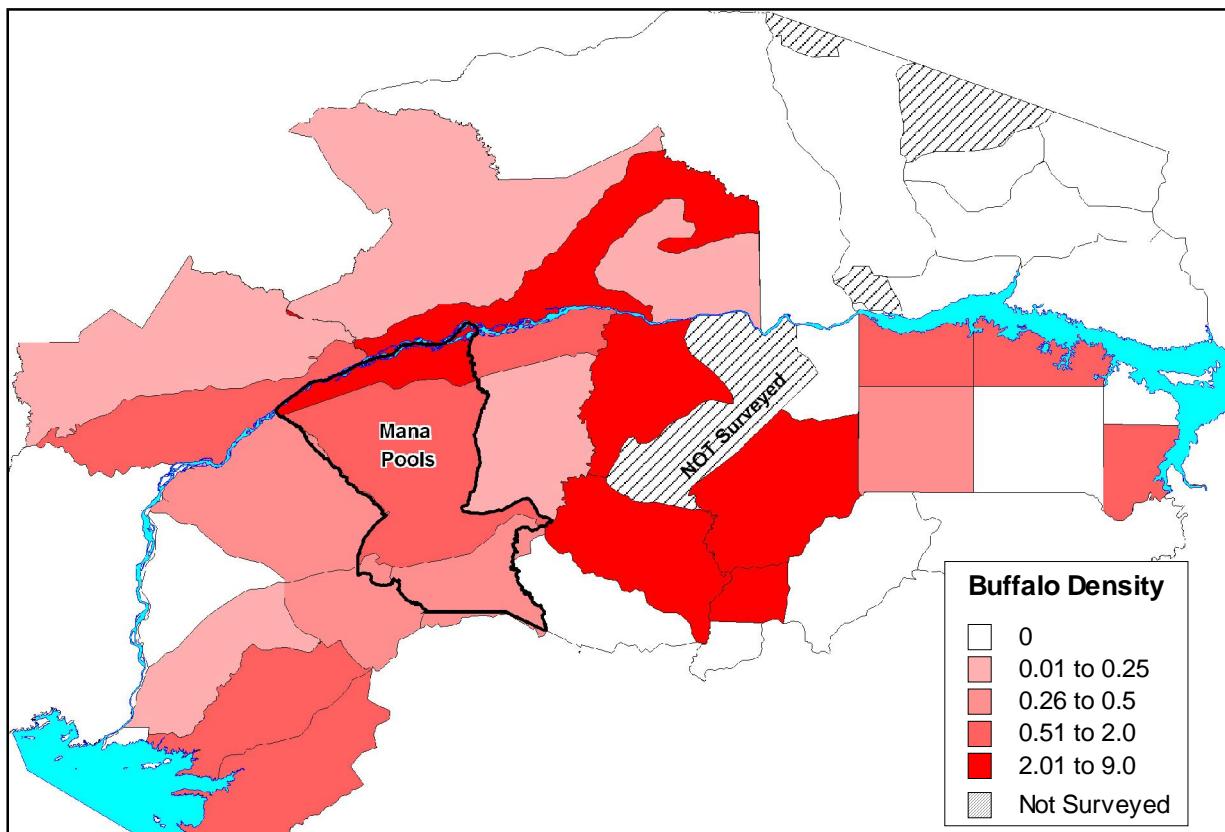
Later work by Dunham showed that there were discrete elephant groups, both on the valley floor and near the escarpment. Movement does occur between Zambia and Zimbabwe but it may not be as extensive as once believed.

It should be stated that any plan for the management of elephants in Mana Pools is probably meaningless without taking into account the elephant population of the whole middle Zambezi valley area.

### Buffalo

There are probably over 3 000 buffalo in Mana Pools National Park which is about 40% of the estimated population for the Zambezi valley. Buffalo are concentrated in Mana and the Chewore Safari Area (Figure 28). Although there is no empirical data to support it, it is believed that buffalo numbers have decreased considerably since the 1970s. The reasons for this are not clear although the decrease coincided with a series of dry years in the 1980s which also meant the closure of the floodgates at Kariba Dam upstream (Dunham, 1994). Another hypothesis is that the area of grassland has decreased but this is not supported by any evidence.

**Figure 28: Density of buffalo in 2003**



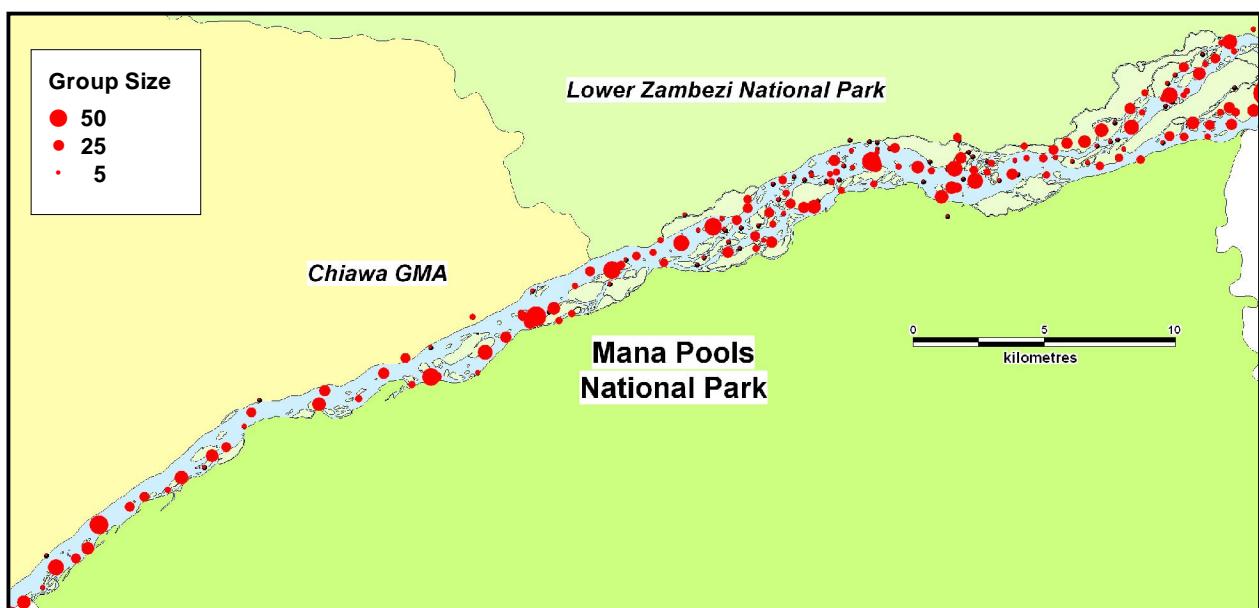
## Hippopotamus

The hippopotamus is one of the megaherbivores found in the Mana Pools system and by grazing for up to 10 kilometres from the river they have the potential to impact significantly on the alluvial floodplains and other habitats in the Park.

Aerial surveys for hippo were carried out along the Zambezi River between the Kariba Gorge and Kanyemba in 1996, 1998 and 2002 (Monks, 2005). These data were compared to earlier surveys as far back as 1968 and the overall rate of increase is estimated at 4.5%. However, the later surveys indicate a slowing of the population growth rate to 1.5%.

The 2002 survey indicated a population of 6 300 animals of which 42% were found on the Mana Pools shoreline, which represents 20% of the available shoreline. Density of hippo on the Mana shoreline was estimated at nearly 50 animals per kilometre.

**Figure 29: Location of hippo pods along the Mana Pools shoreline in 2002**  
(Monks, 2005)



## Predators

The major predators in the park are lions, hyenas and leopards. Other important predators include cheetah and several smaller species (Purchase et.al, 2007). There have been controversial statements made about the interaction between lions and hyenas and these initiated a long-term lion research project on lions in Mana Pools and the surrounding safari areas (Monks, 2009). This study has recently been completed and the results are awaiting publication. The project studied six prides, two at the escarpment (Chitake area) and four on the floodplains (Nyamepi area). The following are the key outcomes

Parameter	Estimates
<b>Pop Est.</b>	<ul style="list-style-type: none"> <li>• 67 adult and sub-adult lions in Mana Pools</li> </ul>
<b>Density</b>	<ul style="list-style-type: none"> <li>• Park wide = 3.05 adult and sub-adult lions/100 km<sup>2</sup>.</li> <li>• Escarpment = was 0.65/100 km<sup>2</sup>; 0.3% prey species</li> <li>• Floodplains = 12.7/100 km<sup>2</sup> (46% of lion population and 63% of available prey base)</li> </ul>
<b>Home Range</b>	<ul style="list-style-type: none"> <li>• On floodplain between 28.1 km<sup>2</sup> to 278 km<sup>2</sup> <ul style="list-style-type: none"> <li>◦ Males range was 2.5 times that of females</li> </ul> </li> <li>• On Valley Floor between 50.2 km<sup>2</sup> to 379.3 km<sup>2</sup> <ul style="list-style-type: none"> <li>◦ These lions had both a wet (379 km<sup>2</sup>) and dry (58 km<sup>2</sup>) season range</li> </ul> </li> <li>• Marked lions moved to the surrounding safari areas and Zambia</li> </ul>
<b>Population Dynamics</b>	<ul style="list-style-type: none"> <li>• Mean group size (adults and sub-adults) was 7.8 (range 5-11)</li> <li>• The adult and sub-adult age class made up 70.7% of the population</li> <li>• Large and small cubs made up 29.3% of the population</li> <li>• Cub survival to one year of age was 66.7%.</li> <li>• 1.8 adult males to 3.3 adult females and all prides were attended by a male</li> <li>• Females produced first litter between 43-53 months and cohorts of cubs were produced on average every 38.5 months.</li> <li>• Pride males average tenure with pride of 33.25 months</li> <li>• Sub-adult males dispersed from prides between 36-57 months (mean of 39.8 months).</li> </ul>

In 1998 two female lions were moved to Mana from Matusadona National Park and released on the floodplain area.

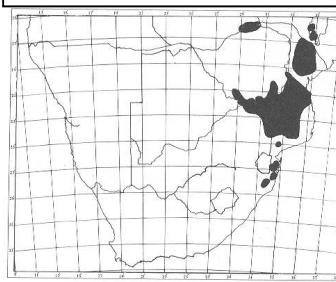
The spotted hyena population was found to be in the low-medium category when compared to other populations in protected areas in Africa (Purchase, 1999).

## Antelope

A nyala (*Tragelaphus angasi*) population of unknown size is found in Mana Pools National Park and the Sapi Safari Area. The species is on the hunting quota for the Sapi Safari Area. This population is separated from the main distribution area which is south of the Zambezi in Mozambique down to the Gonarezhou area. Bushbuck are often seen along the Zambezi in the riverine but numbers are relatively low.

Concern has been expressed about declining populations of sable, roan and nyala in the mid-Zambezi valley. In response to this, a study was carried out on these three species which indicated that none were to be found inside Mana Pools (Mubvuma, in prep). However, other data sources indicate that at least sable and nyala are found in the park (Dunham, 2004). Sable were often seen on the valley floor in the 1980s but they now appear to be confined to the escarpment areas (Dunham, 1994).

Figure : Nyala distribution



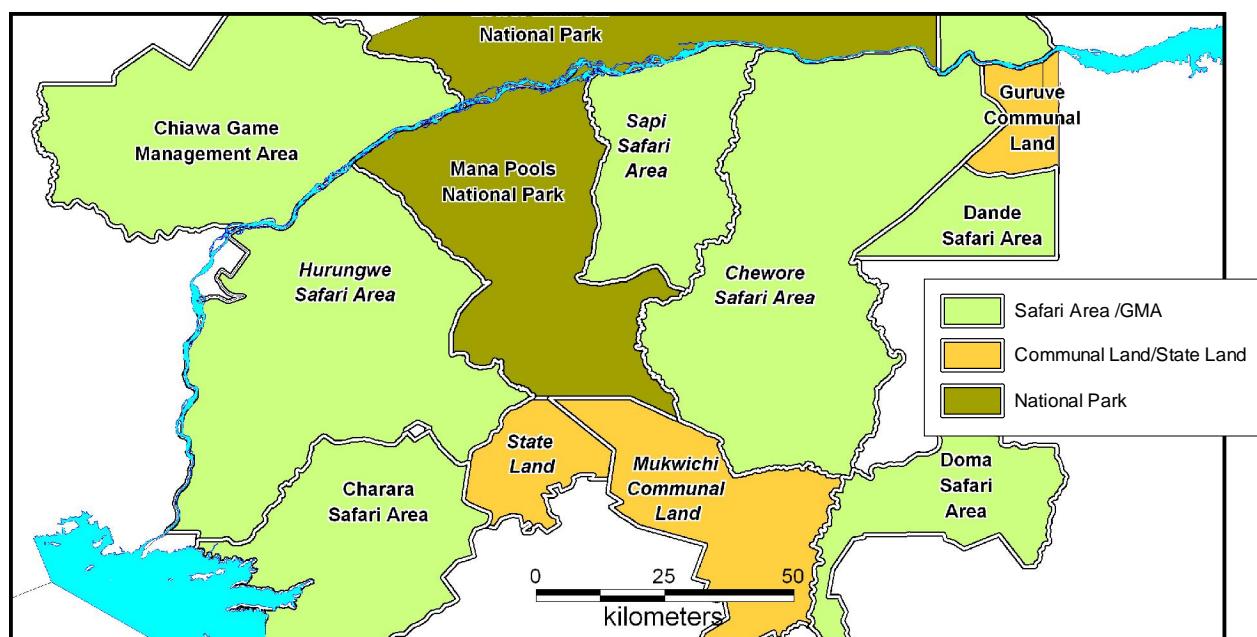
## 2.8 REGIONAL RESOURCES

### 2.8.1 ZIMBABWE PARKS AND WILDLIFE ESTATE

Mana Pools is the core of an extensive network of protected areas in the Zambezi Valley. The key components of these are summarised below.

**Table 9: Adjacent protected areas in Zimbabwe**

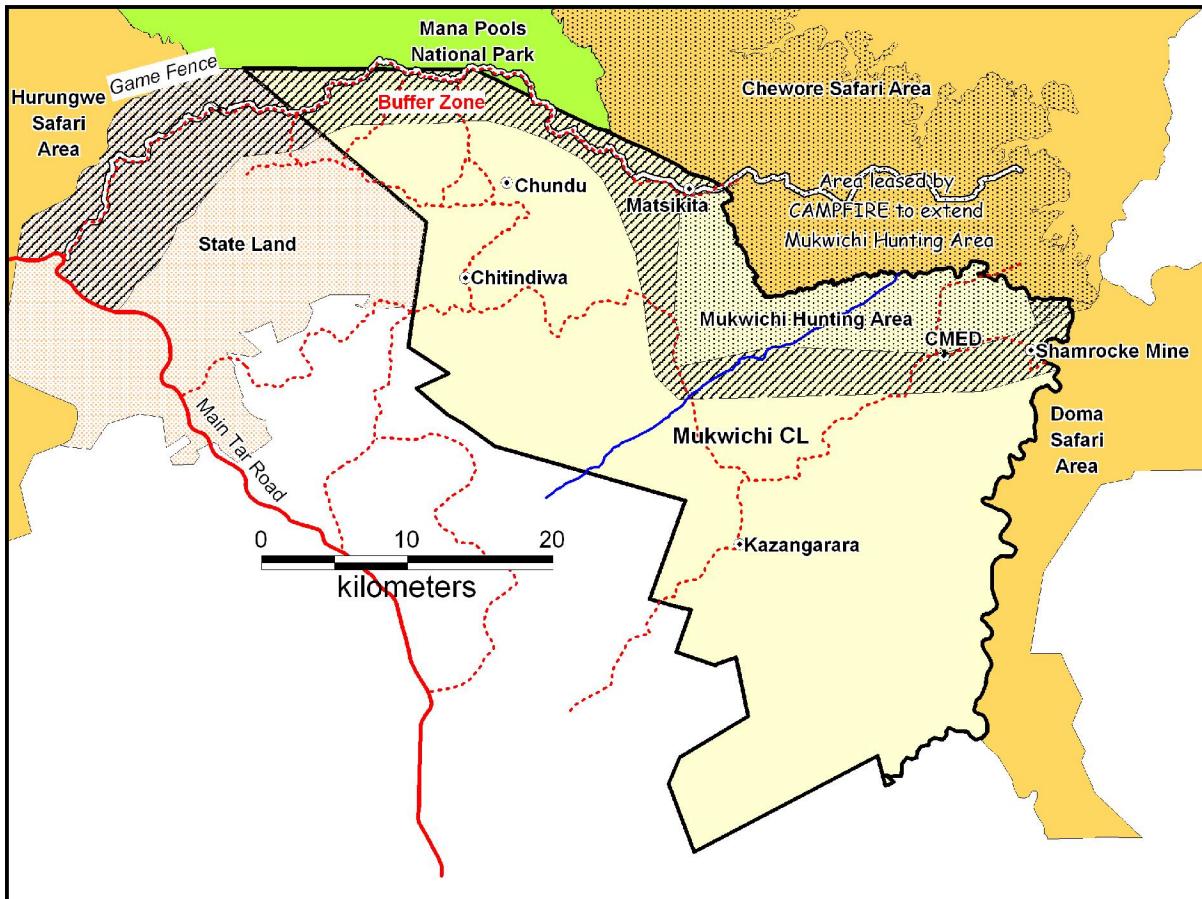
Area	Key Components
Hurungwe Safari Area	2 885 km <sup>2</sup> Forms the western boundary of the park and has the area HQ at Marongora. Divided into Rifa and Nyakasanga areas. Chirundu town and sugar estates are excised from the area. Safari hunting is main form of use.
Charara Safari Area	1 671 km <sup>2</sup> No common boundary with Mana Pools. Kariba town and Charara “suburb” areas are excised.
Sapi Safari Area	1 181 km <sup>2</sup> Forms a significant part of the eastern boundary of Mana Pools. Hunting in most of the area via a time based auction system (see section x.x). Permanent tourist camp located on Sapi river mouth. Nyala on quota.
Chewore Safari Area	3 390 km <sup>2</sup> Forms the southern part of the eastern boundary of Mana Pools. Hunting is main use through long-term leases allocated via an auction system. The land abutting Mukwichi Communal Land is leased to the Hurungwe RDC to extend the communal safari hunting area.



## 2.8.2 MUKWICHI COMMUNAL LAND

The Mana Pools National Park has a common border with the Mukwichi Communal Land. In addition the Communal Land also has a common border with the Chewore and Doma Safari Areas. The main population centre is Kazangarara. Chundu is a smaller population centre closer to the Mana Pools National Park (Figure 30). Mukwichi Communal Land falls under the Hurungwe Rural District Council.

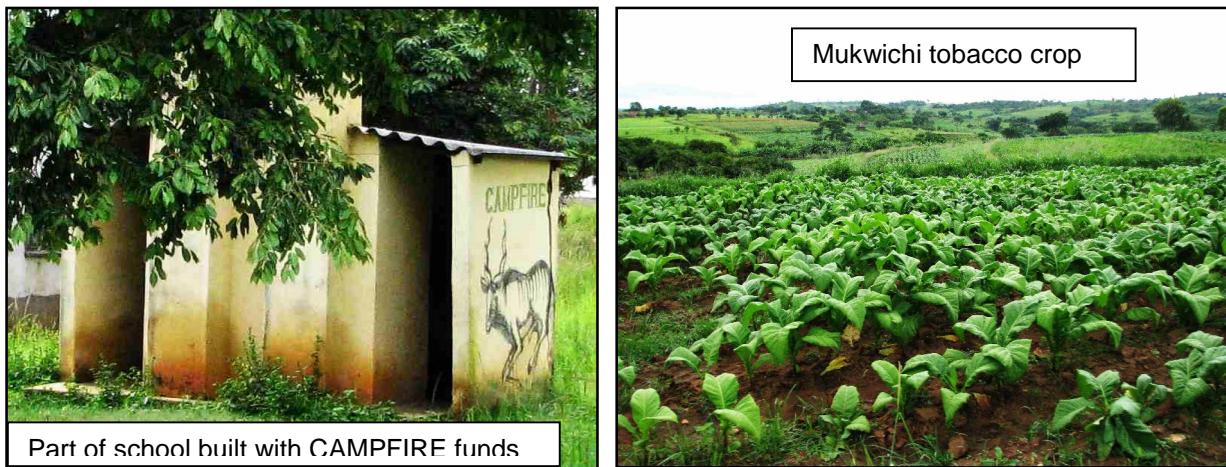
**Figure 30: Main features of the Mukwichi Communal Land**



There are four wards – Chundu, Karuru, Kazangarara and Kapiri. Maize is the main crop with cotton, sunflower, groundnuts and soyabeans being less important. Tobacco appears to be increasing in importance (Figure 31). In 1991 approximately 14% of Mukwichi was under crop production (Cunliffe, 1991). Cattle numbers were increasing. With nearly 10,000 cattle in 1991 (Cunliffe, 1991). Nearly all of these were south of the Mukwichi river.

Part of the communal land near Shamrock Mine is leased as a hunting area under the CAMPFIRE Programme. In order to make the area more viable the PWMA has leased that part of the Chewore Safari Area above the 600 metre contour to CAMPFIRE and the concession used by the Mukwichi hunters includes this area (Safadec Services currently has the hunting lease). Main wildlife species occurring in northern Mukwichi are elephant, buffalo, eland and sable. A survey carried out in 1990 indicated numbers of between 50 and 100 animals for all of these species. In 2006 six trophy elephant were taken out of Mukwichi. In addition, 18 buffalo, one lion, three sable, one eland and seven bushbuck were shot by clients. All quotas are established by an annual quota setting workshop, usually held at the Hurungwe Rural District Council offices. Funds generated through the programme have been used to fund infrastructure and other projects in the area (Figure 31).

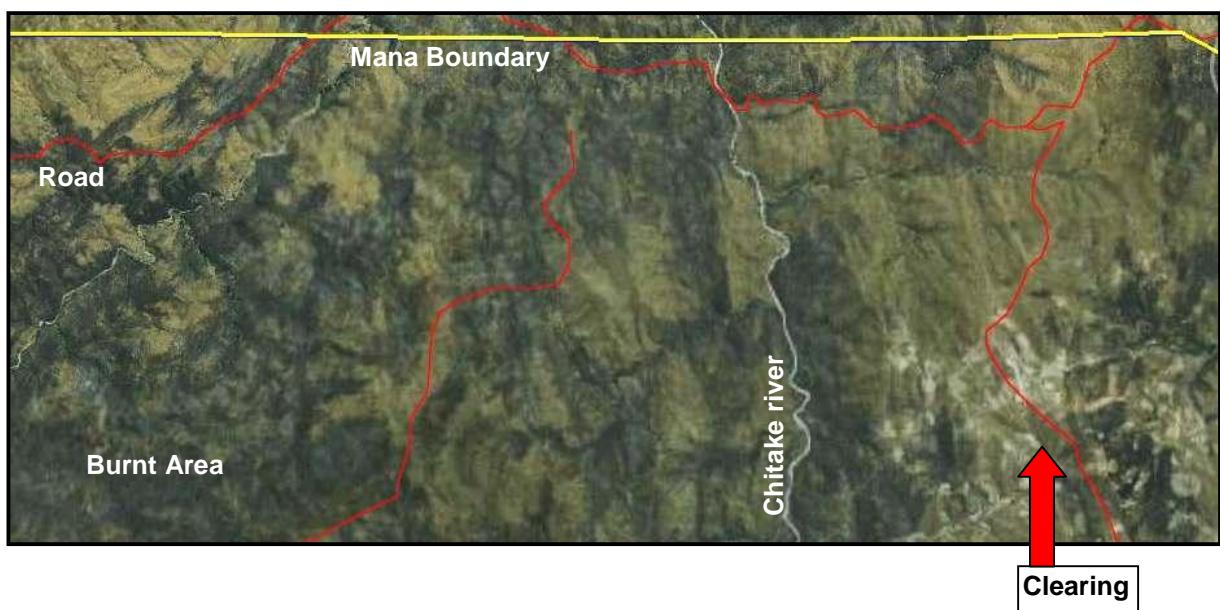
**Figure 31: Aspects of Mukwichi Communal Land**



In addition a wildlife buffer zone was established a few kilometres south of the game fence. Termed the Kabidza-Mayanmba resettlement project it had several objectives, the main one being the boosting of wildlife populations in this part of Mukwichi. The improved wildlife situation would then be used to generate income through hunting or photographic safari options. The establishment of this buffer zone involved the resettlement of 623 families and the establishment of artificial water points for the wildlife.

This buffer area was used for photographic safaris in a joint-venture with Chipembere Safaris, who established a camp near the Mana Pools boundary. This was closed nearly 10 years ago. Other operators have used the area as a starting point for walking safaris into the valley area and Chitake Springs. Unfortunately this area has never been included in any hunting programme and its integrity as a potential wildlife area has been eroded by poaching and artisanal prospecting/ panning operations. Analysis of recent satellite imagery indicates that this may not be as extensive as feared (Figure 32) and the revival of this area as a functioning buffer area may be possible.

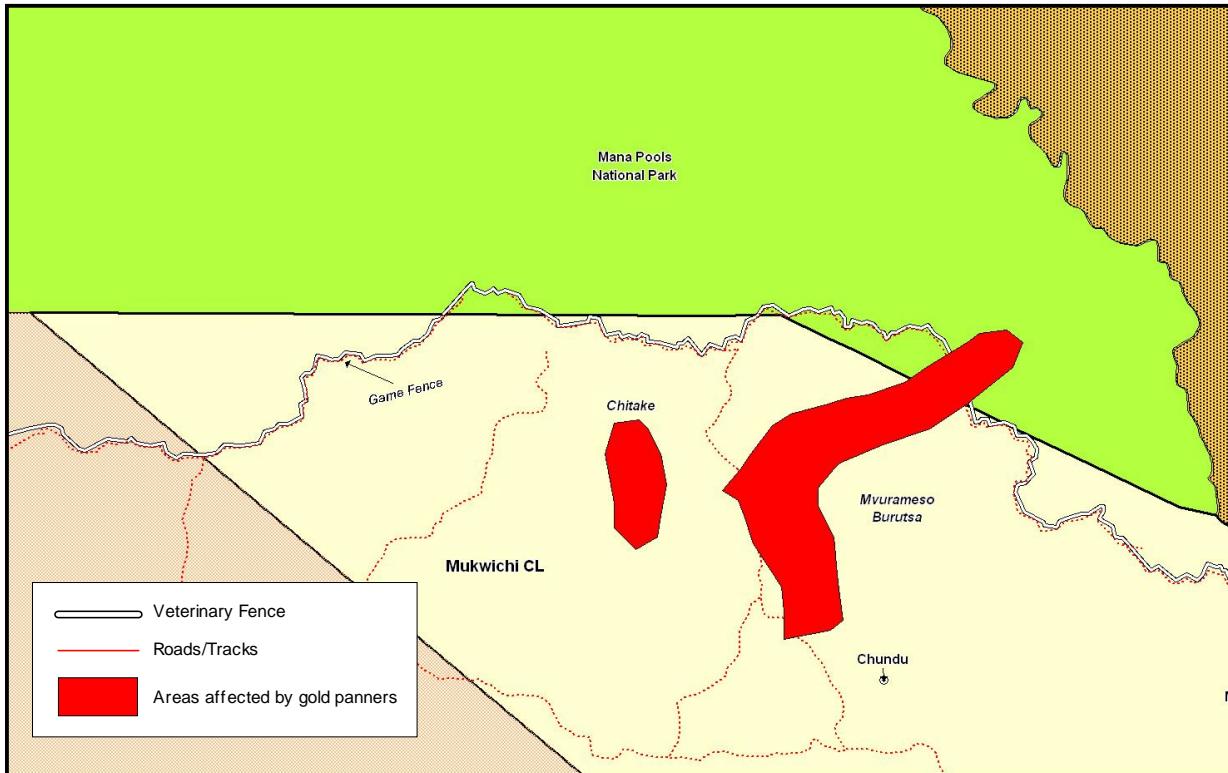
**Figure 32: Current extent of cleared ground in the northern Mukwichi CL**



Settlers in the designated buffer zone often complain about problem animals but there is little reaction to these from the authorities (PWMA at Marongora or Safari Hunters via the Hurungwe RDC) as they are deemed to be illegal settlers. The most frequently reported animal problems come from elephants, eland, lions (mainly in the Nyamakate area) and buffalos. However, the authorities do react to complaints from people living south of the buffer zone and in 2009 three elephants have been shot in response to crop-raiding reports.

Prospecting and panning for gold has recently become a problem along the Mvurameso, Burutsa and Chitake rivers. Miners have already encroached into Mana Pools along the Mvuameso river which is a tributary of the Chewore (Figure 33).

**Figure 33: Areas affected by gold panning in Mukwichi CL and Mana Pools NP**



It should also be noted that the Hurungwe District has a Rural Master Plan (PlanAfric, Undated). **We are waiting on a copy of this document.**

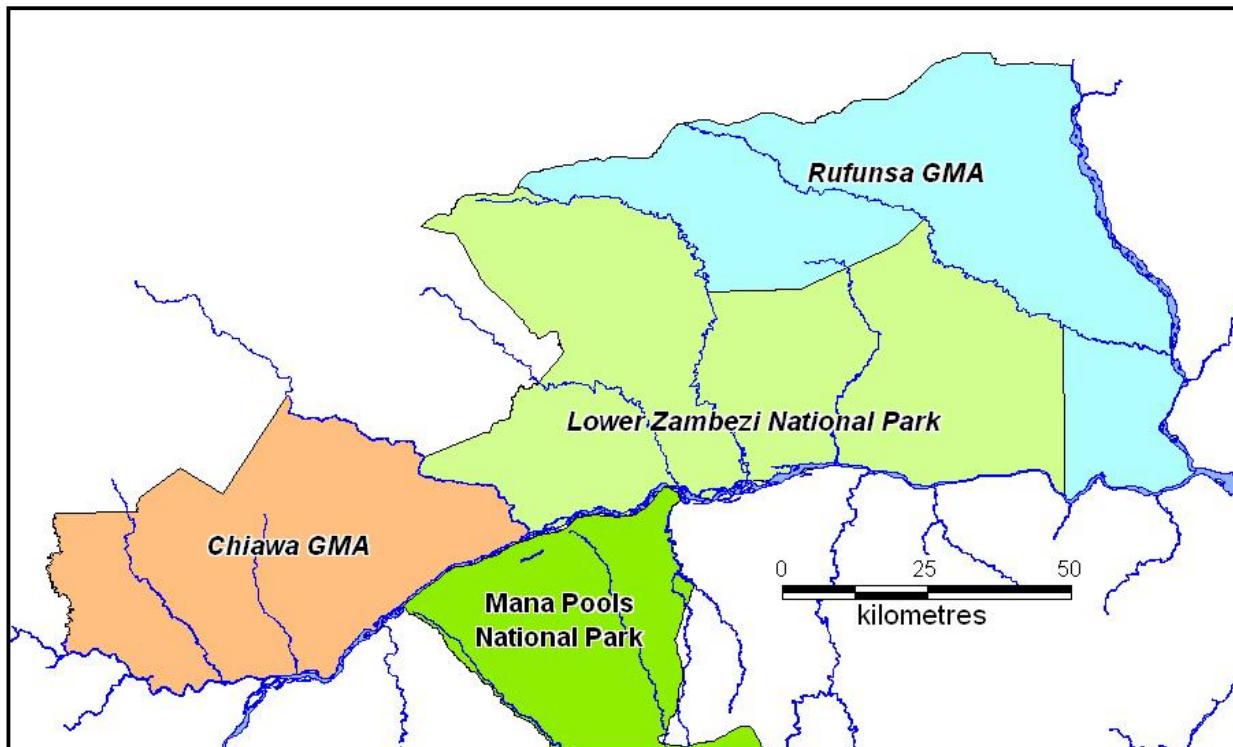
## 2.8.2 ZAMBIAN PROTECTED AREAS

All of the Zambian shoreline adjacent to the Mana Pools National Park has some form of protection under the Zambian Wildlife Act. The key elements of these areas are outlined below

**Table 10: Adjacent protected areas in Zambia**

Area	Key Components
Lower Zambezi NP	4 115 km <sup>2</sup> . About 5% of this alluvial lowlands and hosts all of the current tourism. Current management plan in final stages of approval
Chiawa Game Management Area	Approximately 1 000 km <sup>2</sup> of valley floor which is extensively settled in the east. Titled land separates the east and west GMA and the western GMA has been given an elevated conservation status as it adjoins the LZNP. Parts of the eastern GMA are used for safari hunting.
Rufunsa Game Management Area	Small section along the Zambezi. Heavily settled along the Luangwa but western areas are used for hunting.

**Figure 34: Zambian protected areas adjacent to Mana Pools National Park**





## CHAPTER 3: CURRENT MANAGEMENT STATUS

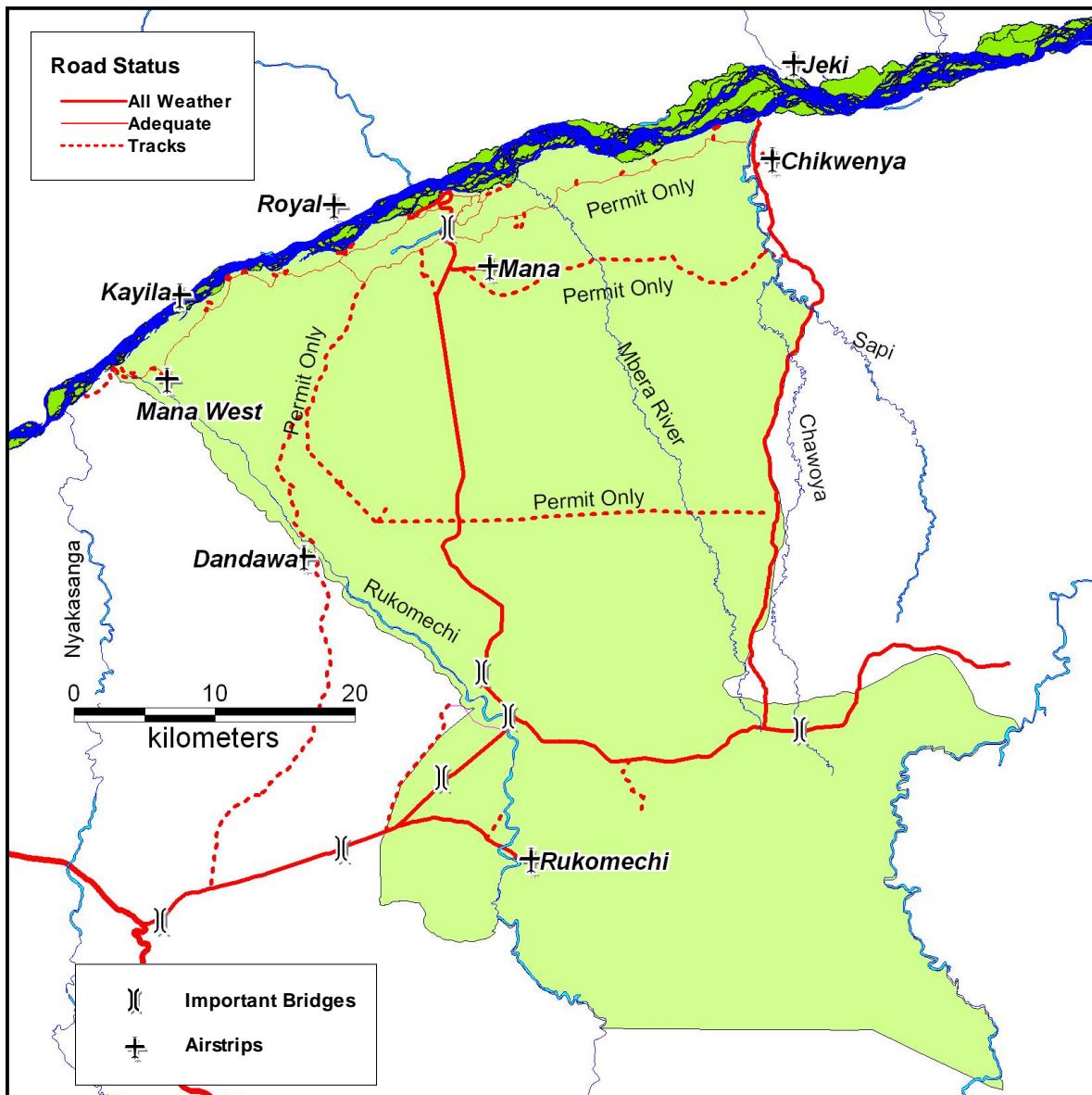
Many of the current management problems facing the Mana Pools National Park are inextricably linked to the current economic and political crisis in Zimbabwe. Morale is low and staff spend a great of time sourcing money and food rather than doing their jobs. This chapter describes management and utilisation of the park.

### 3.1 COMMUNICATIONS, INFRASTRUCTURE, EQUIPMENT AND STAFFING

#### 3.1.1 ACCESS AND COMMUNICATIONS

Access to Mana Pools National Park is via a gravelled road with high bridges which leaves the main Lusaka to Harare tarred road just below the escarpment. This road is part of a security road running along the escarpment base to the Mozambican border at Kanyemba. After crossing the Rukomechi river at Nyakasikanga a good gravelled road leads to the headquarters at Nyamepi. There are around 300 km of roads and tracks within the park but less than 100 km can be considered all-weather. Most roads are closed in the rainy season and others are accessible by permit only. (Figure 35).

Figure 35: Roads and Airstrips in Mana Pools NP



The access road from the main tarred road turnoff below the escarpment to Nyakasikanga Gate is badly corrugated at the time of plan preparation. However, the road between Nyakasikanga Gate and the Chikwenya turnoff has recently been upgraded to provide access to Chikwenya lodge. There are several important river crossings on the main access routes, some of which have been damaged (Figure 36).

Apart from a few exceptions most other roads in the park are considered to be poor and many are closed once it starts to rain. The decision for closure is based on the intensity and timings of the rains. River crossings can be problematic.

Investigation of the 1:50,000 scale maps which are based on aerial photography taken in the late 1960s reveals a far more extensive network of roads in the park. Some of these alignments are barely visible while others have disappeared altogether. Some of the marked roads on the maps could be elephant tracks which were misinterpreted by the surveyors.

There are a limited number of game viewing roads in the park with the exception of the area inside the Rukomechi lease area where the operator has developed an extensive network.

There is no access to the escarpment section of the park without driving out of the park.

**Figure 36: Roads and river crossings in Mana Pools NP**



## Air

There are three main airstrips in the park – Mana Pools, Mana West and Rukomechi. The Mana West airstrip is not a registered airstrip (in terms of the DCA regulations). Other important airstrips in the area are at Chikwenya and at Royal, Kaila and Jeki (in Zambia)

## Communications

Communications for the park are abysmal at present. The land line ceased to function in 2007. There is limited cell phone contact which is largely dependant on there being electricity at Makuti. Radio communications between Nyamepi and Harare/Chinhoyi are poor and irregular.

Importantly, the internal hand-held network does not function because of a problem with the repeater at Nyamepi. It is understood that this is a relatively minor problem but without it being repaired the staff on patrol have no communications with Nyamepi in case of an emergency.

### 3.2.2 INFRASTRUCTURE AND FACILITIES

#### Staff Housing, Offices and Workshops

Unsatisfactory temporary officer and game scout housing exists at Nyamepi camp, where all past development has occurred without planning. The Nyamepi complex has a number of houses, accommodation blocks, ablutions and a workshop and an office block. Police and ZINWA are also accommodated in the complex.

A gate house and accommodation buildings are located at Nyakasikana gate

A summary of buildings for Mana Pools National Park is shown in Table 11

**Table 11: Summary of staff housing and other buildings in Mana Pools**

Type	Description
Officer Accommodation	Five sub-standard houses at Nyamepi. Brick, tin huts and prefabricated. All are in need of upgrading.
Junior Staff quarters	17 detached brick houses with ablutions (13 in need of upgrade) 5 detached brick houses without ablutions (all in need of repair) 1 brick block with 5 bachelor rooms (needs to be modified) 17 Tin Huts (5 with brick, rest with tin kitchens) 2 Communal ablution blocks (both require repair) Old fort used as storeroom and accommodation
Research/Management	Research block with offices and laboratory
Water Infrastructure	Tanks at Gwaya to service lodges ZINWA tanks at Nyamepi for staff housing ZINWA housing
Police Station	3 prefabricated buildings and one communal ablution block

### 3.2.3 OTHER EQUIPMENT

At present the Park has one working vehicle - a Land Cruiser pickup. Much of the other equipment is unserviceable and in need of repair (Table 12).

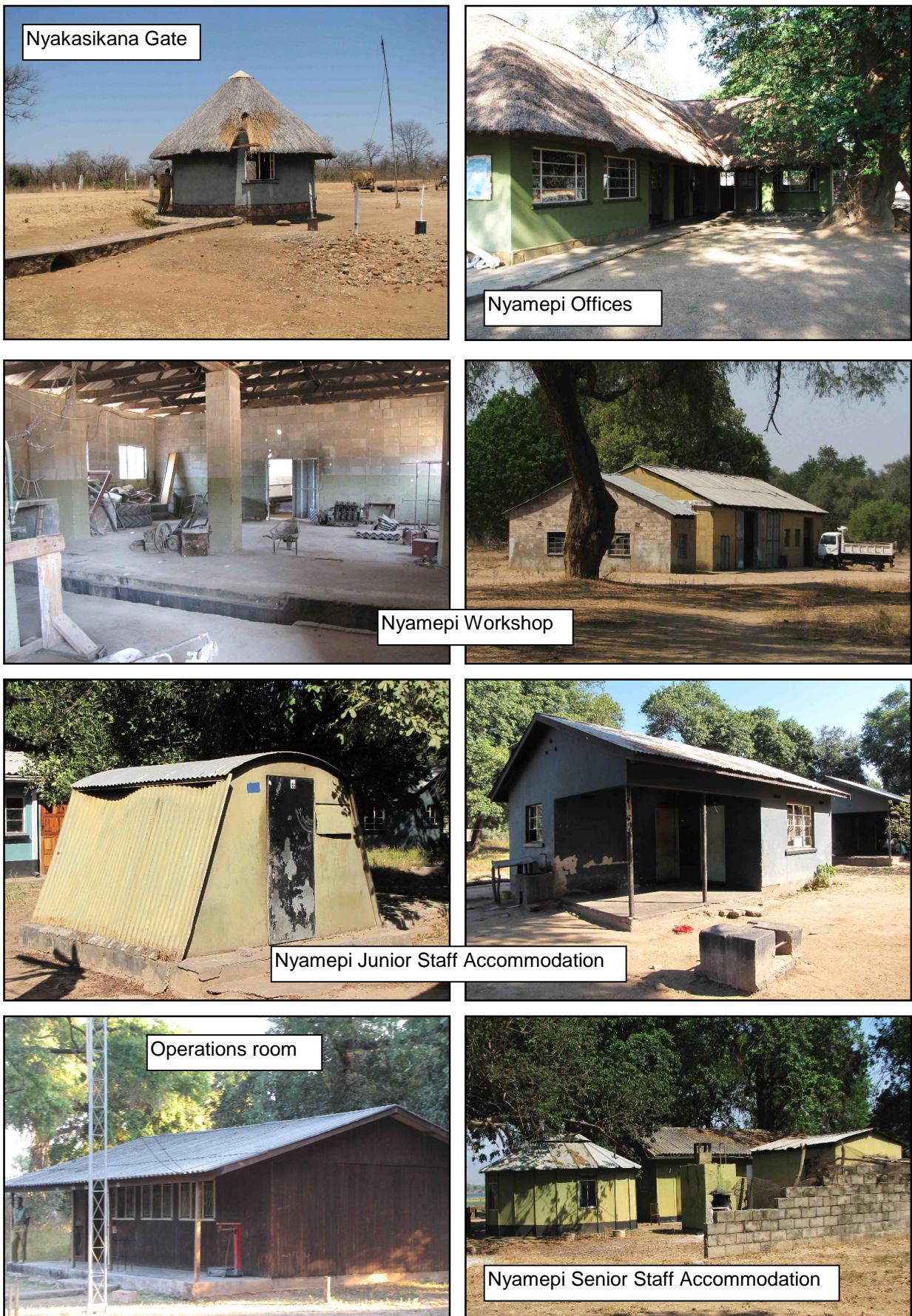
**Table 12: Equipment and Plant for Mana Pools National Park**

<b>Toyota Land Cruiser</b> (needs serious servicing) <b>Tipper Truck</b> (non runner; broken at Marongora) <b>Land Rover Defender x 2</b> (non-runners, need engines) <b>Boat</b> (with new 60hp engine) <b>Tow graders x 2</b> (one non-runner; tyres and spares needed) <b>Water bowser</b> (non-runner) <b>Tractor</b>	<b>Road Rammer</b> (non-runner) <b>Dam Scoop</b> (tyres and tubes needed) <b>Grass Cutter</b> (non-runner) <b>Trailers x 2</b> (one non-runner which needs substantial repairs) <b>Generator x 2</b> (One very old; the other new but there is no fuel to run it and no capital to carry out the installation) <b>Banana Boats (5)</b> (three non-runner) <b>Canoes x 5</b> (all unserviceable)
---	---

**Figure 37: Facilities and equipment for Mana Pools National Park**



Figure 37: Facilities and equipment for Mana Pools National Park (Cont...)



### 3.2.4 STAFFING AND ENFORCEMENT ACTIVITIES

There are approximately 50 staff stationed at Nyamepi. In addition the gate staff at Nyakasikana fall under the Warden at Mana pools.

**Table 13: Staff establishment for Mana Pools National Park**

MANA STAFF ESTABLISHMENT		
Grade	Current	Required
Area Manager	1	
Senior Wildlife Officer	1	
Senior Ecologist	0	
M/ Officer		
Senior Rangers	2	
Rangers	35	
General Hands	2	
Handymen	1	
Drivers	0	2
Accounts	1	
Lodge Attendants	3	2
Research Senior Rangers	0	
Research General Hands	0	
Reservations Assistant	1	
Mechanics	0	1
<b>Totals</b>	<b>48</b>	
Family members Average? = 3	144	3

Enforcement activities consist of regular patrols along the shoreline and into the hinterland. In addition patrol staff respond to reported incidents where possible. Most poaching occurs in the escarpment areas and along the Rukomechi river, especially in the area around Kanga Pan and up to Nyakasikana Gate. Snaring is the main method used by poachers but there are reports of elephant poisoning. Netting for fish occurs in the Zambezi river and is closely linked to legally permitted fishing activities in the Chiawa GMA in Zambia.

Levels of poaching are relatively low at present and around 10 elephant are reported as having been poached annually. The aerial survey data also confirms this and elephant carcass ratios are low in Mana Pools. In 2004 there was an average of two carcasses for whole park but over three in central portion. In 2003 no fresh carcasses were seen (Dunham, 2004). However, there are concerns that these low levels may be a result of the low manpower and resource levels and improved patrolling and monitoring may see an apparent increase in poaching levels.

Early burning activities are carried out in the miombo woodlands of the escarpment but no other fire management occurs.

### 3.2.5 RESEARCH AND MONITORING

#### Research

The bulk of available research done at Mana Pools was carried out prior to 1990. More recent research projects include a long-term study on lions (Table 14).

**Table 14: Research projects carried out in Mana Pools**

Project	Brief Description
Buffalo	Long-term study carried out on the patterns of habitat use by buffalo. Home ranges, population sizes, daily and seasonal movements and habitat utilisation were studied. Results indicated that buffalo densities were lower than expected and water limitations during the dry season force the herds to forego selectivity based on nutrients alone (Swanepoel, 1989).
Vegetation	A number of papers have been written based on research done at Mana. Most of these refer specifically to the <i>Faidherbia albida</i> woodlands and its productivity (e.g. Dunham, 1989, 1990 and 1991). A series of photopanorama points was established in the <i>F. albida</i> woodlands in 1961 and reviewed in 1966, 1971, 1978 and 1987.
Lion	Recent study completed on demography and population status (Monks, 2003; 2009)
Elephants	Some work has been carried out on the movement of elephants (Kerr and Fraser, 1975; Dunham, 1986).
Hippo	Survey carried out in 2005 (Monks <i>et al</i> )
Crocodiles	Survey carried out in 2007 (Fergusson)

#### Monitoring

General monitoring of biological parameters in Mana Pools is limited to rainfall and temperature measurements at Nyamepi. The Veterinary Department was keeping similar records at the Rukomechi Research Station but it is not known how reliable this data collection has been in recent years.

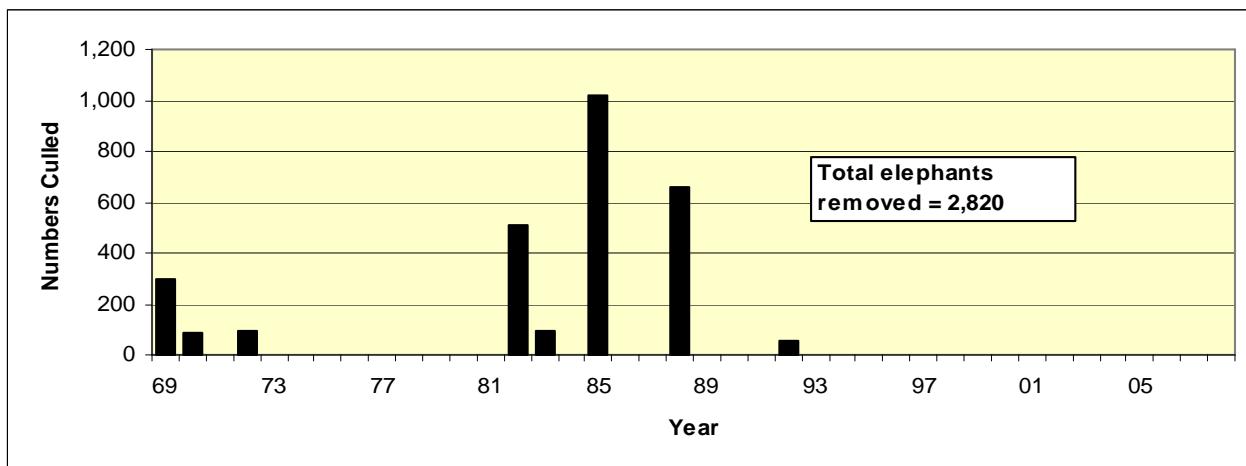
Some tourism data is collected and this includes origin, day or overnight visitors, etc.. Specific records of types of activities used (e.g. canoeing) are not kept.

### 3.2.6 CROPPING AND OTHER CONSUMPTIVE UTILISATION

Animals have been officially removed from Mana Pools National Park since the 1960s. The reasons include cropping, translocation, problem animal control and rations. Starting in 1969 and continuing into the 1980s, claims that the alluvium was over-browsed and over grazed led to the culling of thousands of large mammals, but without any observed increases in the cover of perennial grasses or woody plants.

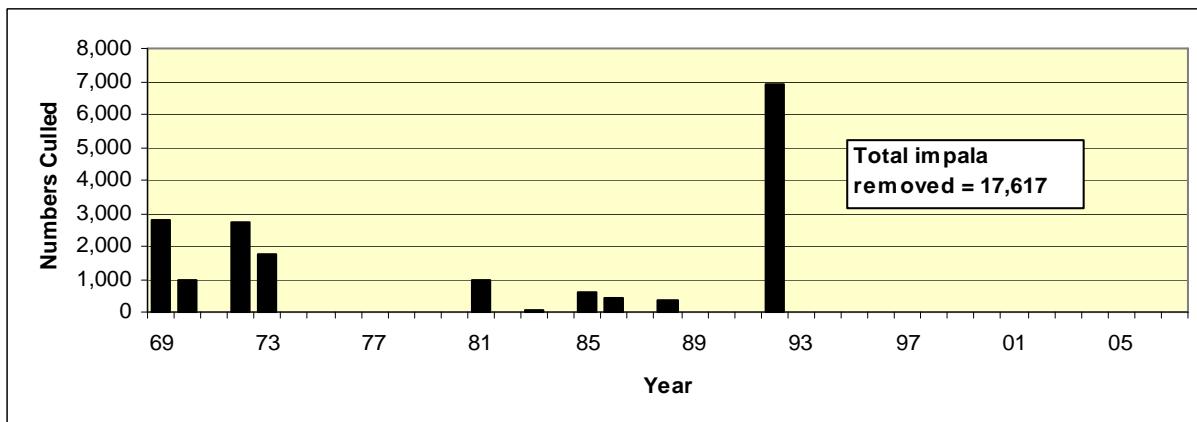
Elephant cropping for woodland protection has seen nearly 3 000 elephants shot with 80% of these between 1982 and 1988 (Figure 38).

**Figure 38: Elephants removed from Mana Pools National Park**



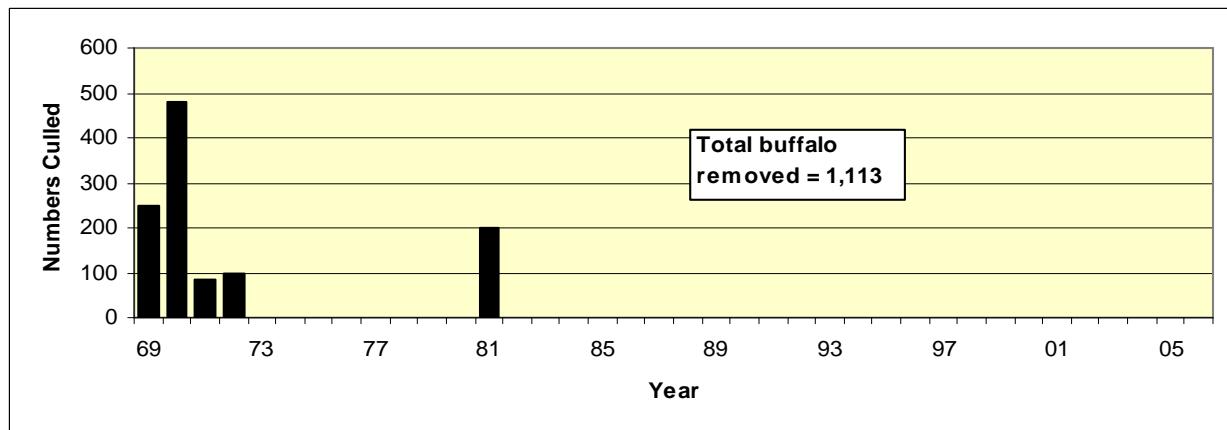
Nearly 18 000 impala have been removed from Mana Pools and over 80% of these through a cropping programme. The remainder were translocated. Nearly 7,000 impala were shot in 1992 (Figure 39). It is believed that was in response to a perceived over-stocking problem.

**Figure 39: Impala removed from Mana Pools National Park**



Almost 1 000 buffalo were removed from the park in the late 1960s and early 1970s with a further 200 shot in 1981 (Figure 40). This was in response to the perceived problem of over stocking and its effects on the woodland. In addition, 353 buffalo have been shot for PAC and rations up to 1995.

**Figure 40: Buffalo removed from Mana Pools National Park**



The station is issued a training and ration hunting permit annually. In 2009 this amounted to 18 animals spread over the whole year. It included five elephant, five buffalo, three hippo and other smaller animals.

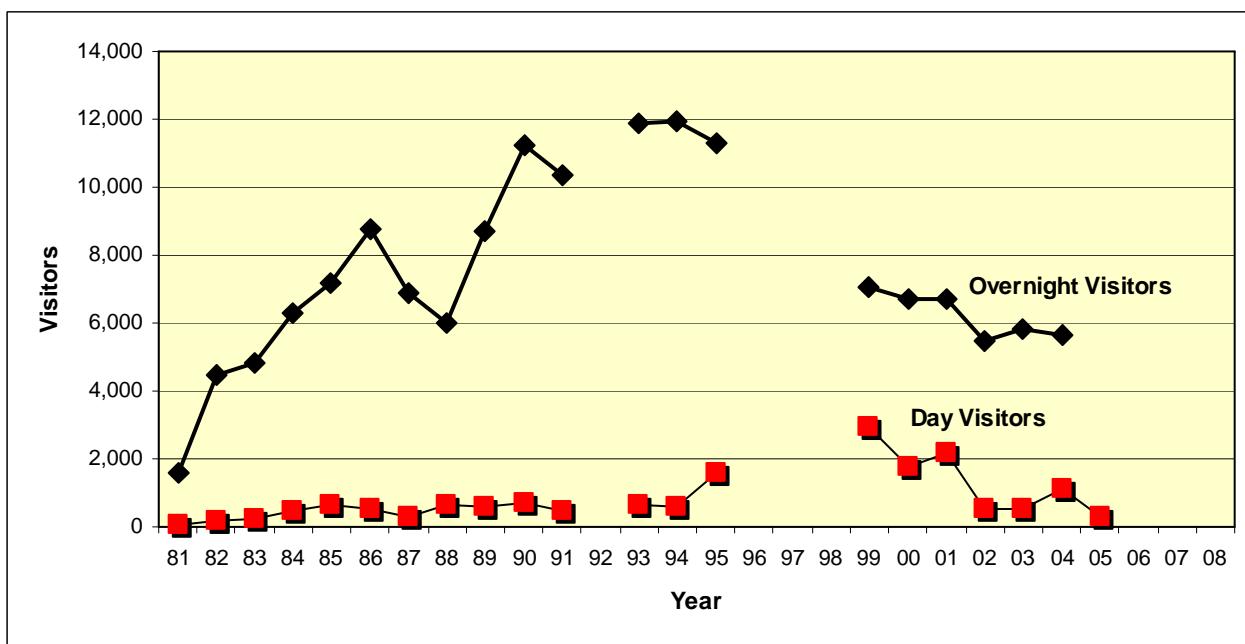
### 3.3 USE AND INCOME OF THE NATIONAL PARK

#### 3.3.1 BACKGROUND TO TOURISM

Currently all income generating activities in Mana Pools National Park are based on non-consumptive tourism. The park famous for its canoeing and walking and it unique in that visitors are permitted to walk unescorted without reference to their “wilderness skills”. Game drives are also a popular activity as is fishing. Notably power boats are not permitted and all fishing is done from the banks or from canoes.

Tourism in the Park was closed in the late 1970s because of the Zimbabwean liberation war and was only reopened in 1980 after the cessation of hostilities. No tourism data appears to have survived from before the war. Visitor numbers increased steadily through the 1980s and peaked in the early 1990s with around 12,000 people. It had declined to about half this number ten years later (Figure 41).

**Figure 41: Visitor numbers to Mana Pools National Park**  
(PWMA data – Does this include canoe data? Don't think it does)

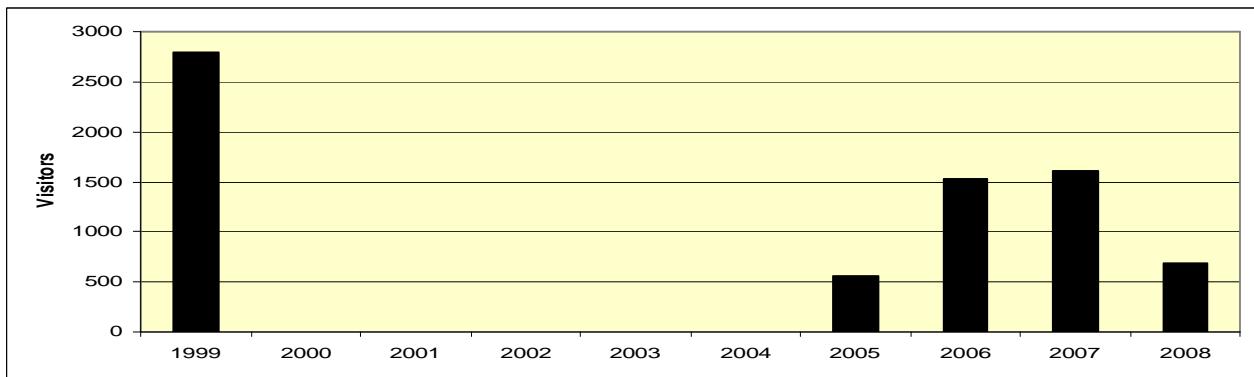


Note: There appear to be discrepancies between the tourism data sets. When visitor numbers based on one set of records (total visitors) are compared to visitor origin there are some major differences. For example the graph above shows over 9,000 visitors in 2004 while the origin data shows only 5,000.

In addition, as no overnight fees are collected from canoe clients there are no records of their numbers

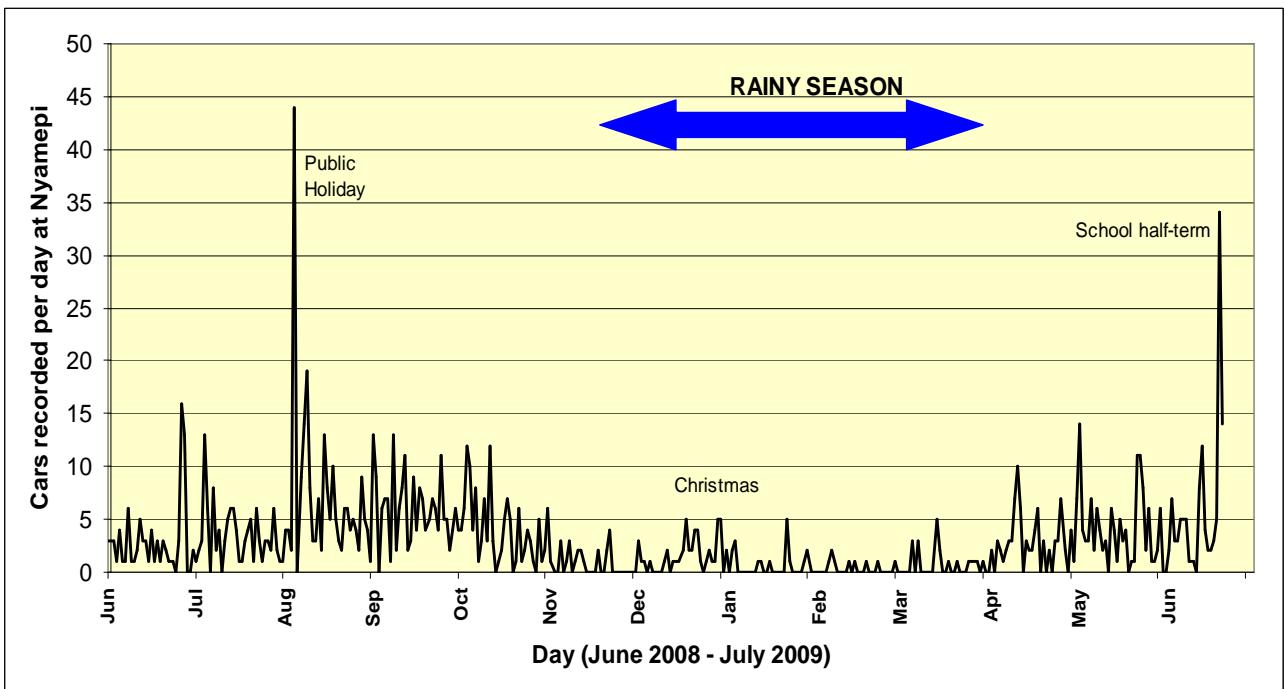
Visitor numbers, which appear to have stabilised and even increased between 2002 and 2007 have again shown a drop in 2008. This is probably related to negative perceptions of the country which have been aggravated by the cholera outbreak of late 2008. Data from the PWMA is still under analysis but this trend is shown clearly by data from one of the lodges operating within the park (Figure 42).

**Figure 42: Visitor numbers 1999 to 2008 indicative of recent trends**



Tourism demand in Mana Pools is directly related to the weather. The season starts slowly in April/May at the end of the rains and increases to a peak in September and October. This is illustrated by the daily record of vehicles seen at Nyamepi (Figure 43).

**Figure 43: Daily cars recorded at Nyamepi over a one year period**



Canoeing has been a driving force in the development of tourism in Mana Pools and the demand for campsites and permits was high during the peak tourism experienced in the 1990s. At this time there were probably around 20 operators. Demand for camping sites along the river high and this led to the opening of the Chitake campsites in 1992. Since then there has been an increased demand for Chitake.

### 3.3.2 CURRENT ADMINISTRATION OF TOURISM

#### Operators

Three types of annual operator permits are issued. These are briefly outlined below (Table 15). Renewal is automatic on payment of fees. License applications are approved by a Committee of PWMA staff from HQ, the regional office and senior staff from the area in question<sup>2</sup>. Most operators are members of the Lower Zambezi Tour Operator Association but membership is not obligatory.

**Table 15: Types of operator permit issued for Mana Pools**  
 (Data from LZTO)

Permit Type	Notes
Canoeing	<p>Issued for specified lengths of the river. These are</p> <ul style="list-style-type: none"> <li>• Mana Pools Shoreline – Six operators</li> <li>• Kariba to Chirundu – Four operators</li> <li>• Chirundu to Mana (includes Mana Shoreline) – One operator</li> <li>• Mana to Kanyemba (includes Mana Shoreline) – One operator</li> </ul> <p>Some operators have two types of licence so it means that there are nine canoeing operators permitted to use the Mana Pools shoreline.</p>
Game Drives	12 permits have been issued to operators to carry out game drives in Mana Pools for hire and reward. Several of these are to operators who also hold canoe licenses
Walking	Four permits have been issued

#### Canoeing

Permits are issued for four types of canoeing (see Table 15 above). However, more important for the management of canoeing, is the way in which they are used. Essentially there are three types of use which are outlined below (Table 16) and summarised graphically in Figure 44.

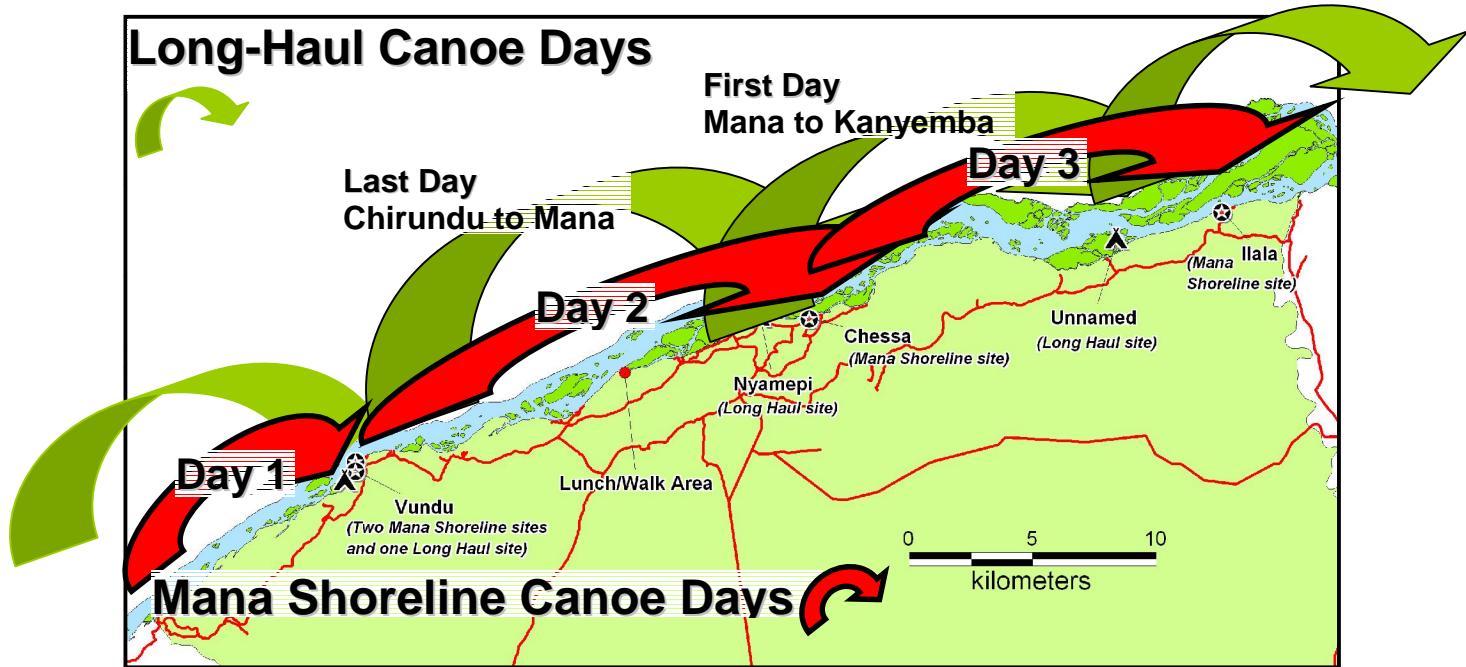
**Table 16: Summary of the canoe safari business in Mana Pools**

Canoe Type	Description
<b>Mana Shoreline</b>	<p>Operators have a permit to canoe the Mana Pools shoreline. Two departures are permitted daily from a site near the western boundary. However on Tuesdays a third departure is permitted for members of the Private Canoe Operators Association.</p> <ul style="list-style-type: none"> <li>• First night stopover at Vundu point</li> <li>• Second night stopover at Chessa campsite</li> <li>• Last night stopover at Ilalla site</li> </ul> <p>All operators pay a departure fee per client (US\$15). No other fees are due unless the operator uses one of the exclusive campsites where normal camping fees apply. If walks are carried out an entry fee to the park applies.</p> <p>Many canoe operators use the area between Vundu and the BBC site for walking and lunch stops.</p>

<sup>2</sup> Management Staff at Mana complain that there have been several decisions made with regard to tourism where there has been no consultation at field level.

Canoe Type	Description
<b>Long-Haul</b>	<p>Split into three sections of river of which two are important for Mana Pools (Chirundu to Mana and Mana to Kanyemba). As with the Mana shoreline there are two departures a day from each starting point.</p> <ul style="list-style-type: none"> <li>• First Mana night stopover on island west of Vundu (for Chirundu to Mana leg)</li> <li>• Last night stop at Nyamepi</li> <li>• First night stop near west end of Chikwenya Island (for Mana to Kanyemba leg)</li> </ul> <p>On long-haul canoe trips all camping is done on islands and usually there are no professional walking guides. This means that walking on the land is not permitted. Canoe departure fee goes to Marongora and not Mana? Therefore Mana receives no income from long-haul trips unless the guide also has a walking licence and can take clients into the park where a park entry fee would apply. In practice this rarely happens</p>
<b>Static</b>	<p>This is unclear. It is assumed that operators working from Temporary Extended camps will have a Mana Shoreline permit. As they are paying camping fees then there is no departure fee but there is a “river usage fee” payable per canoe per day. In addition, these clients often take out a daily fishing permit payable daily per client.</p>
<b>Summary</b>	<p>When the canoeing is “full” then the following can be expected:</p> <p>Six Mana Shoreline trips Eight long-haul trips Extended camp day trippers (2)</p> <p>Assuming five canoes per trip there could be 75 canoes on the water in 15 groups at peak periods.</p> <p>Statistics on canoeists was not readily available but during the peak months there could be around 70 clients on the water a day or approximately 2 000 per month?</p>

**Figure 44: Canoe safaris**



## Fishing

Fishing using rod and line is permitted by permit and payment of a small fee. Allowing fishing in a national park is always a contentious issue as arguments can be brought forward to allow other forms of consumptive utilisation. If fish, why not game birds, for example. There is no available information on the fish stocks and whether the fishing has any impact.

## Fees and Income

The PWMA sets three types of fee rates; international, regional and citizen/resident fees. These have recently been increased (Table 17) and this may have implications for the profitability of the lodges. Traditionally occupancy of the lodges has been high and they are able to remain open during the rains. However, owing to the current economic situation it has been very difficult to maintain standards. Visitors have to bring their own gas, some basics such as soap and towels may be lacking and maintenance of the structures and furnishings is not ideal. The quality of the accommodation does not match with now high fees charged, especially with regard to Zimbabweans.

**Table 17: Fees for Mana Pools National Park**

	International Fee	Regional Fee	Citizen/Res. Fee
PWMA Small Lodge	100	75	50
PWMA Large Lodge	200	150	100
Exclusive Campsite	15	12	8
Public Campsite	10	8	5
Canoe Departure Fee	15		
Entrance Fee	15	12	3
Vehicle Fee	5	5	2

Estimates of incomes to the park have become meaningless in light of the hyper-inflationary environment that currently characterises the Zimbabwean economy. Although records are kept at Nyamepi they are immediately out-of-date. In addition, any payments made in Zimbabwe dollars devalue between the time of writing a cheque and it being deposited in the bank. This means that the PWMA accommodation has been sold at very low levels for customers able to pay in Zimbabwe dollars.

The following income scenarios (Table 18) are based on assumptions about season length, occupancy and average prices for accommodation. They are provided as indication of the potential earning capacity of Mana Pools. It must be remembered that current figures indicate around 6 000 overnight visitors in Mana per annum and the numbers in the table have been adjusted to reflect this.

Income from canoeing appears to be limited to a launch fee in the case of the Mana Shoreline Operators. No camping or entry fees are paid? In the case of the long-haul operators Mana receives no income at all?? Operators using exclusive campsites are also required to pay entry and camping fees for their staff. With the new fees, this now represents a significant outlay.

**Table 18: Income scenarios based on new fees (January, 2009)**

<b>Facility</b>	<b>Number Sites</b>	<b>Number Beds</b>	<b>Season Months</b>	<b>Season Days</b>	<b>% Occupancy</b>	<b>Est Clients Unit</b>	<b>Est Total Clients</b>	<b>Ave Fee</b>	<b>Revenue</b>	<b>AddOns</b>	<b>Totals Site</b>	<b>Mana Total</b>
<b>Campsites</b>	3	12	7	210	40%	1,008	3,024	12	12,096	2,000	14,096	42,288
Temp Extended	5	12	7	210	20%	504	2,520	12	6,048	2,000	8,048	40,240
Operator Exclusive	8	12	7	210	20%	504		10	5,040	2,000	7,040	56,320
Public Exclusive	1	174	7	210	10%	3,654		5	18,270	2,000	20,270	20,270
Public Campsite	3	12	7	210	40%	1,008	3,024	12	12,096	2,000	14,096	42,288
<b>PWMA Lodges</b>	<b>Number Sites</b>		<b>Season Months</b>	<b>Season Days</b>	<b>% Occupancy</b>			<b>Ave Fee</b>	<b>Revenue</b>	<b>AddOns</b>	<b>Totals Site</b>	<b>Mana Total</b>
Large PWMA Lodges Peak	2		7	210	70%			150	44,100	500	44,600	44,600
Large PWMA Lodges Off Peak	2		4	120	20%			150	7,200	500	7,700	7,700
Small PWMA Lodges Peak	3		7	210	70%			75	33,075	500	33,575	33,575
Large PWMA Lodges Off Peak	3		4	120	20%			75	5,400	500	5,900	5,900
<b>Other Lodges</b>												
Rukomechi	1		7	210								5,000
Vundu												5,000
<b>Canoeing</b>	<b>Trips Day</b>	<b>Canoes/Trip</b>				<b>Canoes Total</b>	<b>Clients Total</b>	<b>Ave Fee</b>				<b>Mana Total</b>
Canoeing	6	5	7	210	50%	630	3,150	15				9,450
<b>Entry Fees</b>												
Vehicle Entry	6000								5	30,000		30,000
Visitor Entry	750								3	2,250		2,250
<b>Totals</b>						<b>6,804</b>						<b>297.593</b>

**Notes**

Add-Ons = Staff fees etc etc

Fees for Lodges such as Rukomechi are guesses as they are unknown to me

PWMA Lodges are per lodge not per client

## **Regulations**

Each Area Manager may define park specific rules and regulation in terms of Section xx of the Parks and Wildlife Act. In Mana these are set out on a board at the Nyamepi headquarters and read as follows.

- Please drive only on graded roads. Driving off roads is strictly prohibited especially up to lion kills
- Leaving vehicle and walking is permitted
- All plants, animals and soils are protected and cannot be collected. This includes firewood, insects, including butterflies and animal remains
- Fires are permitted only in designated braai stands
- Please refrain from littering in the National Park
- Please avoid behaviour likely to disturb wildlife or people
- Powerboats may not be used in the park. Canoes are permitted
- Feeding of animals is prohibited
- Generators/Lighting plants are not permitted
- Please be in your camp or lodge during prescribed hours. From May to July these hours are 6:00 pm to 6:00 am and from August to October 6:30 pm to 6:00 am
- Persons disobeying Parks and Wildlife Regulations will be prosecuted and banned from the Park
- However these rules are for your benefit and we hope you enjoy your stay

Other regulations which apply to National Parks, the Parks and Wildlife Estate and wildlife also apply. The most relevant of these include

- Booking and use of exclusive campsites only for 21 days
- Etc
- Etc

## **Accommodation Facilities and Campsites**

Accommodation is offered in established camps (safari camps and extended temporary camps), self catering lodges run by the PWMA, operator run temporary camps and self catering camping (both at exclusive sites and in the general campsite at Nyamepi). Over 450 “beds” are currently on offer, with more than 50% of these being available in the public campsite (Table 19).

**Table 19: Summary of accommodation types and capacities in Mana Pools**

<b>Accommodation Type</b>	<b>Description</b>	<b>Beds</b>
Safari Camps	One located outside the park (Chikwenya), one inside (Rukomechi) and one under construction in the park (Vundu). Rukomechi camp has established a new camp outside the park as erosion was making the original site unsafe.	36
Extended Temporary Camps	Two sites currently operational on the river – Goliath Safaris and Vine. Demand for the Vine site as an extended camp has not been great. One site identified away from the Zambezi on the Chiruve river.	24
PWMA Lodges	Five lodges ranging between four and eight beds (Nyati, Hippo, Mubvee, Musango, Muchichiri)	28
Operator Exclusive Campsites	Five sites in the park . Four on the Zambezi river (Mucheni 1 and 4, Old Ndungu and New Ndungu) and one near the escarpment (Chitake)	60
General Exclusive Campsites	Nine sites in the park. Seven on the Zambezi river (Mucheni 2 and 3, Old Ndungu, New Ndungu, BBC, Gwaya and Nkupe) and two near the escarpment (Chitake and Chitake 2)	108
Canoe Campsites	Several sites are used between Rukomechi and Nyamepi (e.g Vundu West and Nyamfuse). Then Nyamepi, Chessa and xx between Nyamepi and Chikwenya.	36
Public Campsites	There is one public campsite in the park at Nyamepi. The site has 29 individual sites and three ablution blocks. Piped water is available	174
Picnic Sites	Seems to be a single site at the western end of the Nyamepi alluvium	0
<b>TOTALS</b>		<b>454</b>

**Table 20: Types of camps found in Mana Pools**

Type	Description	Facilities in Mana	Beds
<b>Tourist Lodge (PWMA)</b>	<ul style="list-style-type: none"> <li>From four to eight beds</li> <li>Variable design, especially in Mana Pools</li> <li>Permanent structures run by PWMA</li> </ul>	<ul style="list-style-type: none"> <li>3 four bed lodges (Nyati, Hippo, Mubvee)</li> <li>2 eight bed lodges (Musango, Muchichiri)</li> </ul>	28
<b>Semi-permanent Camp</b>	<ul style="list-style-type: none"> <li>Must be constructed so that all traces can be removed.</li> <li>24 client beds</li> <li>5 domestic staff</li> <li>3 Guides</li> <li>Canvas/poles, thatch, concrete or earth floor</li> <li>Alternative energy sources encouraged</li> <li>Payment is on an annual lease fee. No nightly rates</li> </ul>	Vundu - (Under Construction). Beds not specified Exclusive lease amended by gentleman's agreement Speedboat permitted! (for rainy season resupply?)  Chikwenya - Exclusive area 4km radius in Sapi  Rukomechi – Exclusive area 5km radius, extends into Park	20
<b>Temporary Extended Camp</b>	<ul style="list-style-type: none"> <li>Tents only which are dismantled at end of each season</li> <li>12 client beds</li> <li>6 staff beds</li> <li>4 guides</li> <li>Camp pays nightly camping fees, staff fees and firewood fees</li> </ul>	<ul style="list-style-type: none"> <li>Goliath (river site) – Used by Goliath Safaris</li> <li>Vine (River Site) – Used but not all season by Natureways</li> <li>Croton (Inland Site) – Unused at present</li> </ul>	36
<b>Operator Exclusive Campsite</b>	<ul style="list-style-type: none"> <li>Preferably with no facilities. Each operator will create their own camp according to preference with regard to ablutions, kitchen and general layout. 21 day stay limit must be enforced.</li> </ul>	<ul style="list-style-type: none"> <li>Five sites in the park . Four on the Zambezi river (Mucheni 1 and 4, Old Ndungu and New Ndungu) and one near the escarpment (Chitake)</li> </ul>	60
<b>General Exclusive Campsite</b>	<ul style="list-style-type: none"> <li>Braai Stand</li> <li>Long-Drop Toilet</li> </ul>	<ul style="list-style-type: none"> <li>Eight sites in the park. Six on the Zambezi river (Mucheni 2 and 3, Old Ndungu, New Ndungu, Gwaya and Nkupe) and two near the escarpment (Chitake and Chitake 2)</li> </ul>	96
<b>Public Campsite</b>	<ul style="list-style-type: none"> <li>Ablutions with water borne sewage</li> <li>Braai stands</li> <li>Piped water if possible</li> <li>Litter disposal system</li> </ul>	<ul style="list-style-type: none"> <li>There is one public campsite in the park at Nyamepi. The site has 29 individual sites and three ablution blocks. Piped water is available</li> </ul>	174
<b>Picnic Sites</b>	<ul style="list-style-type: none"> <li>No facilities</li> </ul>	<ul style="list-style-type: none"> <li>Single site at the western end of the Nyamepi alluvium</li> </ul>	
<b>Canoe Camps</b>	<ul style="list-style-type: none"> <li>No facilities</li> </ul>	<ul style="list-style-type: none"> <li>Several sites are used between Rukomechi and Nyamepi (e.g Vundu West and Nyamfuse). Then Nyamepi, Chessa and an unnamed site between Nyamepi and Chikwenya.</li> </ul>	36
<b>Temporary Camp</b>	<ul style="list-style-type: none"> <li>One visit, No facilities</li> <li>Overnight stop</li> <li>No road access, all equipment, food to be packed in/out</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>	

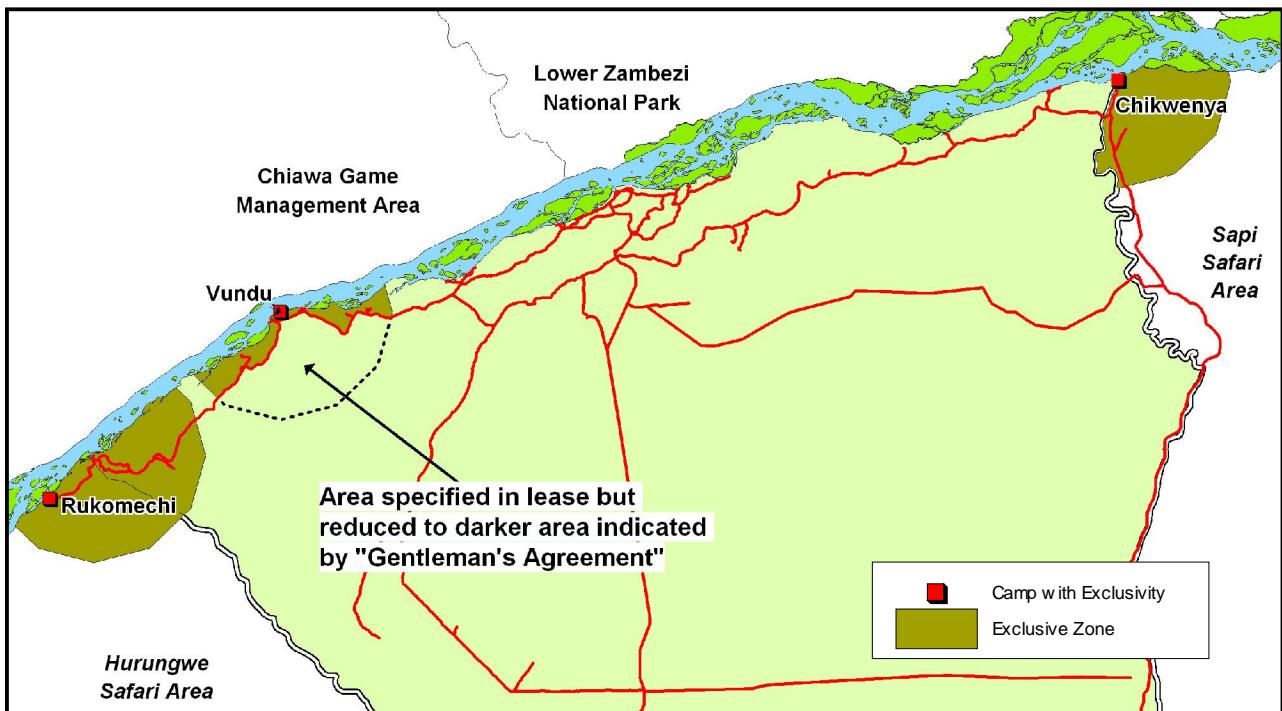
### **Leases and Exclusive Zones**

There are a number of leases existing in or immediately adjacent to the Mana Pools National Park. These are detailed below (Table 21)

**Table 21: Leases in and adjacent to Mana Pools National Park**

<b>Lease Type</b>	<b>Description</b>
<b>Exclusive Leases</b>	Three camps have exclusive leases over land within the Parks and Wildlife Estate in and around the Mana Pools National Park.
Rukomechi	Exclusive area is 5km radius from original site which effectively includes 20 km <sup>2</sup> of the national park Duration 15 years. Automatic renewal if no problems Current lease expires in 2014 Annual fee of US\$ 20,000
Chikwenya	Exclusive area is 4km radius from site in the Sapi Safari Area. Does not include Chikwenya Island. Duration 10 years. Automatic renewal if no problems Current lease expires in 2016 Annual fee of US\$ 12,500
Vundu	Exclusive area is 5km radius from site which effectively includes 36 km <sup>2</sup> of the national park. This includes the river access road, four exclusive campsites and a Temporary Extended Campsite (Vine) but negotiations are underway with the lease holder regarding the extent of the area (now between road and river). This arrangement needs to be formalised. Duration 10 years. Renewal possible for 5 further years Current lease expires in 2016 Annual Fee of US\$ 6,000
<b>Temporary Extended Camps</b>	These are camps that are permitted to remain established for the duration of the season but everything has to be removed at the close of season. The site is negotiated on an annual basis with the operator. Currently three sites available Goliath (river site) – Used by Goliath Safaris Vine (River Site) – Used but not all season by Natureways Safaris Croton (Inland Site) – Unused at present
<b>Semi-Permanent Camps</b>	Currently there are no operational semi-permanent camps in Mana Pools but Kanga Pan has been allocated and development is expected in 2009 (see conditions below).
Kanga Pan	12 bed camp with 15 employees Buildings must be removable on termination of lease Current lease expires in 2016 Annual fee of US\$ 23,000

Figure 45: Exclusive zones leased inside Mana Pools National Park



Several leases refer to a diagram which defines the exclusive lease area. However, none of these diagrams were located in time for this draft document. 5km radius seems to be the figure that people believe forms the basis of their leases.

Figure 46: Tourism facilities along the Zambezi river

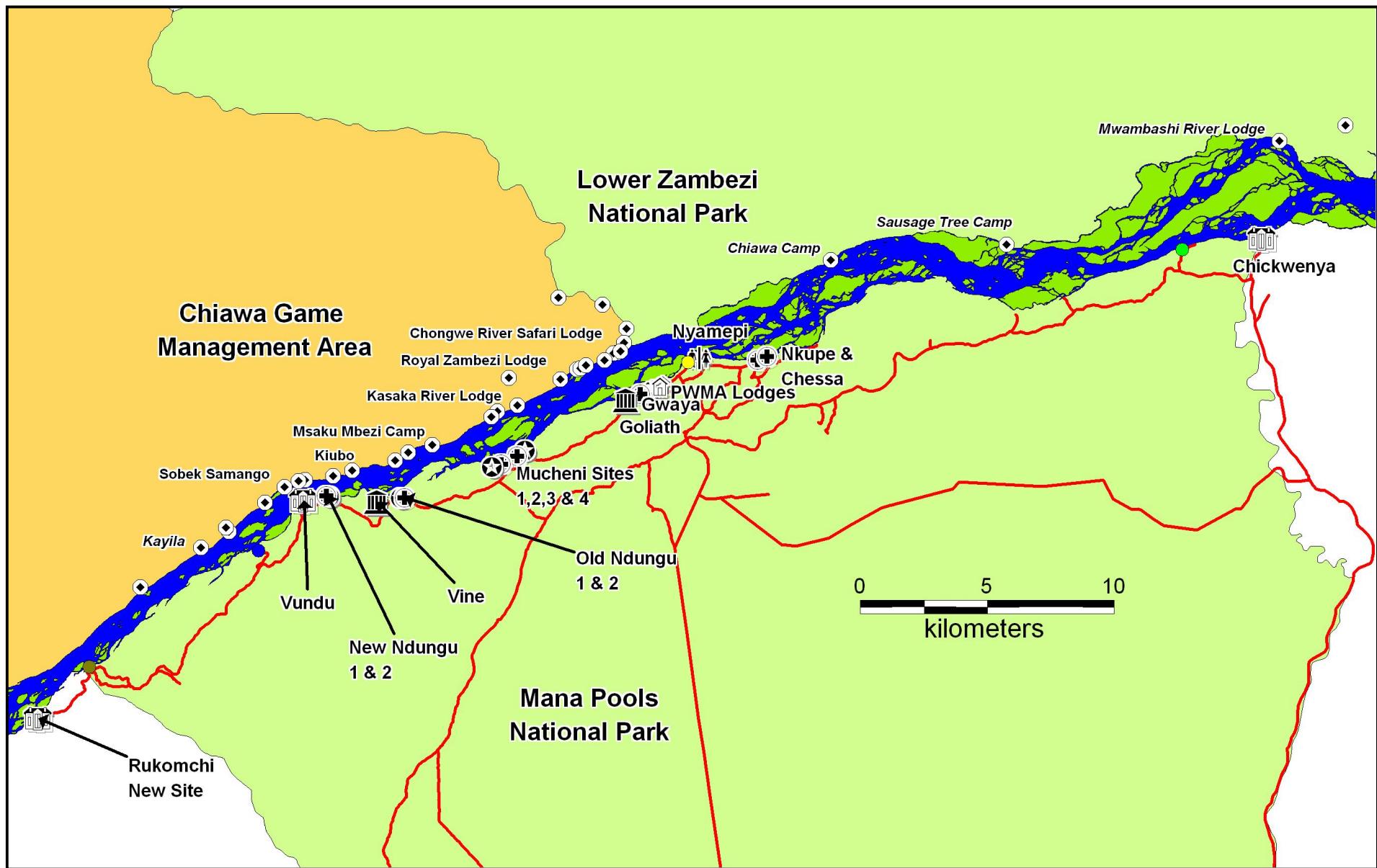


Figure 47: Tourism facilities in the sensitive alluvial floodplains at Nyamepi

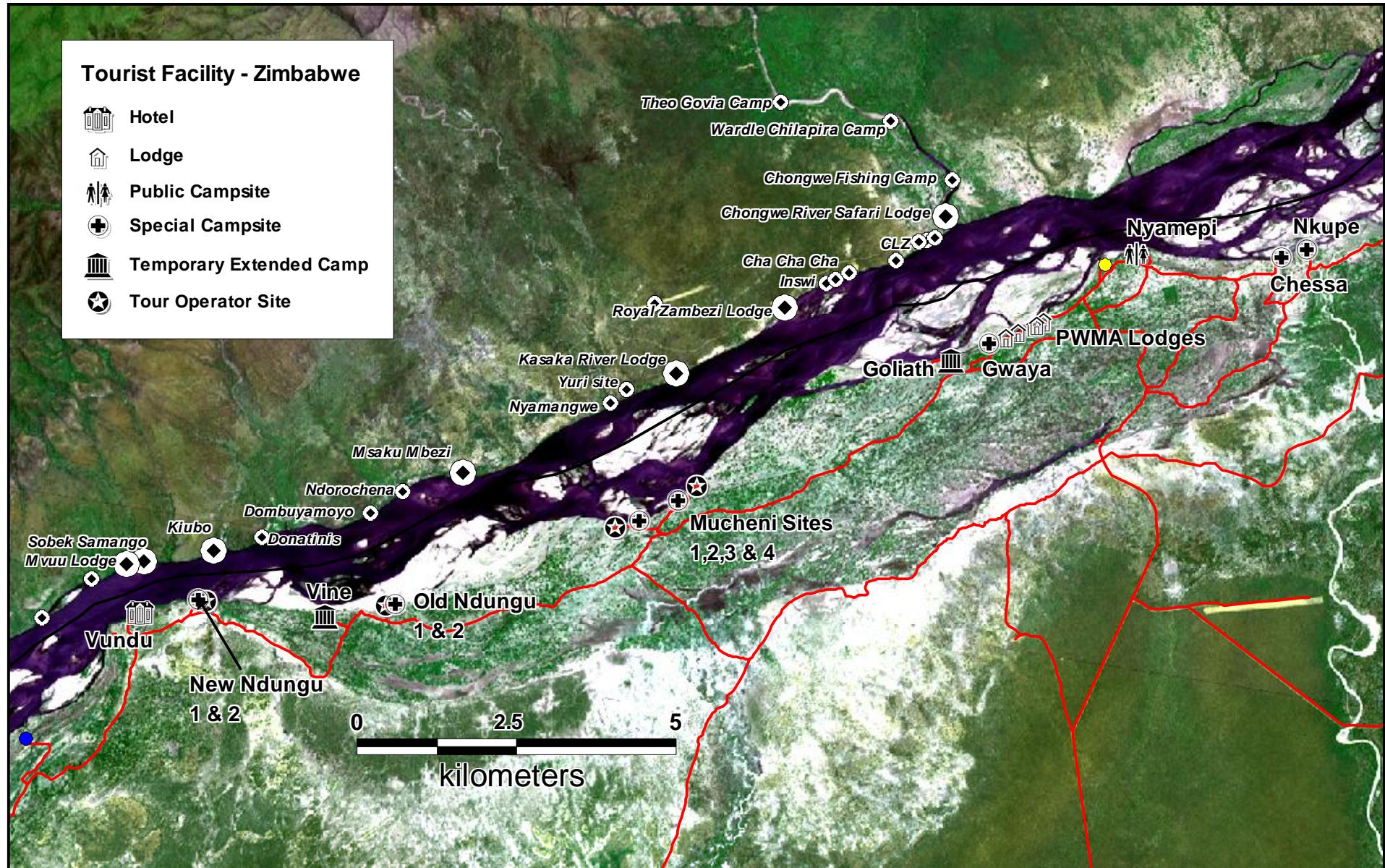
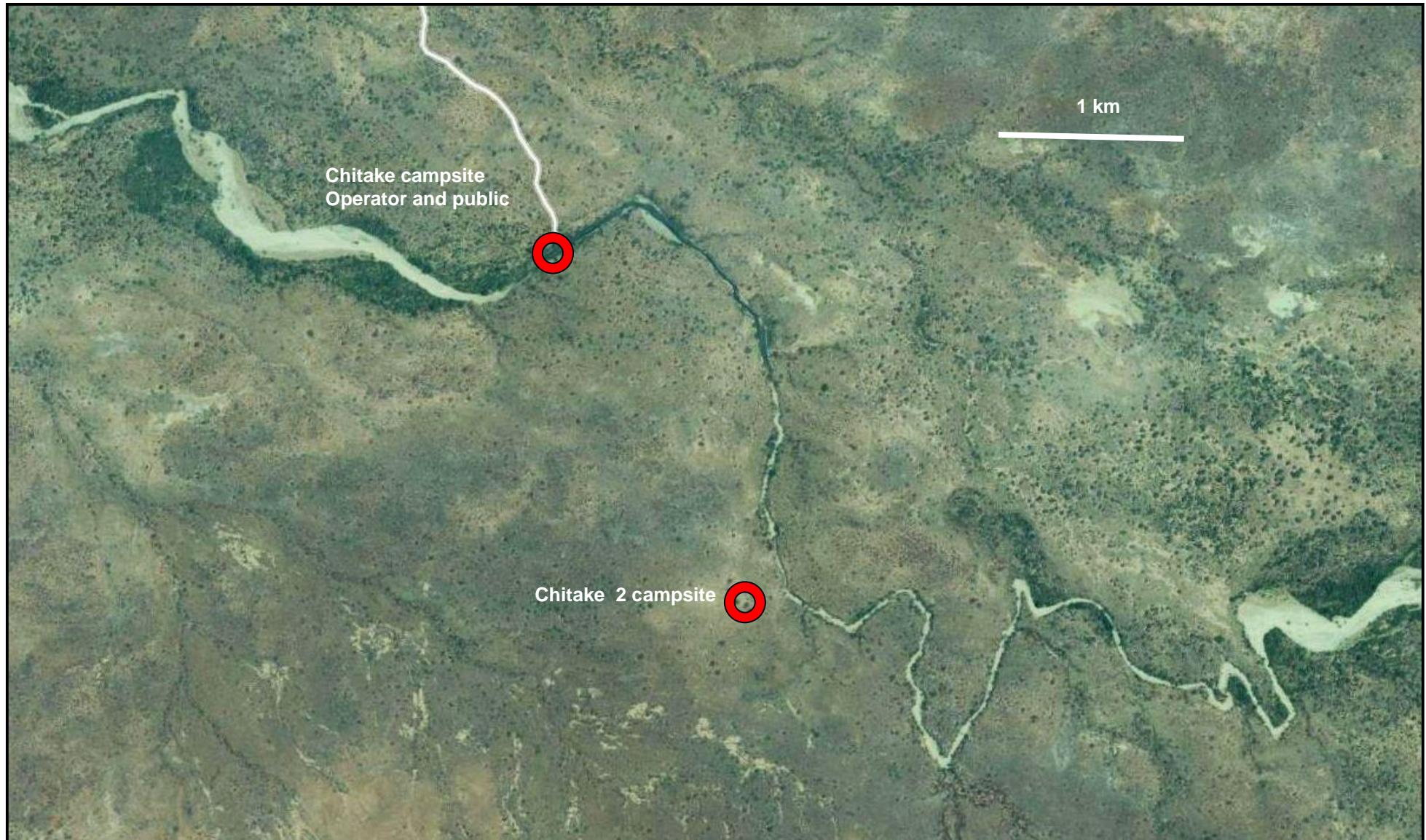


Figure 48: Tourism Facilities at Chitake Springs



### Booking Conditions and Conditions

- Operators can book six month to a year in advance. Ordinary tourist three months in advance.
- Operators need to pay for a minimum of five clients when the booking is made. This is to stop speculation on the bookings.
- Operators are permitted to book a maximum of six nights per site.
- All tour operator sites are to be booked at the Hrare HQ booking office. This is to avoid confusion over bookings made at different places.
- Camping fees will be waived for five staff for tour operators. In addition two staff will be permitted free entry. All staff members above these limits will pay normal fees.

There is better accountability, especially with regard to the exclusive campsites, from tour operators than from the general public.

PWMA authority ought to rethink the use of the Safari areas. Canoeing could make good use of the safari area shoreline. If hunting were moved into the non-prime areas.

### Regulation of the Industry

ZTA is supposed to inspect camps. Quality of the industry is important to ensuring its viability  
Also need regulations regarding vehicles, mobile camps, canoes (need an annual inspection)

### Unescorted Walking

Mana Pools is the only “big-five” park in Zimbabwe which permits unescorted walking. Essentially all visitors are permitted to walk alone or in groups anywhere in the park. They do not need to inform parks staff that they are doing this and there are no qualifications or tests to ensure that people who walk in these wild areas are competent to do so.

There have been remarkably few fatalities associated with unescorted walking. Records of these fatalities were not located but the following are known to have occurred. Where details are available these appear to have been when people were alone and walking at last light.

**Table 22: Fatalities during unescorted walking in Mana Pools**

Year	Animal	Comments
1994	Buffalo	Two visitors in <i>Viteveria</i> grass. Woman killed by lone bull around 15:00 hours
1995	Buffalo	Details unknown
199x	Elephant	University of Zimbabwe Professor walking alone at around 18:00 hours
2001	Elephant	Belgian tourist walking alone between lodges and Office at about 15:00 hours. Walked into a breeding herd
2006	Crocodile	Unprovoked attack on a canoe around 17:30 hours. Young girl taken from the canoe.
2006	Elephant	Zimbabwean resident (German) alone at parking area at around 13:00 hours. Was in front of a breeding herd

### Educational Trips

There are regular school trips into the park but a number of these come completely unprepared and find themselves stuck at Nyamepi with nowhere to sleep and no food. Education of future generations is one of the specific objectives of the Parks and Wildlife Estate as outlined in the policy and more needs to be done to ensure that the possibility of school visits is more organised.

In addition, the park can provide an opportunity for wilderness leadership courses which are important for character building of executives and future leaders of the country.

**Table 23: Summary of accommodation facilities in Mana Pools**

	<b>Site</b>	<b>Type</b>	<b>Beds</b>	<b>SubTotals</b>	<b>Fees Int</b>	<b>Fees Regional</b>
<b>Camps</b>	Rukomechi	Safari Camp	12	76		
	Vundu	Safari Camp	12			
	Vine	Extended Temporary Camp	12			
	Goliath	Extended Temporary Camp	12			
	Chikwenya	Safari Camp	16			
	Croton	Extended Temporary Camp	12			
<b>PWMA Lodges</b>	Nyati	PWMA Lodge	4	28	146	110
	Hippo	PWMA Lodge	4		146	110
	Mubvee	PWMA Lodge	4		146	110
	Musango	PWMA Lodge	8		280	210
	Muchichiri	PWMA Lodge	8		280	210
<b>Operator Sites</b>	Mucheni 1	Operator Exclusive Campsite	12	60	15	11
	Mucheni 4	Operator Exclusive Campsite	12		15	11
	Old Ndungu	Operator Exclusive Campsite	12		15	11
	New Ndungu	Operator Exclusive Campsite	12		15	11
	Chitake	Operator Exclusive Campsite	12		15	11
<b>Public Sites</b>	Gwaya	Public Exclusive Campsite	12	96	15	11
	Mucheni 2	Public Exclusive Campsite	12		15	11
	Mucheni 2	Public Exclusive Campsite	12		15	11
	Old Ndungu	Public Exclusive Campsite	12		15	11
	New Ndungu	Public Exclusive Campsite	12		15	11
	Chitake	Public Exclusive Campsite	12		15	11
	Chitake 2	Public Exclusive Campsite	12		15	11
	Nkupe	Public Exclusive Campsite	12		15	11
	Nyamepi	Public Campsite	174		174	10
<b>Canoe Sites</b>	Chessa	Canoe Campsite	12	48		
	Vundu West	Canoe Campsite	12			
	Nyamfuse	Canoe Campsite	12			
	Ilala	Canoe Campsite	12			
			<b>TOTAL</b>	<b>470</b>		

Camping Beds = 330  
Lodge Beds = 94 (28%)

**Figure 49: Tourism facilities in Mana Pools National Park**

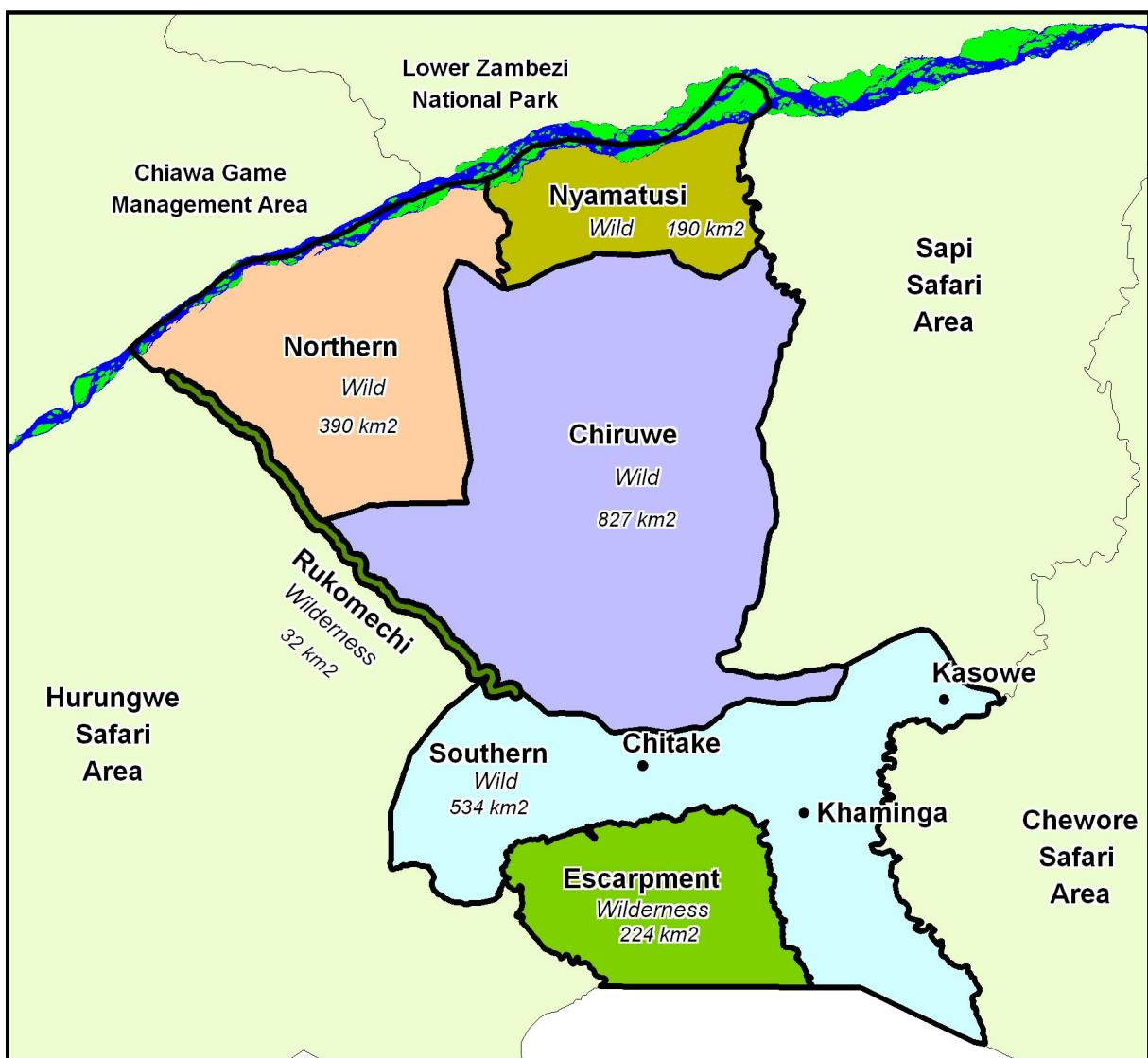


### 3.3.3 CURRENT ZONING FOR MANA POOLS

Zone Type	Comments
Special Protection	For the protection of sites that have unique, unusual or otherwise important features
Wilderness	Typically restricts any development. Roads kept to a minimum and mainly for access, rather than game-viewing. Walking often the main type of activity
Wild/ Low Use	A step-up from wilderness in terms of use. Mainly because some countries have a formal definition of a wilderness area and it can complicate the issue if some developments are proposed.
Development	Usually refers to park headquarters or similar area. However, developments zones often end up so small that they complicate the zone descriptions and management

The Parks and Wildlife (General) Regulations have special provisions relating to Wild Areas and Wilderness Areas ( Section 14 and 15). In addition, Section 40 details special provisions relating to leased areas.

**Figure 50: Current Zone Plan for Mana Pools**



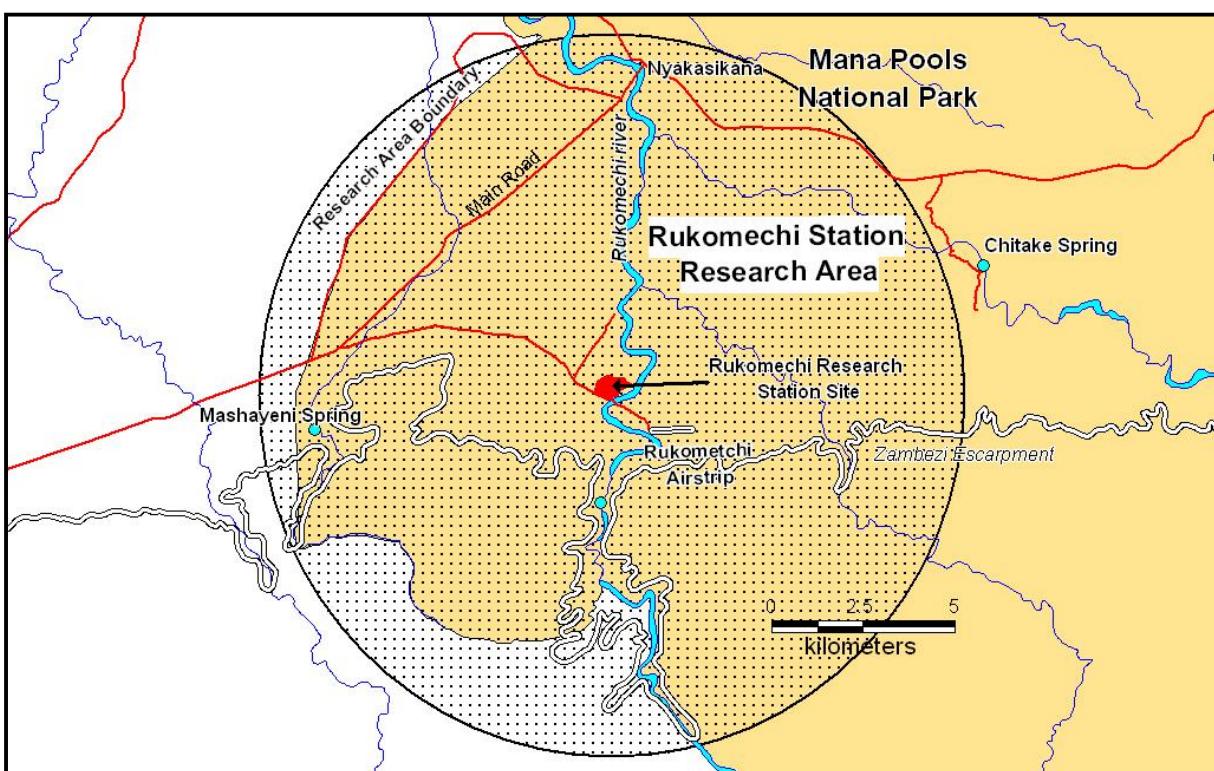
### 3.3.4 RUKOMECHI RESEARCH STATION

The control of tsetse flies has been an ongoing saga in Zimbabwe and many other African countries since the early part of the 20<sup>th</sup> century. The fly and the disease it carries was virtually eliminated by the rinderpest epizootic of the late 1800s but had largely recovered by the 1920s, leading to the use of various control methods. These included the removal of large herbivores (either all or selective by species) vegetation clearing (either all or selective by habitat), ground and aerial spraying.

Rukomechi<sup>3</sup> Research Station was established in the late 1950s to assist the refinement of these techniques, to resolve the controversies that surrounded some of them, and to develop new methods for controlling and surveying the flies. The nucleus of the station buildings was the old Rukomechi Mission (a satellite of Sanyati Baptist Mission) which had been made redundant by the resettlement of people out of the valley and up to the Mukwichi Communal Land.

Although records were not located it appears that the research station was approved by the then Department of National Parks and Wildlife Management. At this time the site would have been in the Urungwe non-hunting area. The agreement gave the station the right to perform its research activities within a six mile (10km) radius. The research team was permitted perform experiments, deploy equipment, develop access and maintain a small herd of domestic and game animals. To ensure that hunters did not interfere with these activities an area to the west of the Rukomechi River was incorporated into the park in 1968 (Vale, pers. comm.; Figure 51).

**Figure 51: Rukomechi Research Station in the context of Mana Pools**



The station was the centre of groundbreaking research in the 1960s and 1970s before being abandoned in the late 1970s because of the Zimbabwean Independence struggle. As soon as peace had returned the station was reopened and received funding from the European Union as part of a regional tsetse eradication programme. By the mid-1980s the centre was recognised as perhaps the foremost entomological research station in Africa. The greatest achievements of the station have been

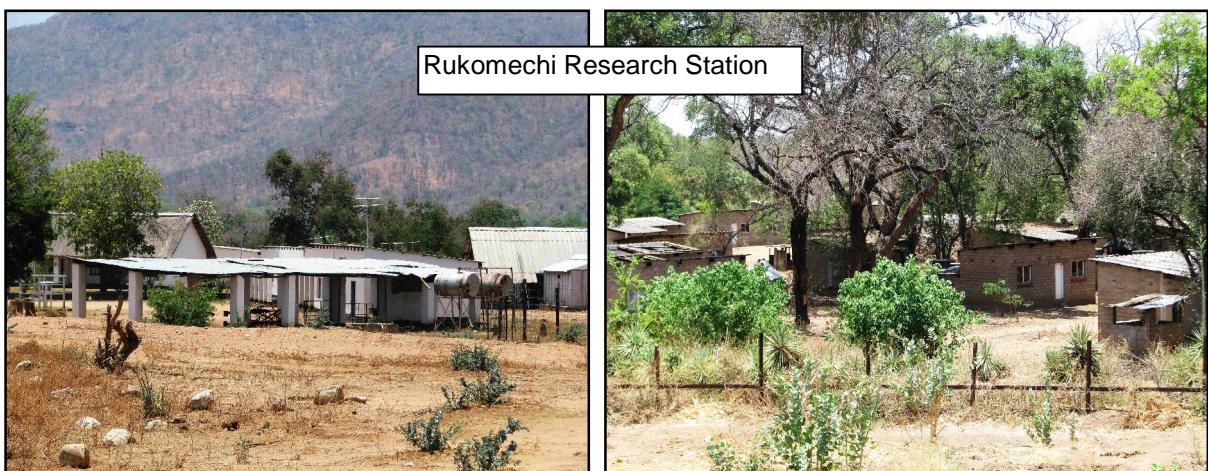
<sup>3</sup> The spelling of Rukomechi generates some discussion. In all scientific papers originating from the station the spelling is Rekomitjie

the refinements to bait technology, allowing baits to be offered as cost effective alternatives to the broadcasting of insecticides.

It is generally believed that Rukomechi Research Station changed the understanding of tsetse control and was instrumental in ensuring that the currently accepted methods of combating the fly are widely used. Research at the station has resulted in over 200 refereed scientific papers, medals, awards and other honours from scientific and environmental organisations and from Governments. In addition the station and its research was the subject of several documentary films, including two in the BBC Horizon series.

The Station currently appears to be in “caretaker” mode with little ongoing research over the last year. In December 2008 there were nine staff in residence and the site had an air of general neglect. The cattle herd was still maintained. However, since the beginning of 2009 additional staff have been posted to the station and some research appears to be underway.

**Figure 52: Rukomechi Research Station**



### 3.3.5 OTHER GOVERNMENT DEPARTMENTS

In addition to the presence of the Veterinary Department, several other Government institutions have established themselves inside the Mana Pools National Park. These are outlined below.

**Roads Department:** Roads Department has established a semi-permanent presence (tin houses) at the site of the old Roads Department camp at Nyakasikana gate.

**ZINWA:** Have staff and pumping station and storage tanks at Nyamepi. ZINWA uses approximately 25% of the fule allocation for the station.

**Police:** Have a police post at Nyamepi.

**Figure 53: ZINWA and Police infrastructure at Nyamepi**



### 3.3.6 NON-GOVERNMENTAL ORGANISATIONS

Several Non-Governmental Organisations are active in Mana Pools. They are listed and their aims briefly outlined below (Table 24)

**Table 24: Non-Governmental Organisations with interests in Mana Pools**

Non-Governmental Organisation	Brief Description
<b>Zambezi Society</b>	The Zambezi Society is committed to initiating rapid, well informed and effective action <ul style="list-style-type: none"><li>• to maintain the Zambezi River Basin's variety and abundance of species and ecosystems.</li><li>• To conserve Zambezi Wildernesses and promote the recognition of their values</li><li>• To ensure that conservation is incorporated in planning for the Zambezi river system</li><li>• To encourage people to find ways of using the natural resources of the Zambezi Basin without destroying them</li></ul>
<b>Ian Nyschens Trust</b>	Formed in 2006. The Trust will provide qualified experts, equipment and funding to carry out research in Mana Pools. Focal areas for this research include predators and fire.
<b>Friends of Mana</b>	?

## 3.4 USE AND INCOME OF THE SAFARI AREAS

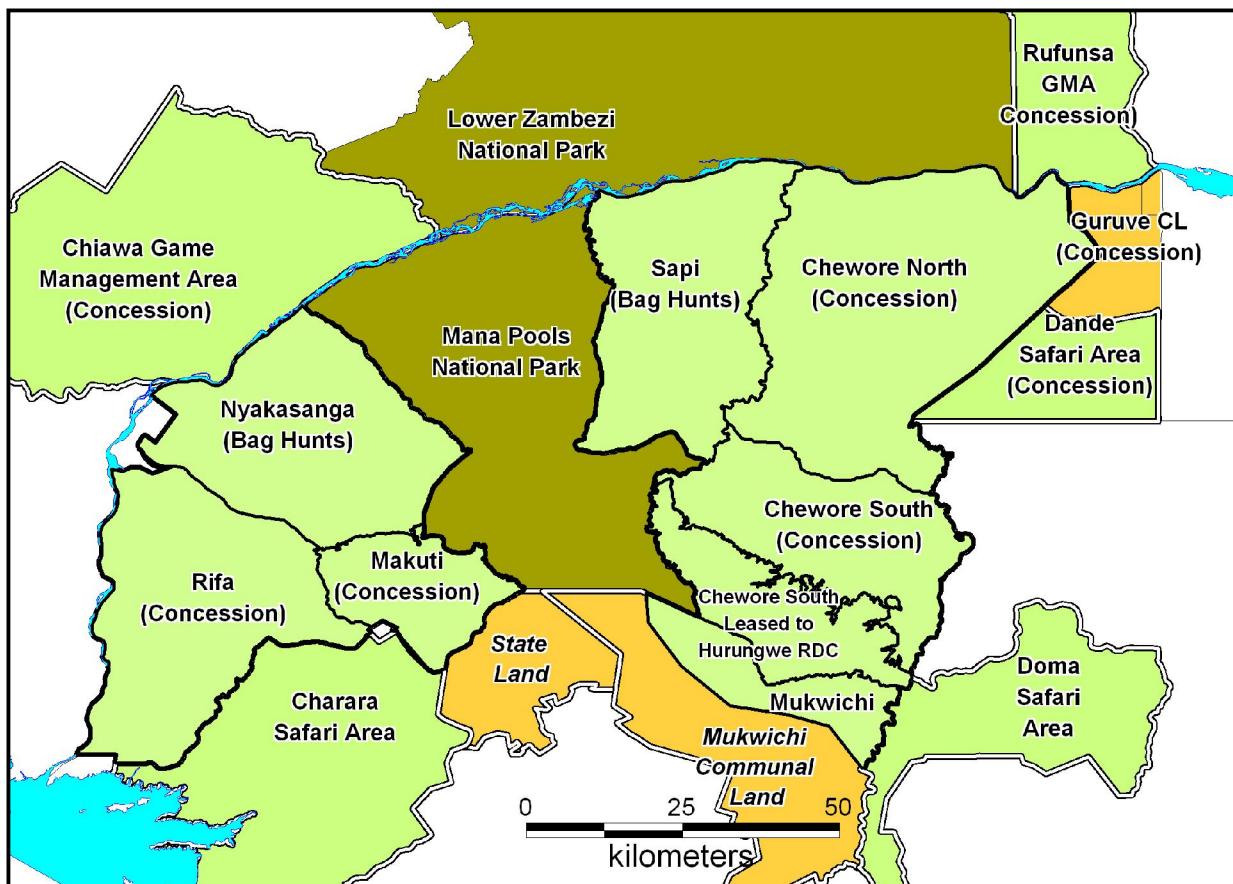
### 3.4.1 PHOTOGRAPHIC TOURISM

As discussed in Section 3.3.2 there are two up-market photographic camps in the Safari Areas adjacent to Mana Pools National Park. These are Chikwenya in the Sapi Safari Area and Rukomechi in the Nyakasanga section of the Hurungwe Safari Area. In addition there are several camps along the shoreline of the Sapi Safari Area that are used for photographic tourism and fishing safaris.

### 3.4.2 SAFARI HUNTING – QUOTAS, USE AND INCOME

Safari hunting takes place in all the Safari Areas surrounding Mana Pools. The Sapi Safari Area and the Nyakasanga section of the Hurungwe Safari Area are used for “bag hunts” where hunting time is auctioned annually in 10 or 14 day time blocks and each hunt is allocated a bag. The escarpment area of the Hurungwe Safari area around Makuti is auctioned as a block concession. The Chewore Safari Area is subdivided into two concessions (north and south) which are auctioned for a five? year period. In addition hunting occurs in the Mukwichi Communal Land. A portion of Chewore South (above the 600 m contour line) has been leased to the Hurungwe Rural District Council to allow the Mukwichi hunting concession to be economically viable. Hunting is also permitted in the Chiawa and Rufunsa Game Management Areas in Zambia (Figure 54).

**Figure 54: Hunting Blocks in the Mana Pools Area**



The philosophy behind the auction hunts was to allow citizens access to big game hunting. However, there are reports that the hunts are being used for foreign clients and hence are not fulfilling their original purpose. For example, all Sapi bag hunts were purchased by Chifuti Safaris in 2005. In addition, the sale of auction hunts has little accountability as the “lease” is for two weeks

**Table 25: Quotas for Nyakasanga and Sapi Sections**

<b>Bag Purchase</b>	<b>Nyakasanga</b>	<b>Sapi</b>	<b>Extra Animals</b>	<b>Nyakasanga</b>	<b>Sapi</b>
Leopard	4	0	Elephant Bull	7	5
Buffalo Male	42	31	Elephant Tuskless	4	4
Buffalo Female	9	9	Lion Male	1	1
Hippo	5	9	Lion Female	2	1
Warthog	9	0	Leopard	8	4
Hyena	33	31	Crocodile	6	6
Waterbuck Female	4	0	Buffalo Male	8	0
Impala Male	176	44	Buffalo Female	0	2
Impala Female	135	40	Hippo	4	3
Duiker	42	31	Kudu Male	0	6
Grysbok	42	31	Kudu Female	2	2
Baboon	168	199	Zebra	3	5
			Waterbuck Male	3	5
			Waterbuck Female	0	4
			Nyala	0	2
			Impala Male	20	6
			Impala Female	20	10
			Bushbuck Male	3	2
			Warthog	5	2
			Hyena	5	
			Jackal	4	4
			Baboon	2	

**Table 26: Chewore North and South quotas for main species**

<b>Species</b>	<b>CHEWORE NORTH</b>			<b>CHEWORE SOUTH</b>		
	<b>Fixed</b>	<b>Optional</b>	<b>Total</b>	<b>Fixed</b>	<b>Optional</b>	<b>Total</b>
Elephant				6	3	<b>9</b>
Elephant T/L				6	9	<b>15</b>
Buffalo-F				15	10	<b>25</b>
Buffalo-M				50	20	<b>70</b>
Leopard-M				6	6	<b>12</b>
Lion				4	2	<b>6</b>
Lioness				0	0	<b>0</b>
Eland				2	3	<b>5</b>
Impala-F				30	30	<b>60</b>
Impala-M				50	30	<b>80</b>
Bushbuck				10	6	<b>16</b>
Kudu-M				12	6	<b>18</b>
Waterbuck-M				6	6	<b>12</b>
Zebra				8	6	<b>14</b>
Sable				4	2	<b>6</b>

Need quotas for Rifa, Makuti, Charara

Marongora manages Sapi, Nkasanga and Rifa.  
Kapirinengu manages Chewore North and South??



## CHAPTER 4: MANAGEMENT PROBLEMS AND ISSUES

### 4.1 INTRODUCTION

Any discussion of problems and issues facing the Mana Pools National Park cannot ignore the current political and economic problems facing Zimbabwe as a whole. The country has gone into serious economic decline which seriously affects the operational capacity of the Parks and Wildlife Management Authority which, in turn, affects the management of the national park.

### 4.2 IDENTIFICATION

Problems and issues were identified by stakeholders at the initial meetings. They were further refined during the working group meetings and the compilation of the Resource Inventory documents.

### 4.3 DESCRIPTION

The following pages briefly describe the identified issues and concerns for Mana Pools. They are broken down to fit the appropriate management programmes.

#### 4.3.1 BIODIVERSITY ISSUES AND CONCERNS

**Table 27 : Biodiversity threats, issues and concerns**  
(Stars indicate a measure of importance)

Threat Issue/Concern	Description
Changing ecology esp. floodplain, including river flows, floods, <i>F. albida</i> *****	<p>The middle Zambezi is a dynamic system and change can be expected. Wildlife numbers in the park have increased since the area was proclaimed a national park and this build up has had a detrimental effect on the vegetation in certain areas. In addition, it is likely that fires have decreased partially due to active discouragement by the ZPWMA and partially because the fire load has been removed by the increased numbers of large herbivores.</p> <p>The alluvial floodplain, with its charismatic <i>F. albida</i> trees, has been affected by these changes. Increased herbivory results in suppressed regeneration of the albida trees. In addition, the existing trees come under pressure from elephants and other animals (although there are theories that elephant are the only animals which affect <i>F. albida</i>). It is likely that many trees found in this area are of a similar age and some may be approaching the end of their "life span". The continued existence of the floodplain in its current state is a cause for concern. Encroachment by <i>Croton megalobotrys</i> has also been mentioned as a cause for concern in some areas, but this is usually limited to alluvial areas related to tributaries of the Zambezi. In addition, elephants have little impact on <i>Trichelia emetica</i> and this could mean a gradual change in the alluvial woodland from <i>F. albida</i> to <i>T. emetica</i> and other unpalatable woody plant dominance.</p> <p>The altered flow patterns of the Zambezi river because of the upstream dams and water management systems is also a cause for concern. There is some disagreement on the regularity of flooding of the alluvial area away from the river at Mana prior to construction of Kariba Dam, but it certainly happened more frequently than it does now. This will have had a marked effect on the ecology of the area.</p>

**Table 27 : Biodiversity threats, issues and concerns**  
 (Stars indicate a measure of importance)

Threat Issue/Concern	Description
Insufficient Resource Information ****	<p>Much of the available information for the area is based on research carried out in the 1970s and 1980s. Since that time research has been limited to surveys for large mammals (as part of a wider aerial survey) and hippo and crocodile counts of the Zambezi river. However, a long-term study on lions was initiated in 1996 and has recently been completed. Many major questions regarding the behaviour, numbers and dynamics of important species remain unanswered. There is a body of “grey” literature at Mana Pools but this needs to be analysed.</p> <p>Very little information exists for rare and endangered species found in the valley. This includes wild dog, nyala, crocodile. etc. A leopard survey is expected to be carried out by Zambezi Society in 2009</p>
Exotics ***	<p>A number of exotic species are found in the park. The most visible of these is the water hyacinth. A number of exotic terrestrial weeds are found but exotic trees have nor been recorded. On the aquatic front <i>Tilapia niloticus</i> has found its way into the river and has been quite successful.</p>
Overstocking carrying capacity/uneven wildlife distribution**	<p>A significant percentage of Mana’s wildlife ends up on the floodplain and close to the river during the dry season. This concentration of wildlife has a huge effect on the area and represents an overstocking problem for a few months of the year. Mention must also be made of the hippo who also rely on the grazing available on the floodplain throughout the year.</p>
Poaching**	<p>Poaching is a perennial problem in protected areas in Africa. It usually takes two main forms – meat and trophy poaching. The Zambezi Valley suffered heavily from trophy poaching in the 1980s and all rhino were either poached or translocated. The park is fortunate in that it is at the centre of a protected area complex and that poaching has not has a serious impact on the wildlife populations – the black rhino being a notable exception. Currently the only trophy poaching in Mana Pools is for elephant, with both from cross-border and local poachers being involved. Between 10 and 20 animals are killed annually.</p> <p>Meat poaching was formerly called “subsistence” poaching and is probably more of a threat in the long-term as it targets all types of animals. It also has a tendency to move from being carried out for subsistence reasons to a commercial level. The levels of meat poaching in the park are not high at present there is evidence that it increases during the rains when patrol effectiveness is less.</p> <p>Cross-border fish poaching is also a cause for concern. Netting is permitted in the waters adjacent to the Chiawa Game Management Area and fishermen have been known to cross into Zimbabwean waters. In addition, even if they remain on the Zambian side they are depleting a shared resource. As there is a fuel shortage and the boat has been without an engine for some time and therefore control of this form of poaching has not been adequate.</p>
Mining and Panning	<p>There are reports that prospecting and extraction permits are being issued for gold and gemstones in the Mukwichi Communal Land. Some of these people are already venturing into the southern part of the park and there are fears that once a “gold rush” starts it could have catastrophic consequences to this remote part of the park.</p>
Mines (Zambia)	<p>Prospecting (which may be followed by mining) is permitted in the Zambian protected areas. There is a strong possibility that an opencast copper mine will be developed in the Chiawa GMA and also gold and copper possibilities in the Lower Zambezi National Park.</p>

**Table 27 : Biodiversity threats, issues and concerns**  
(Stars indicate a measure of importance)

Threat Issue/Concern	Description
Overuse of biological resources	The core area – the alluvial floodplains - of Mana Pools is less than 100km <sup>2</sup> and virtually all tourism activities take place here. The concentration of the activities in this small part of the park can result in the overuse of biological resources. This can be seen as overuse of firewood and degradation of the tourist sites.
Dam development threats	The Mupata Gorge dam has the potential to drown the alluvial floodplains for which the park is famous. Although the dam plans have been shelved for now, development pressures could see its resuscitation.
Possible tourist hunting threat	Zimbabwe legitimised trophy hunting for elephants in its national parks under the umbrella of elephant control. This created an international outcry and it has subsequently been stopped. Although it did not occur in Mana Pools there were indications that it was considered and more recent information suggests that the possibility is again being considered for 2009.
Ration and training hunting	Ration hunting to supplement staff food requirements has been carried out in Zimbabwean Parks for a number of years. In addition, some animals are shot to allow staff to gain experience in the hunting of dangerous game. There are opinions that hunting of any sort should not be permitted in National Parks.
Pollution	Pollution of the river resulting from poor agricultural practices upstream is a threat. In addition, sewage runoff from towns such as Chirundu, Siavonga and Kariba must also be considered.
Climate variability	The rainfall in the mid Zambezi valley is very variable and this has a huge effect on the primary productivity of the area. Climate change (as opposed to seasonal variations) is also a threat to viability of the area.
Erosion (river, inland)	<p>Erosion is a very real threat to the park. The flow regime of the Zambezi has been changed by the Kariba Dam and by the regulation of the Kafue river. This may mean improved bank stability – until the Kariba floodgates are opened. Erosion of the banks is seen in many places and is currently threatening the old Rukomechi camp and the Nyamepi campsite. Liaison with river management authorities is expected to be a way of discussion possible mitigation of these effects.</p> <p>Erosion from boat wake is thought to be a threat on the Zambian side of the river but this has yet to be quantified</p> <p>Erosion on the inland rivers does occur but this is generally seen to be a natural process and part of a dynamic system. However, erosion resulting from human activities, and especially roads, is a cause for concern. This usually results from poor alignment of the road and inadequate maintenance. The bridge on the Rukomechi at Nyakasikana is a cause for concern as there is the possibility that it could be breached by erosion at its northern end.</p>
Use of croc resource	<p>Permission has recently been granted for collection of crocodile eggs and capture of breeding stock from Mana Pools. The egg collection permit is issued as “research permit” and the results of this collection need to be made available as soon as possible. There is concern as to how long this research will continue and to its actual purpose. However, it is noted that collection of eggs and live animals is permitted on the Zambian side of the river. The effect of this type of utilisation on population dynamics is unknown.</p>
	<p>In the case of breeding stock collection the ZPWMA authority is finding itself in a compromised position of being the both the regulator and user of the resource.</p>

**Table 27 : Biodiversity threats, issues and concerns**  
 (Stars indicate a measure of importance)

Threat Issue/Concern	Description
No rhino	The rhino has been extirpated from the middle Zambezi valley. There are plans for a reintroduction in the Lower Zambezi National Park in Zambia but for this to be successful it needs to be accompanied by improved protection.
Uneven water distribution	In the dry season water is available at the Zambezi river/Mana Pools and at a few springs near the escarpment (Chitake, Kasowe and Khaminga). There is no water available anywhere else in the park. In good years some of the larger pans will hold water until the end of August.
Planning needs to be for entire valley	When dealing with mobile megaherbivores such as the elephant, management needs to take into account the wider area. Plans to manage elephant in only part of its range (e.g. Mana Pools) are a short-term view. The same principle will apply for all aspects of ecological management.
Elephants and woodlands	Elephant numbers have probably increased since the beginning of the century and elephants have extensively modified some vegetation types. The <i>Brachystegia</i> woodlands on the escarpment hills have been most affected, with elephants having pushed over many of the canopy trees and annual hot fires preventing or greatly reducing the growth of small woody plants into the canopy layer. Elephants have also modified patches of <i>Colophospernum mopane</i> woodland on the valley floor, especially on sodic soils adjacent to the Zambezi alluvium. The Jesse thickets have also been under heavy pressure from elephants as have the <i>Faidherbia albida</i> woodlands. Some areas of Jesse have been severely modified through elephant pressure.
Fire	It is believed that fires were more extensive on the valley floor in the past than they are today. Analysis of satellite data for fires indicates that there are remarkably few fires on the valley floor. What are the implications of this?
Degraded Mopane woodland	In certain areas of the park, usually just off the alluvial areas there are badly degraded areas of mopane woodland. Usually found on sodic soils the causes of this are not fully understood but theories regarding the leaching of minerals to the surface associated with clay areas have been put forward.
Undue pressure regarding resource management from outside	There has been pressure from operators with regard to the active management of resources, especially fire and predators. This pressure led to the ZPWMA authority assigning an ecologist to research the lion population in the 1990s. This study has recently been completed and refutes the claims made by the operators but the pressure still continues.
Siltation of pools	The pools at Mana, including Long Pool are silting up. In addition a number of the larger pans are also silting up. This decreases their ability to hold water into the dry season.
Tourism over development	Excessive and inappropriate development of tourism facilities has the potential to impact on the environment and the wilderness quality of Mana Pools
Gold Panning	There are recent reports that gold panning is being encouraged in the Mukwichi Communal Land. This activity has already spilled over into the park along the Mvurameso River.
Fossil Sites	There is a single known fossil site in the Park. Currently under investigation by the National Museums, the ZPWMA management needs to have some policy or regulations regarding the site.

#### **4.3.2 TOURISM ISSUES AND CONCERNS**

**Table 28 : Tourism threats, issues and concerns**  
(Stars indicate a measure of importance)

<b>Issue/Concern</b>	<b>Description</b>
Erosion of wilderness values**	Wilderness is a difficult quality to define, mainly because it is so subjective. However, it is a quality that is becoming more and more valuable with time and Mana Pools does have it. But it is very easy to erode the quality of the wilderness with inappropriate developments such as roads and tourism facilities, some of which may be beyond the control of the Authority. For example, tourism development on the Zambian side of the river have eroded the quality of the wilderness on the Zimbabwean side.
Habituated wildlife **	In some areas the numbers of tourists mean that wildlife can become very familiar with people. Notable areas where this occurs are the floodplain at Nyamepi and at Chitake springs. Several fatal incidences are on record.  In addition, canoeing safaris are at risk from crocodile and hippo attack and again, at least one fatal incident is on record.
Wildlife pests	Baboons, monkeys and hyenas. All of these animals have become habituated to humans and steal food from visitors and staff or feed on the rubbish pits. Primates are a particular problem in the ZPWMA lodges and they can cause significant damage to the furnishings and fittings. Elephants have also been regarded as a pest in the past and were known for stealing food from cars.
Pressure for prime sites** Commercialisation of tourist threat	There is pressure for tourist sites to be allocated along the Zambezi River. Owing to the current political and economic situation in Zimbabwe this pressure is not as great as it will be once the country's problems have been resolved. Now is a good time to be defining limits of use
Harsh conditions for tourist (interior)**	Away from the river, Mana can be a harsh environment for tourists. The interior has a significant number of tsetse flies, water is non-existent in the dry season, the heat is intense and shade is limited. All of these factors make much of the interior an unappealing place for tourism.
Current low levels of tourism	Owing to the current political and economic situation in Zimbabwe there are relatively low levels of tourism in Mana Pools. This affects the income to the Authority and its ability to manage and maintain the park.
Inadequate tourism planning	There has been inadequate planning for tourism in Mana Pools. The park has been operating without a ratified management plan since it was established and tourism develop has often been at the whim of individual wardens.
Not enough accommodation	The demand for accommodation in Mana Pools is significant at certain times of year. The ZPWMA lodges operate at 90% occupancy for most of the year and the operator campsites are often fully booked between July and October. There is a need for more accommodation facilities in the Park.
Poor marketing (coordination)	There is no coordinated marketing approach for Mana Pools and the Zambezi valley as a tourist destination.
Short Tourist Season	The main tourist season is between July and October when at least 80% of visitors come to the park. During the wettest period (effectively five months) the park has virtually no income. This is a serious problem given the ZPWMA remit of being self sustaining in financial terms and each park having to generate its own income. Investigations of methods to extend the season during which people will utilise the park need investigation.

**Table 28 : Tourism threats, issues and concerns**  
 (Stars indicate a measure of importance)

Issue/Concern	Description
Unsynchronised tourism activities with Zambia	Since 1990 there has been an unregulated proliferation of tourism facilities in the Chiawa Game Management Area in Zambia. Many of these are running generators and the extent of light pollution is significant. In addition, motor boating is permitted on the Zambian side of the river.
Possible tourist hunting	The ZPWMA allowed trophy hunting for elephant in Hwange NP and it was being considered for Mana Pools. Concerns have been expressed about this type of activity in a national park, even though it is expected to occur away from the floodplain and tourist areas.
Control of tourists	Once tourists have entered the park there is little control. There are instances of people camping in undesignated sites, other cases of people entering the park through undesignated roads, hence avoiding paying entry fees etc.
Conflicts ZPWMA /Private operators	There are a number of conflicts between the ZPWMA and private operators but these are addressed at an annual meeting between the Area Manager for Mana Pools and the tour operators.
Extended use of Operator Sites	Currently continuous use of an operator exclusive camping site is limited to three weeks . There are four exclusive sites in the Park and operators move between the sites to run their businesses on an almost continuous basis. It means that staff are also accommodated on site and generators have been seen to be in operation on occasions.
Tourism data not detailed enough	Data on visitors, and vehicles is collected at the Mana office. However, data on lodge and campsite occupancy, canoe visitors would help to build a more complete picture of tourism in the park. In addition, analysis of the tourism figures from different angles (e.g. origin data) reveals inconsistencies in the existing data.
Tourism fuelwood	There is a huge demand for fuelwood by both visitors and staff and, once the political and economic situation improves, this demand is set to grow. Regulations regarding the use of wood need to be made.
Campsite Locations	Some riverside campsites are very visible. Perhaps the most visible of these is currently unused (the BBC site) Two campsites are located right on the water at Chitake springs. In addition these sites have no ablution facilities
Non Standardised leases	Leases issued for areas inside the park are not standardised. The length of the lease the areas involved and the conditions differ. Some leases do not specify sizes and other allow activities that are prohibited under the park regulations.
Exclusive zones	There are several leases that allow exclusive use of parts of Mana Pools. Some of these cover already existing camps and park access roads and are clearly not tenable. There has been some "Gentleman's Agreements" between park management staff and lease holder but these agreements need to be made legally binding.
Temporary Extended Camps	The temporary extended camp is an "evolved" category of accommodation within the parks estate. Essentially it is the same as an Operator Exclusive Site but the incumbent is permitted to remain on site for the duration of the season. Issues regarding allocation, leases and length of tenure may well become problems in the future.

<b>Table 28 : Tourism threats, issues and concerns</b> (Stars indicate a measure of importance)	
<b>Issue/Concern</b>	<b>Description</b>
Poor communications HQ and Field	Although essentially a management problem it manifests itself through problems with management of tourism. ZPWMA HQ issues leases without consultation on the ground.
Negative perception of Zimbabwe	Zimbabwe is not high on the list of desirable tourism destinations because of the negative publicity surrounding the country. Tourism has slumped and recently this has been exacerbated by the current global recession.
Bank vs street money rates	Unless a business has been approved by the Reserve Bank all charges for citizens and residents need to be made in Zimbabwe dollars. The huge discrepancy means that some camps are selling US\$ 300 rooms for the equivalent of US\$0.30. It is clearly impossible to run a business at these rates. However, recent events during 2009 where Zimbabwe now operates with US\$, make this issue largely redundant.
Auction Hunts	Auction hunts, sold in 10 or 14 day lots, are the management strategy for the adjoining Sapi and Hurungwe Safari Areas. There are no qualifications required to bid in the process and there is little accountability. However, in recent years it seems that the hunts are block-bought by safari operators and the area run as a hunting concession.
Poor tourist Information	Some information is available for tourists at the Nyamepi HQ courtesy third-parties (e.g. Zambezi Society). There is a need for this to be updated and expanded. In addition, an interpretive centre could help inform and educate visitors about the wonders and dangers of the area.
Uncompetitive pricing	ZPWMA has recently increased its pricing for accommodation in parks to high levels. This also includes pricing for residents and citizens which now puts the parks out of reach of Zimbabweans. Foreign visitors have expressed concern that they do not receive value for money at the current pricing as the lodges often have no gas and the condition is poor.
Tourist Camp Administration	Chikwenya Safari Camps falls under the management of Marongora and not Mana Pools. This causes complications for on the ground field management as the camp uses Mana Pools for some of its activities.
Staff Fees	All staff associated with the Exclusive Use Campsites are required to pay entry and camping fees. Operators fear that with the new fee structure this will adversely affect their business.

### 4.3.3 MANAGEMENT ISSUES AND CONCERNS

Several of the management issues and concerns described below are a direct result of the current economic and political situation in Zimbabwe. We all believe that this will be a temporary situation and that there will be a return to normality at some point in the future.

In the context of management planning this has some implications. Some management activities may be devised to address the current situation but these may be short-term solutions and their long-term application may not be in the Park's best interests. For example, fishing and ration hunting may allow the staff to survive a very dire situation but, if uncontrolled, it has the potential to develop into something that will bring a new set of problems.

**Table 29: Park Management Issues and Concerns**

(Stars indicate a measure of importance)

Issue/Concern	Description
Poor infrastructure *****	<p>Road access to the park is reasonable but the surface of the main access road can be degraded. Currently the section to the Nyakasikana Gate is in bad condition. However, most other roads in the park become unusable in the rains.</p> <p>The staff housing at Nyamepi is in variable condition but it is probably fair to say that many of the structures need to be upgraded or repaired. In addition, if staff numbers are increased there will be insufficient accommodation units at Nyamepi. Workshops, offices, the laboratory and other ancillary buildings are also in need of repair and upgrade.</p> <p>The condition of the tourist accommodation is also poor but this problem is addressed under the tourism programme.</p>
Insufficient resources *****	<p>Most businesses in Zimbabwe are struggling under the current economic situation and the ZPWMA is no exception. This has a direct bearing on the resources available to run and maintain the park. Fuel delivered to the station is very limited, vehicles are few and equipment has fallen into a state of disrepair.</p> <p>Related to the problem of insufficient resources is the problem of ensuring that the earnings of the park are correctly credited. Some of the Mana income is reflected in the income of Victoria Falls while other income reflects in the income accruing to the Marongora station. It was difficult to determine the true income of Mana Pools and this has ramifications, especially as the ZPWMA requires that individual parks strive for financial self-sustainability.</p> <p>In addition, there is mis-allocation of resources. Approximately 60 to 70% of the ZPWMA expenditure is believed to be on non conservation related activities. This is an authority-wide problem rather than just being specific to Mana Pools.</p>

<b>Table 29: Park Management Issues and Concerns</b> (Stars indicate a measure of importance)	
Poor communications ***	<p>Communication routes between the Mana Pools HQ and the outside world are poor. The land-line ceased operation at least a year ago and there is only sporadic cell phone communication. The radio link to ZPWMA HQ in Harare and other offices (e.g. Chinhoyi and Marongora) is unreliable and is operational for around 85% of the time. Some of the problems are caused by unreliable power at Makuti.</p> <p>Poor physical communications between the HQ, the Regional Office and the Field Stations results in a number of other problems, some of which are discussed below.</p> <p>At the local level there is no communication on the hand-set radios once patrol staff are in the field. There are indications that this is a relatively easy problem to resolve but it has resulted in the very unsatisfactory situation where, once field staff are on patrol, they are unable to communicate with Nyamepi in case of emergencies.</p>
Inadequate consultation between HQ and field	<p>In many wildlife agencies there is often poor communication between the headquarters and the field management staff and the ZPWMA authority is no exception. Field staff feel that they are not sufficiently consulted before decisions are taken at HQ especially with regard to tourism. Leases are issued with inappropriate clauses which make field management of the situation difficult.</p>
Roads	<p>Much of the present road network was put in place in response to the demands of tourism and are some have poor alignment or are on inappropriate soils. Some of the management access roads exhibit bad erosion often caused by poor alignments. Some of the river crossings are erosion hazards.</p> <p>The Ministry of Roads assumes responsibility for the road between the main tar road to Zambia and Kanyemba. Inside Mana Pools part of this road is known as the "Security Road". All maintenance should be carried out by the Ministry and there are cases on record of them refusing ZPWMA to carry out repairs or maintenance on this road. The condition of this road is usually poor.</p>
Insufficient staff	<p>Staff numbers are currently around 50 people. Ideally the station should have between 60 and 70 staff to function effectively. Accommodation, equipment and resources for extra staff will be an issue as well. The current water and sewage systems at Nyamepi may need to be upgraded.</p>
Low morale	<p>Staff morale is low and much of this can be attributed to the current economic situations. Salaries cannot keep up with inflation, money is not accessible, food is in short supply. Staff currently spend a significant part of each month queuing to collect their wages. Since this was initially written staff income has dropped to such a level that they could be considered to be working without pay. Subsistence allowances, paid for patrolling, are often not collected as they are valueless.</p>
Firewood	<p>Most of the cooking and heating of water for staff is done using firewood. This is a year round demand. In addition, firewood is in demand by tourists for cooking and heating water – which is largely a seasonal demand. This wood is collected from the ground in the mopane woodlands. No new trees are cut. However, it represents a significant amount of nutrient removal from the woodlands and there suggestions that extensive firewood collection has contributed to the degraded mopane woodlands found in the vicinity of Nyamepi.</p>

**Table 29: Park Management Issues and Concerns**  
 (Stars indicate a measure of importance)

Power	Electricity for the station is currently supplied by generator. Present circumstances mean that there is seldom enough fuel to run it to provide power. In addition generators are not permitted in the park for the general public. A related problem for a station without power is to charge batteries for radios, GPS, computers etc and this is currently done with solar panels. Electrification of Mana through the rural electrification programme is a possibility but this has been put on indefinite hold due to the current economic circumstances.
Staff Fishing	Bag limits for fishing are set at 6 fish per day and the method of capture is restricted to rod and line fishing. This limit and the restrictions are also extended to staff and members of their families. In the current economic circumstances fishing is a survival strategy practiced by the staff and it means that fishing pressure in the vicinity of Nyamepi may be considerable. Some idea of numbers and species being removed could help to clarify the situation. There also complaints by tourist about staff fishing in front of accommodation units.
Excessive development	There are considerable developments at Nyamepi. The area includes much of the tourist accommodation, the offices, staff housing, water infrastructure, workshops etc. The area is located on a prime part of the alluvial floodplain.
Political manoeuvring	There are reports of political manoeuvring with regard to allocation of tourist sites, leases, hunting concessions (in the adjacent safari areas) etc. Although these type of reports are difficult to verify it is likely that it does occur.
Loss of expertise	The current salary structure and the value of the Zimbabwe dollar has meant that there is a continual drain of experienced staff who move onto other jobs where prospects may be better. Many of these staff are field staff who take their detailed knowledge of ground conditions with them. However, it must be stated the ZPWMA is one of the better-paying parastatals.
Wounded animals	There have been instances where wounded animals have entered the national park from the safari areas. However, in all cases, the hunters are required to report the incident so that follow-up operations can take place.
Use of the park by other Government Agencies	At least three government departments (Tsetse, Police and Roads) have bases inside the National Park, but operate outside the control of the ZPWMA. The roads camp at Nyakasikana is presently abandoned. The Zimbabwe National Water Authority (ZINWA) operates the water supply system at Nyamepi and has staff on the station. A police post is located at Nyamepi as well.
Rukomechi Research Station	The Veterinary Department has established an extensive development at the base of the escarpment on the Rukomechi river. There does not appear to be any lease for site as it was in existence prior to the extension of the boundary of the park in 1974. Records indicate that it was used extensively for research in the 1980s and 1990s but currently appears to be disused. A skeleton staff of 14 people remains. Cattle are also kept here for use with tsetse fly density assessments. There is also an extensive network of tracks in the area and an airstrip.
Training & Ration Hunting	This is a long standing policy in the ZPWMA and its predecessors. Essentially quotas are approved at Ministerial level for training and ration hunting for many stations in the Parks Estate. The specific use of this quota is at the discretion of the area manager or warden. In addition, decisions about areas in which animals are hunted is also at local management level. In the present circumstances meat from this hunting is a very important supplement for staff nutrition. It is believed that ration supply helps to stop poaching by the staff themselves, given the current economic circumstances in Zimbabwe.

**Table 29: Park Management Issues and Concerns**  
(Stars indicate a measure of importance)

Hunting Ethics	Most of the hunting in the adjacent areas is through the “bag hunt” system. Hunters buy a bag of animals and the hunt is for a specified time period. This means that there is always a new hunter in the area, making control more difficult. Some hunters do shoot animals on the boundary, others bait for cats right on the Mana boundary and others have been known to actually poach in the park. Perhaps a buffer zone could help to alleviate some of these problems.
----------------	---

#### 4.3.4 NEIGHBOURS ISSUES AND CONCERNS

<b>Table 30: Neighbours Issues and Concerns</b> (Stars indicate a measure of importance)	
Issue/Concern	Description
<b>COMMUNITIES</b>	
Cultural site info unknown****	Information is available in the written record for three cultural sites within Mana Pools. In addition a fourth site – Mazunga spring – in the Rukomechi river was described during the meeting. There should be an active investigation of these sites and new ones.
Community participation and involvement with Mana Pools needs to be improved***	There appears to be little interaction between Mana management staff and the Mukwichi Communal Land. However, some of the staff at Mana have their homes in the Communal Land and patrols pass through the area to their pick-up points. In addition, 5 or 6 of the Mana permanent staff are from the Mukwichi Communal Land. This represents about 12% of the current labour force for Mana Pools.
Communications between ZPWMA and communities, local government needs to be improved	Communications between ZPWMA, both at regional and park level, and between communities and the local Hurungwe government, are not as good as they could be. For example, the Hurungwe RDC has recently completed a master plan for the District but there is little awareness of this at the Park level.
Mukwichi buffer zone degraded	A buffer zone was declared within Mukwichi Communal land to further wildlife conservation in the area. This buffer zones abuts the Mana Pools National Park. Unfortunately parts of the buffer zone have been invaded by illegal settlers (approx 700 households) and, more recently by gold panners. This illegal settlement is a recent development – in the last three years.
Problem animals	Settlers in the designated buffer zone often complain about problem animals but there is little reaction to these from the authorities (ZPWMA at Marongora or Safari Hunters via the Hurungwe RDC) as they are deemed to be illegal settlers. The most frequently reported animal problems come from elephants, eland, lions (mainly in the Nyamakate area) and buffalos.
Encroachment in south	The southern boundary of the park with the Mukwichi Communal Land is not clearly marked. Cultivation and clearing is moving closer to the park boundary
Gold Panning	Panning for gold is carried out along the Chitake, Mvurameso and Burutsa rivers. The activity has reached Mana Pools along the Mvurameso river (see map below) and this is a cause for concern. Gold panners can legalise their operations and apply for permits through the RDC. However these activities are being carried out in the buffer zone and it should be possible to stop or control this activity in this area.

<b>Table 30: Neighbours Issues and Concerns</b> (Stars indicate a measure of importance)	
<b>Issue/Concern</b>	<b>Description</b>
<b>TRANSFRONTIER</b>	
Inadequate integration with Zambian management**	There have been informal exchanges including joint patrols between the Zambian and Zimbabwean authorities. However this will need to be formalised.
Zambian activities/developments**	Developments on the Zambian side of the river, especially in the Chiawa Game Management Area, appear to have mushroomed in an uncontrolled manner. Although all developments in GMAs need to be approved by ZAWA it appears that very few have gone through this process. Some large camps with generators have been established which degrade the quality of the tourism experience for both Zambia and Zimbabwe.
Poor TFCA awareness	Awareness of the middle Zambezi Trans-Frontier Conservation Area is low. This is understandable as the initiative is in its early days. However, there is a need to ensure that its profile becomes higher.
<b>OTHER</b>	
Conflicting interests with neighbours	Fortunately most of Mana Pools abuts onto ZPWMA land. However this land is designated for safari hunting and sometimes this land use option clashes with the ideals set out for a National Park.
Hurungwe Master Plan Integration	The Hurungwe District Master Plan is in its final stages and the Mana Pools Management Plan needs to take cognisance of this document. The plan will be made available to the planning team in due course.
No monitoring of safari hunting by ZPWMA	The ZPWMA does not monitor hunts taking place outside the estate. Quotas are set jointly and the Authority actually issues the quota. They will also collect the returns but there is no ZPWMA of the actual hunting. In the case of the Mukwichi this means that the southern part of Chewore is being hunted without ZPWMA presence?
Boundary demarcation	Parts of the Mana Pools NP boundary are not marked on the ground. The area that is of the greatest concern is part of the eastern boundary which follows an old road alignment which has since disappeared. In addition, the 365 metres from the Rukomechi is open to interpretation, given that the course of the river may change in the future.



## REFERENCES

*Note: Entomological references from the Rukomechi Research Station are not included here.*

**ADE B.**, 1985, Storks at Mana Pools, Honeyguide, 31(1):50.

**ASPINWALL D.R.**, 1975, The middle Zambezi Valley and lower Luangwa Valley, Honeyguide, 83:19.

**ATTWELL R.I.G.**, 1970, Some effects of Lake Kariba on the ecology of a floodplain of the mid-Zambezi Valley of Rhodesia, Biol. cons., 2:189-196.

**BENNET J.G., ANDERSON I. & BRINN P.J.**, 1985, Soils at Mana Pools National Park, Soils report A517, Chemical and Soil Research Institute Zimbabwe, 58pp.

**BONE, C. & CHAMBERS, A.** 1993. African Seasons. Wildlife at the Waterhole. Dragon's World Press, Portugal

**BOND G. & CLARK J.D.**, 1954, The quaternary sequence in the Middle Zambezi Valley, South Afr. Archeol. Bull., 9:115-130.

**BOUGHEY, A.S.** (1957). The Vegetation Types of the Federation Of Rhodesia and Nyasaland. *Proc. Rhod. Sci. Ass.*, 45:73-91.

**BRODERICK T.J.**, 1981, Coal and coal potential in the Mid-Zambezi Valley between Chirundu and Mukumbura, Ann. Zim. geol. Surv., 6(1980):22-26.

**BRODERICK T.J.**, 1984, A geological interpretation across a portion of the Mid-Zambezi Valley lying between the Mkanga and Hunyani rivers, Guruve district, Ann. Zim. geol. Surv., 9:19-27.

**CARTER D.T. & THOMPSON B.**, 1952, Report on the survey of Mopane in the Churundu area of the Zambezi Valley, Records of the Forestry Commission, Salisbury, Rhodesia, 20pp.

**CHILD G. & SAVORY C.R.**, 1964, The distribution of large mammal species in Southern Rhodesia, Arnoldia Rhodesia , 1:1-15.

**COOPER J.**, 1970, Traveller's note: Mana Pools Game Reserve, Honeyguide, 62:11-14.

**DEPARTMENT LAND MANAGEMENT, UNIVERSITY OF ZIMBABWE**, 1982, An appraisal of the environmental and economic factors related to further hydro-electric development in the Zambezi Valley, National Resources Board, Zimbabwe, 51pp.

**DUNHAM K.M.**, 1985, Ages of black rhinos killed by drought and poaching in Zimbabwe, Pachyderm, 5:12-13.

**DUNHAM K.M.**, 1988, Demographic changes in the Zambezi Valley elephants, J. Zool. Lond., 215:382-388.

**DUNHAM K.M.**, 1988. Demographic changes in the Zambezi Valley elephants (*loxodonta Africana*). J. Zool. Lond 215: 382-388

**DUNHAM K.M.**, 1989, Litterfall, nutrient-fall and production in an *Acacia albida* woodland in Zimbabwe, J. Trop. Ecol., 5:227-238.

**DUNHAM K.M.**, 1989, Vegetation-environment relations in the middle Zambezi floodplain, Vegetatio, 82:13-24.

**DUNHAM K.M.**, 1989. Vegetation-environment relations of a Middle Zambezi floodplain. *Vegetatio* 82: 13-24

**DUNHAM K.M.** 1990. Fruit production by *Acacia albida* trees in Zambezi riverine woodlands. *J Trop Ecol* 6: 445-457

**DUNHAM, K. M.** 1990. Biomass herbaceous vegetation Zambezi riverine. *Afr J Ecol* 28: 200-212

**DUNHAM K.M.**, 1990, Fruit production by *Acacia albida* in Zambezi Riverine Woodland, *J. Trop. Ecol.*, 6:445-457.

**DUNHAM K.M.** 1990, Biomass dynamics of herbaceous vegetation in Zambezi riverine woodlands, *Afr. J. Ecol.*, 28:200-212.

**DUNHAM K.M.** 1991. Comparative effects *Acacia albida* and *Kigelia africana* trees on soil characteristics in Zambezi riverine woodlands. *J Trop Ecol* 7: 215-220

**DUNHAM K.M.**, 1992, Response of a lion population to changing prey availability. *J. Zool. Lond.*, 227:330-333.

**DUNHAM K.M.** 1994. Effect drought large mammal populations Zambezi woodlands *J Zool Lond* 234 489-526

**DU TOIT R.F.**, 1982, A preliminary assessment of the environmental implications of the proposed Mupata and Bakota hydro-electric schemes (Zambezi river, Zimbabwe), National Resources Board, Zimbabwe, 208pp.

**GUY P.R.**, 1977, Notes on the vegetation types of the Zambezi Valley, Rhodesia, between the Kariba and Mupata gorges, *Kirkia*, 10(2):543-557.

**GUY P.R.**, 1977, Notes on the host species of epiphytic figs (*Ficus* spp) on the flood plain of the Mana Pools National Park Rhodesia, *Kirkia*, 10(2):559-562.

**HENDERSON D.D. & GRIFFITHS E.**, 1959, Report on the soils of the Zambezi Valley, Nyakasanga to Chewore, Department of Research and Specialist Services, Salisbury, Rhodesia.

**HENKEL, J.S.** (1931). Types of Vegetation in Southern Rhodesia. *Proc. Rhod. Sci. Ass.*, 30:1-24.

**HOLE H.M.**, 1905, Some interesting birds of the Zambezi Valley, *Proc. Rhod. Scient. Ass.*, 5(3):99-105.

**HOWELLS W.W.**, 1985, The birds of the Dande communal lands middle Zambezi Valley, Zimbabwe, *Honeyguide*, 31(1):26-48.

**[HUGES R.S.]**, (undated), Chewore : History of the area, Records of the Department of National Parks And Wildlife Management, Zimbabwe, 16pp.

**IUCN**, 1987, Mana Pools National Park and associated Safari areas, IN: IUCN directory of Afrotropical protected areas, 976-978, Gland, Switzerland.

**JACKSON P.B.N.**, 1961, The fish of the Middle Zambezi, Kariba Studies, [(1)]:1-36, Trustees of the National Museums of Southern Rhodesia.

**JARMAN P.J.**, 1972, Seasonal distribution of large mammal populations in the unflooded middle Zambezi Valley, *J. appl. Ecol.*, 9(1):283-299.

**KERR M.A.**, 1968, Management recommendations for the Zambezi Valley and the Mana Pools Game Reserve, Department of National Parks and Wildlife Management, Salisbury ,Rhodesia.

- KERR M.A.**, 1969, Culling recommendations for the Mana Pools Game Reserve in 1970, Department of National Parks and Wildlife Management, Salisbury ,Rhodesia.
- KERR M.A.**, 1971, Game populations control management plan, Zambezi Valley culling and capture 1972, Department of National Parks and Wildlife Management, Salisbury ,Rhodesia.
- KERR M.A.**, 1978, Reproduction of elephant in Mana Pools National Park Rhodesia, *Arnoldia Rhodesia*, 8(29):1-11.
- KERR M.A. & FRASER J.A.**, 1975, Distribution of elephant in a part of the Zambezi Valley Rhodesia, *Arnoldia Rhodesia*, 7(21):1-14.
- MACGREGOR A.M.**, 1938, Zambezi traverse - Churundu to Feira and thence to Sipililo, unpubl., Zim. Geol. Surv. Technical files.
- MAIN M.**, 1990, Zambezi : Journey of a river, Southern Book, Johannesburg, 313pp.
- MEADOWS, K.** 1981. Rupert Fothergill. Bridging a Conservation Era. Thorntree Press.
- MONKS, N.J.** 2003. The lions on the Mana Pools floodplain – Are they decreasing? African Hunter 5:2003
- MONKS, N.J., MURPREE, N.L. AND MCTAGGART, J.** 2008. A census of the hippopotamus population in the Zambezi River from Kariba Lake wall to Kanyemba in Zimbabwe and Zambia. (In press).
- MONKS, N.J.** 2009. Demography and population status of lion (*Panthera leo*) in Mana Pools National Park, Zimbabwe. PhD dissertation. University of the Free State, South Africa.
- NYSCHENS, I.** 1997. Months of the Sun. Safari Press.
- NUGENT C.**, 1990, The Zambezi river: Tectonism, climatic change and drainage evolution, *Palaeogeogr., Palaeoclimatol., Palaeoecol.*, 78:55-67.
- NUGENT C.**, (unpubl), The Zambezi river: Tectonism, climatic change and drainage evolution - reply to discussion, 13pp.
- PHILLIPSON L.**, 1976, Mode three artefact occurrences at Bagosa in the Middle Zambezi Valley, *South Afr. Archeol. Bull.*, 31:112-126.
- PHILLIPSON L.**, 1977, Stone age sites near Churundu in the Middle Zambezi Valley, *South Afr. Archeol. Bull.*, 32:28-62.
- PLANAFRIC**, Undated. Hurungwe Rural Master Plan. Hurungwe Rural District Council.
- RAATH, M.** 1969. "A new Coelurosaurian dinosaur from the Forest Sandstone of Rhodesia." *Arnoldia Rhodesia*. 4 (28): 1-25.
- RAATH, M.A.** 1977. The anatomy of the Triassic theropod *Syntarsus rhodesiensis* (Saurishia: Podokesauridae), and a consideration of its biology. Unpublished. PhD thesis, Rhodes University, Grahamstown, 233 pp.
- RIDDEL I.C.**, 1990, Rare birds in the Rukomechi camp area of Mana Pools National Park, *Honeyguide*, 36(4):165-170.
- ROBERTSON, F.** 2002. Structure and Condition of Zambezi Valley Dry Forests and Thickets. *Zambezi Society Report*
- SAVORY C.R.**, 1961, Report of the status of game in the eastern Zambezi Valley, Department of National Parks and Wildlife Management, Salisbury ,Rhodesia.

**SAVORY C.R.**, [1962], Report on the status of game and management needs in the Urungwe non-hunting area, Department of National Parks and Wildlife Conservation, Southern Rhodesia.

**SAVORY C.R.**, 1965, Game utilization in Rhodesia, Zool. Afr., 1:321-337.

**SMITHERS R.H.N.**, 1963, Report on the Urungwe non-hunting area survey team, National Museums of Southern Rhodesia.

**SMITH K.D.**, 1951, Notes on the birds of the Sipilio area Zambezi Valley, Ostrich, 22:31-34.

**STANNING M.J.**, 1982, Report on the economic impact to Zimbabwe of hydro-electric power development at Mupata and Bakota gorges, from an environmental viewpoint, National Resources Board, Zimbabwe, 122pp.

**SWANEPOEL C.M. & SWANEPOEL S.M.**, 1986, Baobab damage by elephant in the middle Zambezi Valley, Afr. J. Ecol., 24:129-132.

**TEEDE J.**, 1989, Mana Pools, Quest, Harare, pp216.

**TEEDE J. & TEEDE F.**, 1990, The Zambezi: River of the Gods, Russell Friedman, South Africa, 190pp.

**TORREND J.**, 1905, The Sabaeans on the Zambesi, Proc. Rhod. Scient. Ass., 5(2):40-54.

**THOMAS D.S.G. & SHAW P.A.**, (unpubl.), The Zambezi river: Tectonism, climatic change and drainage evolution - is there really evidence for a catastrophic flood ? A discussion, 9pp.

**THOMPSON J.G.**, 1958, Report on the soils of the Zambezi Valley : Kariba gorge to Nyakasanga, Department of Research and Specialist Services, Salisbury, Rhodesia.

**WALLIS J.P.R.(ed)**, 1956, The Zambezi expedition of David Livingstone 1858-1863, Oppenheimer series No. 9, Vol I - Journals, Chatto & Windus, London, 211pp.

**WALLIS J.P.R.(ed)**, 1956, The Zambezi expedition of David Livingstone 1858-1863, Oppenheimer series No. 9, Vol II -Journals, letters and dispatches, Chatto & Windus, London, 251pp.

**WHITE, 19xx.**

**WILD, H., AND BARBOSA, L.A.G.** (1967). Vegetation map of the Flora Zambesiaca Area. M.O.Collins, Salisbury.

**WILLIAMS G.J.**, 1987, Pulse of the Zambezi, Geogr. Mag., 59:608-613.

**WOOD P.A.**, 1994, Red-billed Oxpecker Survey in Southern Mana Pools, Honeyguide, 40(1):16-19.

**WOOD P.A.**, 1994, Unique "Truthing" Counts at Mana, Zimbabwe Wildlife, April-June 19-21.

**WOOD P.A. & TREE A. J.**, 1992, Zambezi River Survey October 1991, Honeyguide, 38(2):54-63.