

**A VULNERABILITY ANALYSIS OF HLUHLUWE IMFOLOZI PARK FOR THE  
PERIOD 1980 TO 2000**

Michael John Harry Wadge

A research report submitted to the Faculty of Science, University of the Witwatersrand,  
Johannesburg, in partial fulfilment of the requirements for the degree of Master of  
Science.

March, 2007

## CONTENTS

DECLARATION .....	4
ABSTRACT .....	5
ACKNOWLEDGEMENTS .....	7
LIST OF FIGURES .....	8
LIST OF TABLES .....	9
INTRODUCTION .....	11
Overview of the research .....	12
CHAPTER ONE - THEORETICAL AND METHODOLOGICAL CONTEXT .....	14
1.1 Vulnerability, Adaptation and Resilience .....	14
1.2 Climate variability .....	20
1.3 Examples of approaches to examine vulnerability and resilience in local contexts .....	23
1.4 Research Methodology .....	26
1.5 Data Sources .....	27
1.6 Summary .....	29
CHAPTER TWO - BACKGROUND TO HLUHLUWE IMFOLOZI PARK .....	31
2.1 Introduction .....	31
2.2 Situation of Hluhluwe Imfolozi Park .....	31
2.3 Park Management .....	31
2.4 Background to Biophysical Aspects .....	32
2.5 Background to Social Aspects .....	35
2.6 Background to Organisational Aspects .....	37
2.7 Summary .....	37
CHAPTER THREE - BIOPHYSICAL VULNERABILITY TO CHANGE .....	38
3.1 Introduction .....	38
3.2 Discussion .....	39
3.3 Summary .....	54
CHAPTER FOUR - SOCIAL ASPECTS .....	56
4.1 Introduction .....	56
4.2 Discussion .....	58
4.3 Summary .....	70
CHAPTER FIVE - ORGANISATIONAL ASPECTS .....	73
5.1 Introduction .....	73
5.2 Discussion .....	73
5.3 Summary .....	77
CHAPTER SIX - CONCLUSIONS .....	79
6.1 Biophysical Aspects .....	79
6.2 Social Aspects .....	82
6.3 Organisational Aspects .....	84
6.4 Summary .....	85
APPENDIX A .....	86
History of Formal Protection .....	86
APPENDIX B .....	90
Biophysical Aspects .....	90
APPENDIX C .....	123
Social Aspects .....	123

APPENDIX D..... 137

Organisational Aspects ..... 137

REFERENCES ..... 140

## **DECLARATION**

I declare that this research report is my own, unaided work. It is being submitted as a research report in partial fulfilment of the Degree of Master of Science in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other university.

---

\_\_\_\_\_ day of \_\_\_\_\_ 200\_\_\_\_\_

## **ABSTRACT**

While much research into vulnerability to global and local environmental change has been undertaken at a regional and biome level, few detailed local case studies of areas vulnerable to national multiple stressors (e.g. environmental and other change) have been undertaken. Little research effort to date, moreover, has been done that attempts to link biophysical impacts and causes of change with socio-economic causes and impacts of change in protected areas and national parks in South Africa.

Governmental departments, non-governmental organisations and global environmental panels such as the Inter-governmental Panel on Climate Change are formulating strategies to counteract the ongoing and increasing environmental stressors, occasioned largely by climate change facing communities, in southern Africa and elsewhere. Vulnerability to global and local environmental change is also compounding food insecurity and is being heightened in part by reduced governmental capacity.

The time scale under investigation chosen is 1980 to 2000; a period that captures varied climate stressors such as floods and droughts, as well as marked socio-political change in South Africa. The data available were, in some cases, restricted and the data range does not always cover the entire period anticipated. The last KwaZulu-Natal Wildlife Service Yearbook was produced in 2000 and this has effectively restricted this end period.

Social and biophysical diversification within one system, namely the Hluhluwe Imfolozi Park, was evaluated in an attempt to evaluate the shorter-term coping capacity and longer-term adaptive capacity of the park over the past twenty-two years. As far as social vulnerability is concerned, the differences between internal and external factors, either enhancing or reducing the response capacity to change, were also noted for the period. The coping strategies being utilised by Ezemvelo KZN Wildlife in order to deal with changing circumstances and inputs including climate variability, political change and social aspects are described.

The very complex interplay between socio-economic and biophysical factors of the Hluhluwe Imfolozi Park, a formally proclaimed protected area managed by KwaZulu-Natal Wildlife Services, is examined in this research. An important aspect of the research is an assessment of vulnerability “drivers”, including climate variability, as well as vulnerability to other stressors such as, for example, social, biophysical and institutional causes and consequences of change.

A preliminary evaluation was carried out to establish what factors are driving change and have the potential to further shape the park. Finally some preliminary suggestions from the study on what constitutes flexibility and resilience, in such cases, are provided. Clearly more detailed assessments will be required in the future in order to support and expand this research.

## **ACKNOWLEDGEMENTS**

I would like to acknowledge the assistance of Ezemvelo KZN Wildlife for granting me permission to make use of the Hluhluwe Imfolozi Park Management Plan and the Annual Reports or Yearbooks and a number of other individuals who assisted me in this research. The then Regional Ecologist of Northern Zululand of Ezemvelo KZN Wildlife, Mr David Balfour, gave valuable assistance. He provided a copy of the Management Plan for the Hluhluwe Imfolozi Park as well as various data used for the analysis in this report. Staff of Hluhluwe Imfolozi Park as well as members of neighbouring communities also provided valuable insights during discussions.

## LIST OF FIGURES

Figure 1.1:	Illustration of the research protocol .....	26
Figure 2.1:	Map of Hluhluwe Imfolozi Park .....	88
Figure 2.2:	Map of the park showing Traditional Authority Boundaries .....	89
Figure 3.1:	Maximum Temperatures – Hluhluwe Game Reserve .....	90
Figure 3.2:	Minimum Temperatures – Hluhluwe Game Reserve .....	90
Figure 3.3:	Annual Rainfall Hluhluwe Game Reserve Average .....	91
Figure 3.4:	Annual Rainfall Hluhluwe Game Reserve (Hilltop) .....	91
Figure 3.5:	Annual Rainfall Hluhluwe Game Reserve (Gontshi/Memorial) .....	92
Figure 3.6:	Annual Rainfall Hluhluwe Game Reserve (Gujaneni/Nqumeni) .....	92
Figure 3.7:	Annual Rainfall Imfolozi Game Reserve (Mpila) .....	93
Figure 3.8:	Annual Rainfall Hluhluwe Imfolozi Park (Average) .....	93
Figure 3.9:	Bush Control, Hluhluwe Imfolozi Park, 1980 - 2000 .....	94
Figure 3.10:	Area Burnt, Hluhluwe Imfolozi Park, 1980 - 2000 .....	94
Figure 3.11:	Alien Plant Removal Programme HIP – 1980 - 1999 .....	95
Figure 3.12:	Estimates HIP – Rhino, Black – 1985 - 1999 .....	95
Figure 3.13:	Estimates HIP - Rhino, White – 1985 - 1999 .....	96
Figure 3.14:	Estimates HIP – Elephant – 1985 - 1999 .....	96
Figure 3.15:	Line Transect Surveys HIP - Buffalo – 1985 - 1999 .....	97
Figure 3.16:	Line Transect Surveys HIP – Impala – 1985 - 1999 .....	97
Figure 3.17:	Line Transect Surveys HIP – Nyala – 1985 - 1999 .....	98
Figure 3.18:	Line Transect Surveys HIP – Kudu – 1985 - 1999 .....	98
Figure 3.19:	Line Transect Surveys HIP – Wildebeest – 1985 - 1999 .....	99
Figure 3.20:	Line Transect Surveys HIP – Zebra – 1985 - 1999 .....	99
Figure 3.21:	Line Transect Surveys HIP – Waterbuck – 1985 - 1999 .....	100
Figure 3.22:	Line Transect Surveys HIP – Warthog – 1985 - 1999 .....	100
Figure 3.23:	Estimates HIP – Lion – 1985 - 1999 .....	101
Figure 3.24:	Bovine TB Testing HIP - Maximum Incidence – 1993 - 1998 .....	101
Figure 3.25:	Bovine TB Testing HIP - Minimum Incidence – 1993 - 1998 .....	102
Figure 3.26:	Bovine TB Testing HIP- Mean Incidence – 1993 - 1998 .....	102
Figure 3.27:	Bovine TB Testing HIP – No. of Buffalo Tested – 1993 - 1998 .....	103
Figure 3.28:	Bovine TB Testing HIP – No. of Herds Tested - 1993 - 1998 .....	103
Figure 3.29:	Bovine TB Testing HIP – No. of Herds Positive – 1993 - 1998 .....	104
Figure 3.30:	Rhino Deaths as a Result of Poaching – HIP – 1990 - 1999 .....	104
Figure 4.1:	Consumptive Utilisation of Vegetation (Thatch) .....	123
Figure 4.2:	Consumptive Utilisation of Vegetation - Monetary Value (Thatch) .....	123
Figure 4.3:	Consumptive Utilisation of Vegetation (Reeds) .....	124
Figure 4.4:	Consumptive Utilisation of Vegetation - Monetary Value (Reeds) .....	124
Figure 4.5:	Consumptive Utilisation of Vegetation (Wood) .....	125
Figure 4.6:	Consumptive Utilisation of Vegetation - Monetary Value (Wood) .....	125



## LIST OF TABLES

Table 1.1:	History of Formal Protection of Hluhluwe Imfolozi Park.....	86
Table 3.1:	Important Conservation Aspects .....	105
Table 3.2:	Biodiversity Management Objectives .....	106
Table 3.3:	Biophysical Threats .....	106
Table 3.4:	Aquatic Systems Management Objectives .....	107
Table 3.5:	External Originating River Objectives .....	107
Table 3.6:	Threats to Aquatic Systems .....	107
Table 3.7:	Management of Surface Water for Animals.....	108
Table 3.8:	Indigenous Vegetation Objectives.....	108
Table 3.9:	Utilisation of Indigenous Vegetation Objectives.....	109
Table 3.10:	Vegetation Monitoring Objectives .....	109
Table 3.11:	Fire Management Objectives.....	109
Table 3.12:	Threats to Vegetation.....	109
Table 3.13:	Importance of the Park in Respect of Fauna.....	110
Table 3.14:	Vertebrate Species Declining .....	110
Table 3.15:	Successfully Reintroduced Vertebrate Species .....	110
Table 3.16:	Unsuccessfully Reintroduced Vertebrate Species .....	111
Table 3.17:	Threatened Vertebrates Classified by IUCN as Endangered.....	111
Table 3.18:	Threatened Vertebrates Classified by IUCN as Vulnerable.....	111
Table 3.19:	Threatened Vertebrates Classified by IUCN as Rare .....	112
Table 3.20:	Threatened Vertebrates Classified by IUCN as Peripheral .....	112
Table 3.21:	Threatened Vertebrates Classified by IUCN as Isolated .....	113
Table 3.22:	Key Fauna Species.....	113
Table 3.23:	The Principles for the Management of Fauna .....	113
Table 3.24:	Fauna Management Objectives .....	113
Table 3.25:	Threats to Fauna .....	114
Table 3.26:	Mitigating Factors Regarding Threats to Fauna .....	114
Table 3.27:	Animal Population Monitoring Programmes .....	114
Table 3.28:	Animal Population Monitoring Objectives.....	115
Table 3.29:	Herbivore Management Objectives .....	115
Table 3.30:	Management Objectives regarding Disease Surveillance .....	115
Table 3.31:	Threats posed by Bovine Tuberculosis.....	116
Table 3.32:	Summary of Bovine Tuberculosis Surveys .....	116
Table 3.33:	Security Management Objectives.....	117
Table 3.34:	Security Threats.....	117
Table 3.35:	Staff Sergeant Responsibilities.....	118
Table 3.36:	Section Corporal Responsibilities .....	118
Table 3.37:	Types of Patrols .....	119
Table 3.38:	Fence Line General Assistants Responsibilities.....	119
Table 3.39:	Patrol Radio Reporting Procedures .....	119
Table 3.40:	Security Controls and Procedures.....	120
Table 3.41:	Geographic Positioning System Procedures.....	120
Table 3.42:	Security Aspects of the Black Rhino Monitoring Programme .....	121
Table 3.43:	Anti Poaching Unit Responsibilities.....	121
Table 3.44:	Law Enforcement Officer (Zululand) Responsibilities .....	122

Table 3.45:	Investigations Unit Responsibilities .....	122
Table 4.1:	Income Earned from Economic Opportunities during 1998/99 .....	126
Table 4.2:	Trust Funds for Neighbour Programmes in 2000 .....	127
Table 4.3:	Total Tonnage and Monetary Value for the period 1986 to 1999 .....	127
Table 4.4:	Social Threats .....	128
Table 4.5:	Political Threats .....	128
Table 4.6:	Community Conservation Objectives.....	129
Table 4.7:	Principles and Policies relating to community relations .....	130
Table 4.8:	Community Conservation Evaluation Methods .....	130
Table 4.9:	Ecotourism Objectives.....	131
Table 4.10:	Ecotourism Related Opportunities.....	131
Table 4.11:	Composition of the Hluhluwe Imfolozi Park Local Board.....	132
Table 4.12:	Composition of the iNkosi Liaison Forum .....	132
Table 4.13:	Terms of Reference of the iNkosi Liaison Forum .....	133
Table 4.14:	Composition of the iNduna Liaison Forum .....	133
Table 4.15:	Terms of Reference of the iNduna Liaison Forum.....	133
Table 4.16:	Composition of Stake-holder Interest Groups Forum .....	134
Table 4.17:	Partnership Projects Objectives .....	134
Table 4.18:	Internal Biodiversity Education Programme Objectives .....	135
Table 4.19:	External Biodiversity Conservation Awareness Objectives.....	136
Table 5.1:	Organisational Objectives.....	137
Table 5.2:	Organisational Threats.....	137
Table 5.3:	Management Meetings held on Hluhluwe Imfolozi Park.....	137
Table 5.4:	Staff Meetings held on Hluhluwe Imfolozi Park.....	138
Table 5.5:	Personnel Management Issues.....	138
Table 5.6:	Administration Objectives .....	138
Table 5.7:	Financial Management .....	139

## **INTRODUCTION**

The interplay between social, organisational and biophysical factors of the Hluhluwe Imfolozi Park is examined in this research. Indicators of vulnerability, in terms of anticipated climate variability as well as other stressors and the consequences of change are investigated. Some coping strategies to better deal with change are also highlighted.

The research report is divided into five chapters. Chapter One provides an introduction to the study area and gives a brief history of the park. This background, provided in the first two chapters, outlines the context from which vulnerability to change can be explored. A description of the structure of the report is provided as well as theoretical background. Chapter Two provides some background to the park, particularly those biophysical, social and political aspects which are investigated in more depth in the subsequent chapters. Chapter Three deals with biophysical aspects and the impacts of, for example, shorter events (e.g. the severe droughts in the early 1980s and 1990s as well as the floods in 1984 and 1987). Examination of impacts arising from such shocks and responses to them are highlighted. The chapter contains data captured from reports in the Yearbooks, which are examined in detail under the discussion section of the chapter. Coping and adaptive management responses to environmental stressors such as game and predator management programmes are examined and impacts on the biodiversity of the park, as a result of these actions, ascertained. The relationships between stressors and impacts as well as indicators of resilience are described. Staff were interviewed in order to qualify findings and gain further insight.

In Chapter Four, which deals with social aspects, the environmental awareness and community conservation programmes undertaken in the communal areas surrounding the park are examined. Reports in the relevant Yearbooks are also probed in order to establish staff's evaluation of the effectiveness of these coping and adaptive strategies. Financial factors in shaping coping and adaptation options are also examined.

Chapter Five deals with the institutional and political aspects which have impacted on the park during the period under review. The major impact in this regard which is examined

is the recently completed amalgamation process of the Natal Parks Board and the KwaZulu Department of Nature Conservation. This process has entailed the restructuring of the organisation and these changes are examined under the discussion section to assess the extent to which they have shaped or potentially augmented vulnerability to environmental stressors in the park. The process is described together with management procedures which are adhered to in order to mitigate against this impact. Under the discussion section an evaluation is provided in order to describe the impact.

Finally, conclusions are given in Chapter Six, in the order that they were provided in the text. Appendices are provided which are referred to in the text and are largely comprised of data obtained from the Yearbooks which have been reworked and presented in graph or tabular formats.

This research report is not an ecological resilience assessment but rather provides a valuable *preliminary assessment* of the overarching array of factors that influence the fragility of the park. Clearly given this initial baseline assessment, much more detailed analysis of the complex drivers of change in this area awaits further investigation. Despite its limitations, the study begins to point to areas of possible robustness within the park and the surrounding areas that could be enhanced in the future to withstand change.

## **Overview of the research**

Certain combined stressors on a system can either weaken or enhance adaptation to such stressors. Exposure to impacts, sensitivity and the capacity to adapt to change (in this case, environmental change) all contribute to vulnerability to change (Kelly and Adger, 2000 and Smit *et al.*, 2000). The objective of this study was to assess to what extent various “drivers of change”, e.g. biophysical stressors such as climate variability as well as political and socio-economic stressors, shape and configure vulnerability to environmental change.

The study encompassed the evaluation of biophysical and various social and institutional stressors occurring in the Hluhluwe Imfolozi Park over the period 1980 to 2000, which

includes periods of change such as droughts in the early 1980s and 1990s and floods in 1984 and 1987. As will be shown, intensive periods of socio-political change also occurred in the period of the latter half of the 1990s to 2000 that also impacted on the situation in the park.

Aspects that were investigated include determining exposure to crises, stress and shocks over the time period, assessment of some of the capacities to cope with these and the consequences of and the attendant risks of slow or limited coping and adaptive responses to them.

## CHAPTER ONE - THEORETICAL AND METHODOLOGICAL CONTEXT

### 1.1 Vulnerability, Adaptation and Resilience

Gallopín (2006) has proposed the use of a systemic perspective to identify and analyze the conceptual relations among vulnerability, resilience, and adaptive capacity within socio-ecological systems (SES). Socio-ecological systems are considered to be systems that include societal (human) and ecological (biophysical) subsystems in mutual interaction (Gallopín, 1991) and are seen by Gallopín as the natural analytical unit for sustainable development research (Gallopín *et al.*, 2001). The need to investigate the whole SES arises from the increasingly recognized evidence that understanding and anticipating the behaviour of the social and ecological components of the SES in many cases requires simultaneously taking into account of both of these components (Gallopín, 2006).

The concepts of vulnerability, adaptation and resilience are increasingly important for the study of the human dimensions of global environmental change (Janssen and Ostrom, 2006) and are relevant in the biophysical realm as well as in the social realm. In addition to being terms in colloquial language, they are widely used by the life sciences and social sciences, not only with different foci but often with different meanings. Vulnerability, a key component of the resilience and adaptive management debate, has its roots in the study of natural hazards and poverty (Janssen and Ostrom, 2006) and in the simplest sense means the potential to be harmed and relates to sustainability, which in many of its meanings denotes the capacity to persist. It has more specifically been defined as the degree to which an exposure unit is susceptible to harm due to exposure to a perturbation or stress, and the ability (or lack thereof) of the exposure unit to cope, recover, or fundamentally adapt (become a new system or become extinct) (Kasperson *et al.*, 2000). Although vulnerability is seen by some as the “opposite” to resilience, others prefer to describe a vulnerable social-ecological system as one that has lost resilience. Losing resilience implies loss of adaptability (Folke, 2006). The IPCC judges a system to be vulnerable if it is exposed to climate change impacts, is sensitive to those impacts and has a low capacity to cope with those impacts (Adger *et al.*, 2004).

In order to understand what makes a socio-natural system vulnerable, two properties of the system must be taken into account. These are that an external disturbance usually triggers a number of reactions and that faster dynamics (e.g. a flood event) can react to slower dynamics (e.g. management practices) (van der Leeuw, 2001). The contextual nature of vulnerability, the validation of indicators and consideration of timescale serve to complicate the development of robust indicators of vulnerability (Adger *et al.*, 2004). The impacts associated with environmental stressors, including climate stress, have been the focus of much of the research on climate change for many years, with the emphasis being given to the exposure of systems, both human and physical, to a risk or hazard. The impacts and changes induced by stressors have usually been examined in isolation, either from a biophysical or socio-economic perspective (as critiqued by Chambers, 1989; Blaikie *et al.*, 1994; Bohle, 2001; Hilhorst and Bankoff, 2004, among others).

An important development in the GEC community has been the examination of vulnerability as it is shaped by multiple causes (e.g. Pielke, 1998; Huq and Reid, 2004; Institute of Development Studies (IDS), 2004; UNDP, 2004). “Double” risk factors, for example, climate change and globalisation, are shown to further aggravate stress in an exposed region (e.g. O’Brien and Leichenko, 2000; Leichenko and O’Brien, 2002). The role and confluence of various “drivers” or causes of both “chronic and transitory vulnerability” are also important when trying to understand and manage overall risks to global environmental change and being able to understand and distinguishing between them. Social factors, for example, access to information, can often further aggravate local vulnerability particularly at times of heightened climate stress (e.g. O’Brien and Vogel, 2003). Social justice dimensions, as well as the role of social networks, and the influence of varying forms of social capital, as contributing factors to vulnerability to climate and other stressors are also receiving attention (e.g. Adger *et al.*, 2003; Bohle *et al.*, 1994; Bohle, 2001; Girot, 2002; Kelly and Adger, 1999, 2000; Pelling and High, 2005; Polsky *et al.*, 2003; Watts and Bohle, 1993; Wisner, 1993, 1995, 2004.) The field and emerging discourse is therefore growing and is raising a number of new research arenas.

One key issue that is emerging in the vulnerability, adaptation and resilience discourse is the need to explore both the “internal” and “external” dimensions that are contributing to

vulnerability when examining vulnerability to a particular stress. Physical and the social aspects shaping vulnerability can be viewed as two separate entities (Blaikie *et al.*, 1994) and the cumulative effect of various additional stressors on a system, already strained, becomes heightened. A system or group's capacity to anticipate, cope with and resist stress, as well as the ability to recover from stress, have all been highlighted as factors that configure vulnerabilities in various settings (Kasperson and Kasperson, 2001a, b). Key components of vulnerability have been identified by Cannon (2000) as including initial well-being, livelihood resilience, self-protection, societal protection and social capital including co-operating groups and social cohesion. Access to resources, weakening social patterns, degradation of the environment, and lack of access to information have further been identified as additional components of reduced resilience or factors heightening vulnerability (e.g. Aysan, 1993; Scoones, 2004). A different interpretation has been proposed on the basis of a systemic analysis of the concept of vulnerability (Gallopín, 2003). According to this conception, vulnerability is not always a negative property and positive vulnerability leads to a beneficial transformation in some cases (Gallopín, 2006).

The vulnerability of people and places is also an inherently geographical problem, one that necessitates a spatial solution. Adaptive capacity has been shown to be scale-dependant and different indicators are required to capture elements of adaptive capacity at different scales (Adger *et al.*, 2004). Adaptation is generally perceived to include an adjustment in social-ecological systems in response to actual, perceived, or expected environmental changes and their impacts (Janssen and Ostrom, 2006). Vulnerability to climate change and adaptation is highly variable and is strongly tied to local places and local contexts (e.g. Leichenko and O'Brien, 2002). Parts of South Africa, for example, may rank positively when assessing overall vulnerability to climate stress in terms of access to resources and livelihoods, but there are areas where adaptive capacity is currently extremely stressed and where future adaptive capacity is at risk of being further weakened by the growing HIV/ AIDS pandemic and other stressors (see for example Midgely *et al.*, 2003). Climate-related risks, as listed by the IPCC, are real threats to livelihoods in southern Africa (Reid and Vogel, 2006). Rainfall events are now, in some cases, shorter and more intense than was experienced previously, with some suggesting



that drought and other extreme events may become more severe and more frequent under certain climate change scenarios (Joubert and Mason, 1997), necessitating a range of shorter-term coping capacity and longer-term adaptive or adaptation strategies.

Resilience is currently considered to be the *capacity of a system to absorb disturbance and re-organise while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks* (Walker *et al.*, 2004). Over and above this, resilience also deals with the opportunities that disturbance opens up in terms of the recombination of evolved structures and processes, renewal of the system and emergence of new trajectories that can provide enhanced adaptive capacity (Smit and Wandel, 2006; Bellwood *et al.*, 2004). Capacity of response or coping capacity is defined by Gallopin (2006) as the system's ability to adjust to a disturbance, moderate potential damage, take advantage of opportunities, and cope with the consequences of a transformation that occurs.

A central concept to vulnerability is exposure, generally understood to be the degree, duration, and/or extent in which the system is in contact with, or subject to, the perturbation (Adger, 2006; Kaspersen *et al.*, 2005). Gallopin (2006), on the other hand, has proposed that exposure is not a component of vulnerability, but rather that vulnerability is a function of the system's sensitivity and capacity of response, and the transformation suffered by the system is a function of its vulnerability, the properties of the perturbation, and the exposure of the system to the perturbation (Gallopin, 2006).

Managing vulnerability therefore requires consideration of both observable and non-observable characteristics of a system. Despite vulnerability often being characterized as "non-observable" (Downing *et al.*, 2001), managers and policy makers often rely on information and observations to make decisions. Local and regional manifestations of broad social and ecological processes, moreover, produce proximate causes of vulnerability that can help identify immediate action priorities and provide a guide for further research into the complexities of underlying causes (Luers, 2005).

While there is considerable research activity on selected elements of vulnerability such as social systems, exposure, risk estimation and infrastructure, the capability to assimilate information across all of these domains is often lacking and a “hazards of place” model, that bridges various definitions and states that vulnerability is the likelihood that an individual or group will be exposed to and adversely affected by a hazard, has been proposed (Cutter, 2001). *Institutions* can be considered as social tools for the management of scarcity and uncertainty. They *minimise vulnerability and conflict, and enhance sustainable management of resources when everything works well and when environmental scarcity is high and the competition for resource use is important, there can be a social demand for technological change and for institutional change, in order to increase productivity of resources and optimise coordination for their alternative or interdependent uses* (Mathieu and Trottier, 2001; Reid and Vogel, 2006).

Resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes of state variables, driving variables, and parameters, and still persist (Holling, 1973, p. 17). In the past, resilience has focused on the capacity to absorb shocks and still maintain function but the capacity for renewal, re-organisation and development is now considered to be essential for the sustainability of various systems (Gunderson and Holling, 2002; Berkes *et al.*, 2003). The necessity to learn to *manage change* rather than simply to *react to it* and the key role that individuals and small groups or teams of individuals play in this context are now considered essential. Uncertainty and surprise are considered normal as is the necessity to be prepared for it and to learn to live with it (Carpenter and Gunderson, 2001; Berkes *et al.*, 2003; Peterson *et al.*, 2003; Kinzig *et al.*, 2003). The resilience perspective shifts policies from those that aspire to control change in systems assumed to be stable, to managing the capacity of social-ecological systems to cope with, adapt to, and shape change (Berkes *et al.*, 2003; Smit and Wandel, 2006).

The Resilience Alliance has developed from the Resilience Network which was started by the Beijer Institute and the University of Florida and is a consortium of research groups and research institutes from many disciplines who collaborate to explore the dynamics of social-ecological systems. The purpose of the alliance is to stimulate interdisciplinary and

integrative science using resilience as an overarching framework (Folke, 2006). Recent advances in research into social-ecological resilience include understanding of social processes such as social learning and social memory, mental models and knowledge-system integration, visioning and scenario building, leadership, agents and actor groups, social networks, institutional and organisational inertia and change, adaptive capacity, transformability and systems of adaptive governance that allow for management of essential ecosystem services (Lee, 1993; Grumbine, 1994; Danter *et al.*, 2000; Gunderson, 2001; Ostrom and Ahn, 2003; Adger, 2003; Pretty, 2003; Ostrom, 2005; Armitage, 2005; Galaz, 2005; Folke, 2006).

Active adaptive management and governance of resilience will be required in future to sustain desired ecosystem states and transform degraded ecosystems into fundamentally new and more desirable configurations. The likelihood of regime shifts in terrestrial and aquatic environments in relation to resilience of complex adaptive ecosystems and the functional roles of biological diversity shifts may increase when humans reduce resilience (Folke *et al.*, 2004). Resilience may be reduced through such actions as removing response diversity, removing whole functional groups of species, removing whole trophic levels, impacting on ecosystems via emissions of waste and pollutants and climate change and altering the magnitude, frequency, and duration of disturbance regimes. Ecosystems become more vulnerable to changes that previously could be absorbed through the combined and often synergistic effects of these pressures. As a consequence, ecosystems may suddenly shift from desired to less desired states in their capacity to generate ecosystem services (Folke *et al.*, 2004).

One lens through which one can observe vulnerability, adaptation and resilience is climate variability and change (e.g. IPCC1, IHDP2, UNEP, 1998, 2001; Downing and Patwardhan, 2003; Fussel and Klein, 2005). Adaptation can be reactive or anticipatory and can be carried out in response to or in anticipation of changes within existing situations (IPCC, 1995). In social systems, adaptation decisions are often made by a variety of actors including private decision-makers, public agencies, governments and civic society (IPCC, 2001). Adaptive capacity also refers to the degree to which *adjustments are possible in practices, processes, or structures of systems* to projected or

actual changes of climate (IPCC, 1995, Fig. 1) and is influenced by the resilience within the system or community (Berkes and Folke, 1998; Carpenter *et al.*, 2001). The capacity to adapt is a critical element of the process of adaptation but this varies, depending on various factors including scale (e.g. global, national, local scales) and context, with one of the key issues being the determination of future adaptive capacity (Adger and Vincent, 2005).

Gallopin (2006) has shown that vulnerability, resilience, and adaptive capacity and robustness are different manifestations of more general processes of response to changes in the relationship between open dynamical systems and their external environment (Gallopin, 2006). In this research, a deeper understanding of the hazards of “natural” park-like spaces is probed. One of the key hazards that impacts on parks is climate variability. The impact and responses to climate variability is examined. Factors weakening and or, enhancing response capacity, however, not only to climate as a driver of change, are also identified.

## **1.2 Climate variability**

Climate change could cost the world up to a fifth of its entire wealth, with major implications for human welfare, if nothing is done about it, according to the Stern Review on the Economics of Climate Change. The report, which was commissioned by Chancellor Gordon Brown of the United Kingdom and produced by a former chief economist of the World Bank, Sir Nicholas Stern, and his team in November 2006, notes that carbon dioxide and other greenhouse gas levels need to be stabilised in the next twenty years and thereafter fall to between 1% and 3% through a reduction of global emissions in order to prevent temperatures rising between two and three degrees Celsius over the next fifty years (Stern Review, 2006). Environmental impacts predicted in the report, should insufficient action be taken, include increased flood risk to coastal areas due to melting glaciers, declining crop yields particularly in Africa, rising sea levels, the extinction of up to 40% of all known species and extreme weather patterns. Economic impacts predicted include a reduction in global economic output by as much as 3% if there is an increase in temperature of two to three degrees Celsius and 10% if there is a

five degrees Celsius increase, with the poorest countries losing more than 10% of their output. The worst case scenario, according to the report, sees global consumption per head falling by up to 20% (Stern Review, 2006).

The IPCC Fourth Assessment Report (2007) builds upon past IPCC assessments and incorporates new findings from the past six years of research. It describes progress in understanding of the human and natural drivers of climate change, observed climate change, climate processes and attribution, and estimates of projected future climate change. The report is based upon large amounts of new and more comprehensive data, more sophisticated analyses of data, improvements in understanding of processes and their simulation in models, and more extensive exploration of uncertainty ranges (IPCC, 2007).

The understanding of anthropogenic warming and cooling influences on climate has improved since the Third Assessment Report (TAR), leading to very high confidence that the globally averaged net effect of human activities since 1750 has been one of warming. Changes in the atmospheric abundance of greenhouse gases and aerosols, in solar radiation and in land surface properties, which are expressed in terms of radiative forcing, alter the energy balance of the climate system. Since the Third Assessment Report (TAR), new observations and related modelling of greenhouse gases, solar activity, land surface properties and some aspects of aerosols have led to improvements in the quantitative estimates of radiative forcing (IPCC, 2007).

The report states that global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. The global increases in carbon dioxide concentration are due primarily to fossil fuel use and land-use change, while those of methane and nitrous oxide are primarily due to agriculture. The primary source of the increased atmospheric concentration of carbon dioxide since the pre-industrial period results from fossil fuel use, with land use change providing another significant but smaller contribution (IPCC, 2007).

The report expresses confidence that warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level. More intense and longer droughts have been observed over wider areas since the 1970s, particularly in the tropics and subtropics. The frequency of heavy precipitation events has increased over most land areas, consistent with warming and observed increases of atmospheric water vapour. Widespread changes in extreme temperatures have also been observed over the last 50 years (IPCC, 2007).

The impact of climate change in Africa will largely affect its rich ecosystems, on which the majority of the population derives its livelihood (Nyong, 2005). Africa's vulnerability to climate change limits the effectiveness of development interventions and calls for greater efforts in reducing the rate of global warming (Nyong, 2005). KZN is currently experiencing multiple stressors including climate stress and, in some cases, stressors occasioned by poor agricultural extension, health problems and poor governance (Reid and Vogel, 2006).

Poor communities are likely to be most strongly affected by any change in the frequency of extreme climate events such as floods and heat waves. Projected change in the frequency of extreme events will be amplified by the vulnerability of communities with limited resources to allow them to avoid or adapt to the impacts. The livelihoods of people across the economic spectrum will be impacted to some extent by climate change, but it is not likely that all will feel these impacts equally. It is important to identify and address the needs of the most vulnerable (Department of Environmental Affairs and Development Planning Report, 2005), but it has been noted that it is very difficult to probe the range of factors that shape vulnerability and adaptive capacity to stressors such as HIV/AIDS, climate risks and insecure land access (Reid and Vogel, 2006).

Bioclimatic model projections indicate that temperatures will rise over the whole of South Africa and summer rainfall will decrease by between 5% in the northern regions and 25% in the eastern and southern Cape (Rutherford *et al.*, 1999). Species-level modelling is essential for detailed conservation planning. Individual species range shifts, contraction

and expansion, are all possible outcomes of climate change and these need to be considered both individually and jointly (Midgley *et al.*, 2003).

### **1.3 Examples of approaches to examine vulnerability and resilience in local contexts**

*The ability to design effective response strategies depends on the understanding of key factors of success at the threshold of sustainability transitions.* For every resource management situation, an in-depth analysis of what factors may cause environmental degradation and impede the adoption of more sustainable management practices needs to be conducted (Lambin, 2005). Environmental perception, information processing and transfer, determinants of decision making and individual behaviour as well as the portfolios of available and feasible responses to environmental change all contribute to an understanding of sustainability. The interactions and synergies between these factors then need to be considered (Lambin, 2005).

Success or failure in resource management by human societies has been shown by scientific evidence to be controlled by three components of human-environment interactions. These three components are information on the state of the environment, motivation to manage the environment sustainably and capacity to implement a sustainable management of the environment (Gordon *et al.*, 2001).

The information component relates to the understanding by decision-makers of resource degradation and of alternative management practices, as driven by knowledge, information, and communication. The necessary information about the resource systems being governed as well as the human-environment interactions affecting those systems, at the appropriate scale is required for sustainable resource management (Dietz, 2003; Gordon *et al.*, 2001).

The motivation component relates largely to the evaluation of response options to environmental change. The capacity component deals with the resources required to implement change and is related to the provision of appropriate physical, technical and

institutional infrastructure necessary for the sustainable management of natural resources (Dietz *et al.*, 2003).

The information, motivation and capacity factors may form the broad outline of a theory of human-environment interactions in the context of sustainability science. They should not be treated in isolation but should rather be taken as a whole, recognizing their interdependence and interactions (Lambin, 2005).

Analytical methods for systematically assessing vulnerability may be critical for defining current and future management needs and policy decisions. Luers (2005) states that one of the biggest challenges in analysing dynamic vulnerability is capturing the evolution of a system's sensitivity, the effects of which are often not immediately apparent. She has proposed an analytical framework for evaluating the vulnerability of people or places to environmental and social forces. A position on a three-dimensional analytical surface is used in order to establish the relative vulnerability of a variable of concern (e.g. such as agricultural yield) to a set of disturbing forces (e.g. climate change). The surface is defined based on a generic vulnerability function, which is derived by translating a general definition of vulnerability, the susceptibility to damage, into a mathematical expression.

A threshold of damage is initially defined in this analytical method and susceptibility is then represented in terms of its sensitivity and exposure to exogenous disturbing forces and its state relative to a threshold of damage. Vulnerability expressed in this form is proportional to sensitivity and exposure and inversely proportional to the state of the system relative to a threshold of damage. The goal is to attempt to represent a relationship in a standard form that can be used as a tool to help sort through the complexity of vulnerability analysis in order to prioritise actions and assess the vulnerability implications of management and policy decisions and not simply to define a quantifiable measure. Changes in institutional, socio-economic and biophysical conditions will lead to shifts in the position on the surface over time. Adaptations to changing conditions, such as modifications in management could decrease sensitivity to increased exposure (Luers, 2005, p. 216).



Finding an appropriate way to examine the complexity of vulnerability analysis is critical. The “Situational Approach” (Wisner, 2004) is an approach that can be used to assist in making some sense of these various interacting variables. This approach focuses on everyday life and the situations in which people find themselves and does not view disasters and climate stress or shocks as extraordinary events but rather as “normal” circumstances to which communities have to respond (Wisner, 1993; Cannon, 2000). All people are viewed as having capabilities of self-protection and group action even though these capabilities are often not used to their fullest extent, if at all. These capabilities moreover go beyond what was previously described as “coping” and “adaptation” (Wisner, 2004, p. 191). This notion of building on inherent, daily capacities that can be used to enhance adaptive capacity has been expanded on by Devereux and Edwards (2004) who state that: “The people who will be worst affected are unlikely to be passive victims of climate change. Most already live in marginal environments and face weather variability, against which they have developed strategies that are resilient against all but the most severe or protracted shocks (Devereux and Edwards, 2004, p. 27).”

Having described the detailed complexity of some of the emerging analytical theory of vulnerability, adaptation and resilience, attention now turns to the methodology adopted for this research report. Clearly the emerging field is a very rich one, and justice to *all* the dimensions requiring detailed investigation cannot be undertaken here. Nevertheless, this study aims to bring to the surface some of the key aspects of the interacting “drivers” of change in the Hluhluwe Imfolozi Park. These can then be further examined and probed by those seeking a more rigorous analysis of such a complex system.

## 1.4 Research Methodology

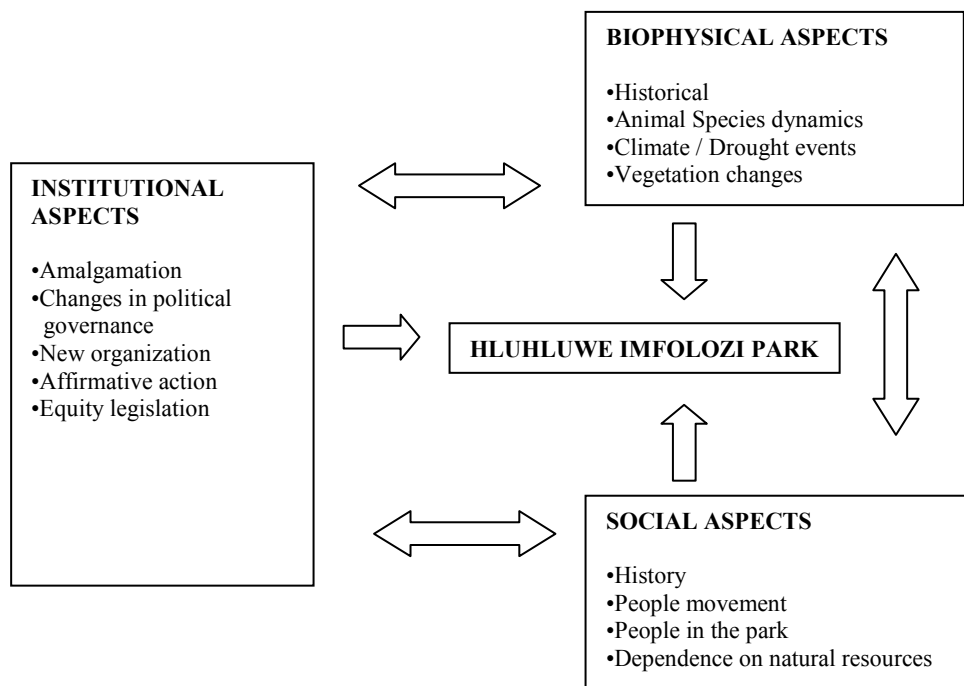


Figure 1.1: Illustration of the research protocol

The “Situational Approach” has been used in this research to examine complex vulnerability, adaptation and resilience in the Park. It became clear during the compilation of this report, however, that a detailed investigation into vulnerability, involving an anthropological investigation, which is beyond the scope of this report, is required. This investigation should analyse socio-economic, cultural and political dimensions as well as the drivers shaping societal-environmental interaction in the park.

The lens used to examine the complex interactions between the park and the various impacts is climate variability/change, with the unit of analysis being the Hluhluwe Imfolozi Park (Figure 1.1) in the first instance, although a range of additional stressors are also probed. The range of stressors have been categorised into biophysical, social and institutional aspects and these are investigated and reported on in the following chapters. The situational approach recognises that vulnerability to climate variability or risk is, however, not only because of physical factors e.g. rainfall, but is rather a complex

interaction of stressors that are usually revealed during acute and prolonged periods of climate stress.

In evaluating the park's vulnerability to change, the study addresses the question of what state is the park in biophysically, socially and organisationally and how vulnerable is the park to change? The interaction of the biophysical, social and organisational aspects is examined as well as how the park has responded to stress in the past. Finally, some of the strategies designed to better cope and adapt to anticipated future stress are profiled.

### **1.5 Data Sources**

To address the above question, various data have been used. Up until 2000 Ezemvelo KZN Wildlife produced an Annual Report known as the Yearbook. This is a compilation of Annual Reports submitted by all reserve managers and dealt with all aspects of the management of these areas for the preceding year. The process, culminating in the production of the Annual Report for Hluhluwe Imfolozi Park, involved a number of inputs and meetings at numerous management levels. On an annual basis Section Rangers and other staff compiled reports dealing with their areas of responsibility. Meetings were then held with these staff and the reserve Conservation Managers during which these reports were discussed, finalised and combined into a report for each of the reserves. A combined meeting involving all of the management staff of both of the reserves was then held which was chaired by the Regional Manager which drew together the combined reports of the Hluhluwe and Imfolozi Sections. This meeting also included inputs and reports by Scientific and Community Conservation staff who had responsibilities in both of the sections. It is appreciated that the data referred to in these reports may be biased, with one of the shortcomings being that the facts presented are all from the park management team's perspective. In order to obtain more balance in interrogating the data, *ad hoc* discussions were held with neighbouring community members during the period 1995 to 1998.

As a member of the Imfolozi Game Reserve management team, I attended a number of these report compilation meetings during the period 1995 to 1998. Together with the insight gained through this process, copies of Yearbooks and the Hluhluwe Imfolozi Park Management Plan were referred to and an analysis of patterns of resilience and vulnerability regarding the more important political, biophysical and social aspects (e.g. climate variability, management practices and the resultant impact on animal and plant populations, as well as the perceived effectiveness of neighbour relations programmes) was undertaken.

During 1997 the Management Plan was amended by management staff in order to ensure that the format was more relevant to the existing management philosophies. During this period the Community Conservation Strategic Plan was also formulated. Both of these processes involved evaluation of actual and perceived threats to the park as well as mitigating factors and provided an indication of resilience. Strategies to deal with the perceived threats were formalised by the stakeholders during this process. The results of these workshop sessions, involving management, Community Conservation, Scientific Services staff and representatives of neighbouring communities, have been drawn on in this research report. I also had *ad hoc* informal discussions with the organisation's Head of Game Capture, the Conservator in charge of Imfolozi Game Reserve, the Regional Ecologist for Southern Zululand, the Section Rangers of Makhamisa and Mbhuzane Sections in Imfolozi Game Reserve, the organisation's Law Enforcement Officer and Conservator Investigations as well as members of communities neighbouring the park during the period that I was employed on Imfolozi Game Reserve i.e. 1995 to 1998 as well as subsequent to these dates, to determine their perceptions in respect of a number of the issues investigated in this report.

Utilising the data obtained through the processes described, I show when, how and why the various stressors have interacted within the park, highlighting which stressors are the most important and why. Those strategies which appear to have helped the park to effectively deal with the various stressors are also highlighted.

Although this research report is not the “norm” in ecological resilience assessments, such as ecological modelling assessments done by Biggs and Scholes, (2002), Midgeley *et al.*, (2003), Rutherford *et al.*, (1999) and van Jaarsveld *et al.*, (1999), it nevertheless provides a preliminary assessment of emerging areas of fragility and areas of possible robustness within Hluhluwe Imfolozi Park regarding vulnerability to biophysical, social and political aspects.

## **1.6 Summary**

Vulnerability, adaptation and resilience is a key emerging discourse in GEC science. Resilience is currently considered to be the capacity of a system to absorb disturbance and re-organise while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks. In the past, resilience has focused on the capacity to absorb shocks and still maintain function but the capacity for renewal, re-organisation and development is now considered to be essential for the sustainability of various systems. The necessity to learn to manage change rather than simply to react to it and the key role that individuals and small groups or teams of individuals play in this context are now considered essential. Adaptive capacity deals with the degree to which adjustments are possible in practices, processes, or structures of systems to projected or actual changes. The ability to design effective response strategies depends on the understanding of key factors of success at the threshold of sustainability transitions.

In compiling this research report, copies of Yearbooks and the Hluhluwe Imfolozi Park Management Plan were referred to and an analysis of patterns of resilience and vulnerability regarding the more important political, biophysical and social aspects was undertaken. Together with this, I attended a number of report compilation meetings and also referred to the results of various workshop sessions, involving management, Community Conservation and Scientific Services staff as well as representatives of neighbouring communities. I also had *ad hoc* discussions with a number of the organisation’s staff members as well as members of communities neighbouring the park during the period 1995 to 1998, in order to determine their perceptions in respect of a number of the issues investigated in this report. A number of meetings were attended which were held at the three sections in Imfolozi Game Reserve in order to facilitate

communication between the section management staff and members of the neighbouring communities. Elected councillors, izinDuna and other members of these communities attended these meetings.

Utilising the data obtained through the above-mentioned processes, I show when, how and why the various stressors have interacted within the park, highlighting which stressors are the most important and why. In evaluating the park's vulnerability to change, this study addresses the question of what state is the park in biophysically, socially and organisationally and how vulnerable is the park to change? The interaction of the biophysical, social and organisational aspects is examined as well as how the park has responded to stress in the past. Those strategies which appear to have helped the park to effectively deal with the various stressors are highlighted. In order to place the park in context, the next chapter provides some background to Hluhluwe Imfolozi Park, describes the park's management programme and institutional and governance background and highlights the more important biophysical, social and organisational aspects.

## **CHAPTER TWO - BACKGROUND TO HLUHLUWE IMFOLOZI PARK**

### **2.1 Introduction**

This chapter begins with a brief description of the situation of the park in order to provide a geographic and contextual perspective. This is followed with a description of the park's management programme and institutional and governance background. Thereafter an overview is provided of those biophysical, social and organisational aspects which were investigated in the study. Maps, which are provided in Appendix A, are referred to in order to illustrate the spatial perspective of the park as well as its geographic relationship with the neighbouring communities.

### **2.2 Situation of Hluhluwe Imfolozi Park**

The Hluhluwe Imfolozi Park is situated in Northern Zululand in the province of KwaZulu-Natal in South Africa. It lies to the west of the town of Mtubatuba and east of the town of Hlabisa. These two towns are linked by a road, which bisects the park through the section known as the Corridor and demarcates the management divide between Hluhluwe and Imfolozi Game Reserves.

### **2.3 Park Management**

Hluhluwe Imfolozi Park is fenced as one unit, but managed as two distinct entities. Since 1952, the reserve has been managed by staff of the Natal Parks Board and, more recently, the KwaZulu-Natal Wildlife Service, now known as Ezemvelo KZN Wildlife, which was formed through the amalgamation of the Natal Parks Board and the KwaZulu Department of Nature Conservation.

The park is managed according to strict guidelines laid down in a combined management plan. The opportunity for natural selection to take place is maintained through a minimum interference approach to management. Process Based Management is practiced through, for example, predator simulation, dispersal sinks and point source burning. The

naturalness and integrity is maintained over the greater part of the reserve through a process of use zonation. Integrated Environmental Management procedures are used to minimise the impact of management actions and those developments that are deemed necessary by management (Hluhluwe Imfolozi Park Management Plan, 2000).

A Conservator or Conservation Manager is based in the Hluhluwe section of the park in the north at Hilltop and is responsible for the management of Hluhluwe Game Reserve and one is based in the Imfolozi section in the south at Mpila and is responsible for the management of Imfolozi Game Reserve. Hluhluwe Game Reserve is divided into two management sections and Imfolozi into three. These sections are managed by Section Rangers who have a complement of Field Rangers and General Assistants assigned to each section. Figure 1.1 Map of Hluhluwe Imfolozi Park in Appendix A provides a spatial perspective of the park.

Both of the Conservation Managers report to a Regional Manager based at Ulundi, who reports to the Head of Conservation based at Ezemvelo KZN Wildlife's head office in Pietermaritzburg. Also reporting to the Regional Manager are a Regional Ecologist, a Human Resources Manager, a Community Conservation Officer and other support staff.

## **2.4 Background to Biophysical Aspects**

### **2.4.1 Climate**

There is significant climatic variability due to the topography of the area. The proximity of the coast influences the climate and the annual rainfall is seasonal with most rain falling between October and March. The mean annual rainfall is significantly higher in the high altitude regions in the Hluhluwe section in the north than in the low-lying western areas in the Imfolozi section in the south. Annual temperatures are also variable, with these being significantly higher in the low-lying western areas in the Imfolozi section (Hluhluwe Imfolozi Park Management Plan, 2000).



#### **2.4.2 Hydrology/Aquatic systems**

The aquatic ecosystems are represented by rivers which are both perennial and non-perennial and stationary water bodies which are both permanently and seasonally wet. The three main watercourses, which usually have water throughout the year, are the White Umfolozi River, the Black Umfolozi River and the Hluhluwe River with its two larger tributaries the Mansiya and the Nzimane Rivers. Most of the streams in the park are non-perennial. The most important vlei areas are Hidli vlei and Mgqisweni Pan. Numerous other smaller wetlands such as sponge areas and seepage lines are distributed throughout the area (Hluhluwe Imfolozi Park Management Plan, 2000).

#### **2.4.3 Flora**

As far as habitat is concerned, the park is effectively an island which is more and more being isolated from similar habitat types due to land use practices in the surrounding areas. As such it has high importance due to benchmark considerations as well as being representative of an ever diminishing habitat type (Hluhluwe Imfolozi Park Management Plan, 2000).

#### **2.4.4 Alien Flora**

The species considered to constitute an immediate threat to the ecology of the park by management are *Chromolaena odorata*, *Lantana camara*, *Opuntia ficus-indica*, *Melia azedarach*, *Psidium guajava*, *Solanum mauritianum* and *Cesalpinia decapetala*. An alien plant removal and monitoring programme is ongoing (Hluhluwe Imfolozi Park Management Plan, 2000).

#### **2.4.5 Fauna**

Herbivore monitoring is conducted during which data regarding population fluctuations as well as supplementary data that contribute to population modelling and life table analyses is collected by management and scientific staff and incorporated into computer models (Hluhluwe Imfolozi Park Management Plan, 2000).

#### **2.4.6 Problem Animals**

Problem animals are classified by park management as wild animals that are resident in the reserve but cross the boundary and cause conflict with neighbouring communities, wild animals that are resident outside the reserve and become problematic to the communities living there and wild animals that cause problems inside the reserve. The species which have the potential to become problem animals are lion, leopard, elephant, cheetah, wild dog, hippo, crocodile, hyaena, baboons, monkeys and bush pigs (Hluhluwe Imfolozi Park Management Plan, 2000).

#### **2.4.7 Disease Management**

Tuberculosis is present in the buffalo population and has been confirmed in lion and other species. It is suspected to have caused lesions discovered in black rhino in 1970 and again in 1996. A Tuberculosis survey has indicated that the disease had spread throughout the park by 1995. The strategy presently is to eliminate or manage the prevalence of Tuberculosis to below 10%, which is considered the acceptable limit by management and scientific staff. Foot and Mouth Disease, Anthrax and Rinderpest are not present but would pose serious economic losses to the neighbouring agricultural sector should they appear and therefore management is on constant alert regarding these diseases (Hluhluwe Imfolozi Park Management Plan, 2000).

#### **2.4.8 Security Management and Protection Programme**

Whilst most poaching is undertaken largely by people living adjacent to the park, internal poaching by staff has occurred in the past. Poaching consists of the poaching of warthog and antelope using dogs as well as rhino poaching using firearms. The use of snares is very rare. The poaching of rhino by neighbours and other outsiders escalated during the 1990's, with 23 white rhino and 4 black rhino being poached during the period 1991 – 1999.

Mitigating factors regarding security are the extremely formalised and closely monitored security structures which are in place. The park is divided into five enforcement sections.

Each section is under the command of a Section Ranger who is assisted by a Corporal. The Staff Sergeant is the senior Field Ranger and the overall commander of all the Field Rangers. There are a number of Field Ranger camps within each section under the control of a Lance Corporal and manned by three Field Rangers. When required, smaller satellite camps are established in problem areas.

The Field Ranger force operates on a picket system which consists of outposts situated on the boundary of the park as the foundation of the law enforcement programme. From these outposts Field Rangers are tasked on a daily basis as to which areas to patrol. This system allows staff to be strategically positioned, is a deterrent to poachers, acts as a means of gathering data, and is an early warning system in the event of a poaching incident.

A Law Enforcement Officer is based in Imfolozi Game Reserve. His operational area is all reserves administered by Ezemvelo KZN Wildlife containing rhino in the Zululand region. An Investigations Unit is based in Durban which supports all of the reserves administered by Ezemvelo KZN Wildlife.

An extensive community conservation programme aimed at community upliftment and community support for conservation is underway. This programme is guided by a Community Conservation Strategic Plan, approved by both Ezemvelo KZN Wildlife and local traditional leaders (Hluhluwe Imfolozi Park Management Plan, 2000).

## **2.5 Background to Social Aspects**

Human occupation of the area is believed to extend for approximately half a million years. It seems unlikely that the permanent settlement of people occurred in what is now the Imfolozi section of the park, due to the presence of tsetse fly *Glossina spp.*, although the remains of homestead sites and numerous grinding stones indicate that the western section of Imfolozi section was fairly densely populated by African clans at one time. Shaka proclaimed the area between the Black and White Umfolozi Rivers as his private

hunting ground during his reign from 1818 to 1828 (Hluhluwe Imfolozi Park Management Plan, 2000).

### **2.5.1 Cultural Context**

The people living adjacent to Hluhluwe Imfolozi Park consider themselves to be Zulu, are largely loyal to the Zulu King and are living on Ngonyama Trust Land. Forced removals during the apartheid era as well as the villagization concept have affected modern settlement patterns in these areas. The tenant farmer system, refugee settlement from internecine faction fighting in the Tugela Ferry area and the migrant labour system have affected the culture of these people significantly (Hluhluwe Imfolozi Park Management Plan, 2000).

### **2.5.2 Socio-political Context**

Political structures which are in place in the areas surrounding the park are those of the Regional Authorities of uThungulu and Zululand, the Magisterial Districts of Hlabisa, Lower Imfolozi, Mtonjaneni, Mahlabatini and Nongoma and the local town councils of Hluhluwe, Ulundi and Nyala, which include the towns of Mtubatuba, Hlabisa and Kwa-Msane. Also present is representation of proportionally elected members of the provincial and national Parliament.

There are ten Traditional Authority wards neighbouring the park in which the traditional tribal political system is the primary form of governance. Figure 1.2: Map of the park showing Traditional Authority Boundaries in Appendix A provides an indication of the distribution of these wards (Hluhluwe Imfolozi Park Management Plan, 2000).

### **2.5.3 Socio-economic Context**

The park lies in a marginalised area with respect to government expenditure due to its geographic location and which is one of the most impoverished in KwaZulu-Natal, with 75% of all individuals living in poverty. The region has a population of approximately 2 million people, which is growing at a rate of approximately 2, 5 % per annum. In excess

of 80% of the inhabitants are economically inactive and in excess of 12% earn less than R12 000 per annum (Hluhluwe Imfolozi Park Management Plan, 2000).

The majority of the communities neighbouring the park practice subsistence agriculture, with a number of individuals working for government and community services and providing migrant labour to the industrial areas of Gauteng, Durban and Richards Bay. Land-use to the east of the park is characterised by extensive agricultural, commercial, industrial and infrastructural development. Land-use practices are more traditional in the areas closer to the park and particularly to the west, consisting of agriculture on communal land (Hluhluwe Imfolozi Park Management Plan, 2000).

## **2.6 Background to Organisational Aspects**

The creation of the KwaZulu Nature Conservation Service in April 1998, through the amalgamation of the Natal Parks Board and the KwaZulu Department of Nature Conservation, resulted in a number of changes in the organisation as far as staffing structures, responsibilities and alignment of regional boundaries are concerned. The name of the KwaZulu Nature Conservation Service has subsequently been changed to Ezemvelo KZN Wildlife.

## **2.7 Summary**

This chapter has provided a brief description of the situation of the park, in order to provide a geographic and contextual perspective, and has also given a description of the park's management programme as well as the institutional and governance background. Those biophysical, social and organisational aspects which were investigated in the study are described. The following three chapters deal in more depth with the biophysical, social and organisational aspects, with the next chapter dealing with biophysical vulnerability to change. Impacts, coping and adaptive management responses to biophysical environmental stressors as well as the relationships between stressors and impacts are examined.

## **CHAPTER THREE - BIOPHYSICAL VULNERABILITY TO CHANGE**

### **3.1 Introduction**

In this chapter biophysical data such as temperature, rainfall and animal population figures which have been captured from reports in the Yearbooks are referred to. These data are represented largely in tables and figures which are presented in Appendix B. Descriptions of various programmes and processes are also provided. An evaluation of the data is then provided under the discussion section of the chapter. The Hluhluwe Imfolozi Park has been the subject of a number of published and unpublished studies, both in the biophysical and social realm. An example of these is the unpublished study by Dr. Helen Watson on soil erosion within and outside the park (Watson, 1990). These studies are referred to where relevant.

Impacts, coping and adaptive management responses to biophysical environmental stressors are examined using these reports and impacts on the biodiversity of the park are ascertained. The relationships between stressors and impacts as well as indicators of resilience were thus captured, so as to provide insight to the park's vulnerability to a range of biophysical stressors, as well as to establish whether there are indicators that climate change appears to be manifesting as an issue during the period under review. Data were primarily analysed to establish whether the impacts and coping strategies related to biophysical stressors appear to be indicators that the park would be particularly vulnerable to climate change which would be revealed during acute and prolonged periods of climate stress. Discussions with staff members were held in order to qualify findings and gain further insight. Additional biophysical aspects are provided in Appendix B in order to provide further background and to emphasise important aspects of the management programme.

## **3.2 Discussion**

### **3.2.1 Climate**

#### **3.2.1.1 Temperature**

Climate is not indicated in the management plan or the Yearbooks as a principle threat and no management actions are noted as a result. Figures 3.1 and 3.2 in Appendix B, which indicate maximum and minimum temperatures for Hluhluwe Game reserve for the period 1980 to 1994, note a range of 3,8 degrees Celsius to 32 degrees Celsius. This is the only data available for the period under review and gives no indication of any observed change towards a warmer or cooler climate, as can be expected due to the limited data as well as the relative brevity of the period under review.

#### **3.2.1.1 Rainfall**

Rainfall is a critical meteorological variable influencing life in the park. The average annual rainfall for Hluhluwe Imfolozi Park, based on the data available from all of the measuring stations on the park for the fifteen years from 1985/86 to 1999/2000 as shown in figure 3.8 (Appendix B), amounted to 889.68 mm. When analysing the data represented in figures 3.3, 3.4, 3.5, 3.6 and 3.7 (Appendix B), which indicate the annual rainfall measured at different measuring stations throughout the park, it becomes apparent that substantially more rainfall than the average occurred in 1983/84, 1987/88 and 1995/96 at all of the stations.

When referring to the above figures and figure 3.8 (Appendix B), there is an observable variability in the rainfall (e.g. lower than average for the period from 1980 to 1983 as well as the period 1991 to 1993), thereafter followed by a year of above average rainfall followed by a year of below average rainfall for the period 1993/94 through to 1999/2000. The 4 year moving average trendline depicted in figure 3.8 (Appendix B) indicates a gradual increase in annual rainfall over the period 1985/86 to 1990/91. This average then drops for the period 1990/91 to 1994/95 and then shows an increasing trend for the period 1994/95 to 1999/2000. These average increases and decreases in average annual rainfall

are not significant and range from approximately 700mm in 1985/86 to 980mm in 1990/91 and 640mm in 1994/95 to 720mm in 1999/2000.

The tropical cyclone Domoina in 1984 and the serious flooding of 1987 appear from the data to be unusual and unpredictable and no management action could be expected to mitigate against this type of event. The annual rainfall figures are not, however, particularly affected by these events and the flooding was apparently a result of the large amount of rain received over a very short time span.

Periods of drought and floods have always occurred in KZN (Reid and Vogel, 2006) and such periods of climate stress are expected to occur, possibly with greater frequency and magnitude, in the future (Joubert and Mason, 1997; Schulze, 2005). Predictions are that these types of events could also become more frequent and even less predictable (Rutherford *et al.*, 1999). There is no indication, however, from the data that either temperature or rainfall is becoming more erratic or that the climate of the park is becoming drier, wetter, hotter or colder and this clearly requires more detailed investigation.

There is considerable debate taking place presently as to whether the climate in the Eastern parts of South Africa will become wetter or drier. The development of regional scenarios is an evolving, and maturing, research activity. A key source of uncertainty in regional climate projections is feedback mechanisms (Hewitson *et al.*, 2005). Climate simulations by the Conformal-Cubic Atmospheric Model (C-CAM) indicate that much of the Eastern subcontinent will experience an increase in rainfall in the early summer within the context of future climate (Engelbrecht, 2005). Whether or not climate change can be detected at a local or regional scale is questionable. Problems exist in the detection of climate change due to inhomogeneity in climatic datasets, as well as the lack of long-term, high quality daily datasets for the region (Warburton and Schulze, 2005). It is within this context of uncertainty that an initial assessment of vulnerability to climate variability and change and possible implications for park management were considered.



Management's perceptions in this regard are that, given the increasing populations of megaherbivores such as elephant, climate extremes on the dry side will become a serious threat in the absence of management intervention. The responses of interviewed community members are that this issue is also a threat in terms of their agricultural and domestic efforts but they do not indicate any opinion regarding the effects on the park itself. This result appears to concur with that of Reid and Vogel (2006) who found that climate stress is not perceived as a major priority by resource poor farmers in KwaZulu-Natal. Climate change rather, in these communities, appears to compound existing pressures and hence a better understanding of multiple stressor interactions producing change in the park is required.

When referring to Table 3.6 (Appendix B), it is noted that management has identified the most important threats in the Management Plan as those of an increased flooding regime due to upstream catchment alteration and increased sedimentation of rivers with catchments outside the park. Domoina and other less severe floods as well as poor catchment management in surrounding areas have resulted in particularly the White Umfolozi River becoming observably silted up to the extent that it virtually ceases to flow during the dry season. Particularly the Imfolozi Section in the south of the park is susceptible to water scarcity which would become critical should the climate tend towards a drier regime.

The management plan does not, however, make any reference to strategies to deal with these threats and no efforts are reported in the Yearbooks, however, the responses of management staff during discussions indicate that this has been identified by them as a threat more recently and it has been proposed by management that a catchment management forum be established with the Department of Water Affairs and Forestry (DWAF) to investigate ways to address this. It is felt by management that this issue is further compounded by increased water abstraction by industry, particularly mining in the river systems and by damming of tributaries for domestic supply as part of the municipal services roll out.

The overwhelming response by community members when questioned in this regard is that climate variability is not considered an issue as water is increasingly being provided by municipal services by way of pipes and the situation is continually improving, in their estimation. I, however believe, from experience gained from working in the park, that the threat to water flow from sedimentation is of such a magnitude and the possible negative consequences so potentially catastrophic, that a strategy aimed at educating neighbours regarding effective catchment management needs to become a priority of the community conservation programme.

### 3.2.2 Flora

The two major threats to vegetation identified by management in the Management Plan are the encroachment of woody plants in grasslands and invasive alien plants, especially *Chromolaena odorata* (Hluhluwe Imfolozi Park Management Plan, 2000).

Bond *et al* have shown that disturbance gradients, from high fire frequency and low herbivore density at high altitudes, to lower fire frequency and higher herbivore density at low altitudes, are responsible for the shift in plant community structure along the spatial gradient within the park. They suggest that differential responses to browsing and fire may also explain temporal turnover from *Acacia nilotica* in the past to *Acacia karroo* in the present. They propose that changes in the area burnt annually, and in faunal composition, suggest a landscape-scale shift from grazing-dominated short-grass landscapes in the 1960s, favouring *Acacia nilotica*, to fire-dominated tall grasslands in the 1990s favouring *Acacia karroo* (Bond *et al.*, 2001).

In an attempt to define an alternative mechanism of grass–tree coexistence in savanna ecosystems a model has been built by Higgins *et al.*, which concentrates on life history–disturbance interactions between grasses and trees. This model demonstrates coexistence for a wide range of environmental conditions, and exhibits long periods of slow decline in adult tree numbers interspersed with relatively infrequent recruitment events. It shows that recruitment is controlled by rainfall, which limits seedling establishment, and fire, which prevents recruitment into adult size classes. It also demonstrates that decline in

adult tree numbers is the result of continuing, but low levels, of adult mortality. Both aspects of the dynamics are consistent with an established non-equilibrium mechanism of coexistence (the storage effect). The analysis by Higgins *et al.*, using this model, suggests that understanding grass–tree interactions in savanna requires consideration of the long-term effects of life history–disturbance interactions on demography, rather than the fine-scale effects of resource competition on physiological performance (Higgins *et al.*, 2000).

As far as present management staff members are concerned, their responses during discussions indicate that woody plant encroachment is considered a threat principally in the North of the park where the rainfall is higher. This is, however, also seen as something that may be cyclical in nature and it is further realised by them that people played a significant role in keeping bush encroachment under control prior to the establishment of the park through agricultural practices at the time. The release of this pressure through the establishment of the park has allowed the relatively rapid return of this vegetation and research is under way to understand better the mechanisms involved in this process.

Community member's responses during discussions indicate that this is considered a threat outside the park as it provides hideouts for problem animals, closes up grazing land and invades cultivation fields. As far as the situation inside the park is concerned, this is not considered to be something that affects them, except positively through providing employment opportunities to eradicate encroaching vegetation.

Referring to Figure 3.9 (Appendix B), it is clear that the bush control programme has suffered greatly during the period under examination through lack of adequate funding. Amounts cleared every year reduced to virtual nil in 1999, but this was followed by an intensive effort in 2000, resulting in 5 500 hectares being cleared in 2000. This is three times more than that cleared in a single year in the period from 1980 though to 1999 and indicates an extremely positive development, should this be sustained.

Management staff members have advised that during the latter part of the period under review this programme was not funded at all but was carried out at no cost by members of

neighbouring communities for the wood resource that it provided them. This programme has subsequently been suspended by management due to a perception by them that this may not, in fact, be as big a problem as previously thought.

Community member's perceptions regarding the suspension of the clearing programme are largely negative in that this has resulted in reduced employment opportunities, despite this having been offset by other poverty alleviation programmes that have been implemented by management. This issue clearly interacts with organisational aspects due to budget constraints and has impacted negatively on the park's attempts to positively influence neighbouring communities' perceptions of the park.

Referring to Figure 3.10 (Appendix B), it is clear that the use of fire to limit woody plant encroachment has not suffered due to funding constraints as this is not as reliant on funding as the other methods used. The data indicate a massive sustained effort for the period 1988 through to 1990, but then this reduced significantly until 1993, when very little burning took place. The programme was intensified from 1994 through to 1999, with an average of approximately 35 000 hectares being burned annually during this period.

Management staff's perceptions are that fire, if properly implemented, can be extremely effective in this regard and will continue to implement the programme where feasible. The actual practical implementation of this fire policy is constantly debated due to changes in ecological concepts and a new focus on biodiversity (Bond and Archibald, 2003). As far as the community members are concerned, discussions indicate that this is a non issue.

The effectiveness of this programme is still in doubt and it appears that thickly wooded savanna biome may dominate the area completely over time. The resultant loss of grassland habitat is of concern as regards the habitat requirements of megaherbivores as well as reduced sightings of game, resulting in a reduction in the attractiveness of the area to ecotourism (Hluhluwe Imfolozi Park Management Plan, 2000). The structural changes that have occurred in the vegetation of the Hluhluwe-Imfolozi Park have been quantified

by Watson and MacDonald using 1937, 1960 and 1975 aerial photographs, and related to the management history. A progressive increase in both tree and shrub cover has been seen to have occurred. In the short term, both intensive woody plant removal operations and controlled burning applications appear to have been effective in retarding the rate of encroachment by both shrubs and trees. Their study has shown, however, that neither was effective in the long term (Watson and MacDonald, 1983).

In the future, because of climate variation, there will be a need to manage vegetation more appropriately and grazing and fire will have to be used more cautiously as management tools. A critical role for fire in maintaining plant community structure in many grassland types leaves them vulnerable to vegetation change should changes to temperatures and precipitation occur that are sufficient to alter biomass and fire frequency. Grasslands are also vulnerable due to the introduction and spread of invasive species (Rutherford *et al.*, 1999).

### **3.2.3 Alien Flora**

Alien plants appear to represent the greatest threat to the park at all levels. Similarity to the impact of bush encroachment, alien flora poses the threat of reducing the habitat of a number of indigenous animal and plant species within the park and due to the requirement of a warm, humid environment by *Chromolaena odorata* for optimal growth and propagation, a warmer and more moist climate would increase the park's vulnerability, particularly in the north of the park, to the negative impacts of this plant.

Referring to Figure 3.11 (Appendix B), it becomes clear that the programme has not been sustained throughout this period. According to reports in the yearbooks the programme suffered during this period due to a lack of funding, negating any gains made previously, through the lack of sustained follow up programmes. Up until 1999 the lack of funds had virtually reduced the programme to being totally ineffective. The Department of Water Affairs and Forestry Working for Water programme injected funding into the programme in the latter stage of the period under review and, through partnerships with local

communities, the programme has been resurrected, but these benefits were only being realised in 2000.

Figure 3.11 (Appendix B) indicates that the removal programme reduced from the effort in 1987 when 3 600 hectares of *Chromolaena odorata* were cleared mainly in the Hluhluwe section to virtually no clearing being carried out in 1990. From 1991 through to 1999, the effort was sporadic and influenced by lack of funding, according to reports in the yearbooks, with no work being done in 1998 and only 500 hectares being cleared in 1999.

As far as present management staff are concerned, they have indicated during discussions that the Hluhluwe Imfolozi Park Chromolaena Project is presently funded to an amount of fourteen million Rand per annum. They feel that this level of funding is crucial but the long term plan for sustainability is of concern to them. Despite this, they are positive that, as alien plant control at a provincial level is far more strategic now than before, the prospect of sustainability of the programme is improving, but no indication is made of a perception that the threat would increase due to climate change resulting in a warmer, more moist climate. It is felt that the programme has provided a positive public relations opportunity for management as they have, at times, as many as 900 people in the field clearing alien plants. These people work for emerging local contractors, that management employ, and community relations are improving significantly as a result. Due to the requirement of a warm, humid environment by *Chromolaena odorata* for optimal growth and propagation, it is apparent that climate change resulting in increases in a warmer and more moist climate would increase the park's vulnerability, particularly in the north of the park, to the negative impacts of this plant.

Community member's perceptions are that this is considered a threat outside the park as alien plants provide hideouts for problem animals such as hyaena, close up grazing land and invade cultivated agricultural fields. As far as the programme inside the park is concerned, their responses indicate that it is not considered to affect them except for employment opportunities provided through the programme. As with the responses of management staff, it is apparent that climate change which increases the ability of alien

plants to encroach into existing indigenous plant communities is not a consideration. It is anticipated that climate change will necessitate greater efforts at clearing invasive vegetation which would provide even greater employment opportunities for the neighbouring community members, thereby interacting with social aspects. The funding requirements of this programme interact with the organisational aspects in this regard, in that a reduction in budget, as occurred during the latter part of the period under review, would reduce the scale of the programme, thereby reducing employment opportunities and leading to negative perceptions on the part of community members.

#### **3.2.4 Fauna**

The most important threats to fauna identified by management are alien diseases and loss of habitat. The habitat loss threat has been dealt with in the flora section, with the potential threats to the grasslands being highlighted. This threat is of particular concern regarding the megaherbivores such as white rhino and buffalo. With white rhino having the status that it does in the park, this threat needs to be aggressively mitigated against.

Referring to Figures 3.12 through to 3.24 (Appendix B), dealing with animal population estimates and removals, it becomes clear that the population growth rate is upward and there is no indication that there is cause for concern that animal populations are not increasing. Fluctuations in estimates are the result of differing intensities in estimating procedures and are not considered to be indicative of significant population reductions or recruitment by management and scientific staff. The various monitoring programmes are noted in Table 3.27 (Appendix B).

Estimates for herbivores are noted in Figure 3.17 for African Buffalo, Figure 3.18 for Impala, Figure 3.19 for Nyala, Figure 3.20 for Kudu, Figure 3.21 for Wildebeest, Figure 3.22 for Zebra, Figure 3.23 for Waterbuck and Figure 3.24 for Warthog. All of the data indicate a steady upward growth rate over the period 1993 through to 1995. The estimates then drop fairly significantly and thereafter indicate a steady increase. The estimates for the period 1997 through to 1999 are considered more reliable by

management and scientific staff than those for the preceding years due to more intensive surveys.

Responses of fauna to drivers of change, including biophysical change such as climate, are however complex. Census records for eleven ungulate species in the Kruger National Park over 1977–96 were examined by Ogutu and Owen-Smith, who found that severe population declines by seven ungulate species were inadequately explained by indices of El Niño-Southern Oscillation (ENSO) or its effects on annual rainfall. They found that an additional influence of change was an extreme reduction in dry season rainfall, concurrent with and perhaps related to a regional temperature rise which was possibly a signal of global warming (Ogutu and Owen-Smith, 2003). Similar population declines in response to biophysical change are not evident in the census records for Hluhluwe Imfolozi Park, but this may require further detailed assessment.

A further study which reconciled census totals with population structure and estimated annual survival rates for the juvenile, yearling and adult stages of ten ungulate species over fourteen years or longer in the Kruger National Park found that during this period four species maintained high abundance levels, while six species declined progressively in abundance. Juvenile survival was found to be sensitive to annual variability in rainfall for most of these species, especially in the dry season component. Rainfall components also affected adult survival in several of the declining species. A negative effect of past prey availability as well as changes in predator abundance, on adult survival was more strongly supported statistically among the declining species than the lagged effect of prior rainfall (Owen-Smith *et al.*, 2005).

The authors believe that the susceptibility of adult survival to environmental influences for the declining species probably reflected an interaction between nutritional shortfalls and a numerical increase in lions, preying largely upon the adult segment of these species. The ungulate species that persisted at high abundance seemed resistant to effects of rainfall on food resources and evidently drove the changes in predator abundance. The sharp density effect on adult survival among these species could indicate prey switching by lions following changes in their relative availability (Owen-Smith *et al.*, 2005).



The ecological consequences of a severe drought on Tuli, Klaserie, the Kruger National Park and Imfolozi Game Reserve established that herbivore mortality occurred during the second year of the drought, when failure of the spring rains coincided with depleted food reserves. Herbivore mortality was found to be low in Imfolozi despite the mortality of grass tufts being extensive during the drought. Initial recovery was found to be rapid in Imfolozi after one season of above-average rainfall. The study concluded that some drought-related mortality is natural and probably beneficial to both animal and plant populations and that wild ungulate populations should be allowed to fluctuate within limits set by management objectives (Walker *et al.*, 1987).

Regarding climate change, according to the Vulnerability and Adaptation Assessment of South African Animal Taxa to Climate Change, the modelling of species in the Kruger National Park indicated that after climate change only 27 species of the 80 investigated were still present in the park in 2050 with 1 additional species having shifted into the park. Of the 34 bird species included in the study all but one are predicted to go locally extinct in the park under conditions of climate change. The authors feel that these dramatic results emphasise the transitory nature of many conservation areas as biodiversity sanctuaries under conditions of climate change (van Jaarsveld *et al.*, 1999). It is reasonable to assume that similar impacts will be felt in Hluhluwe Imfolozi Park though to a lesser extent due to the geographic position of the park, which, according to the modelling, is not expected to become as arid as the Kruger National Park. As is clearly shown by the studies conducted in the Kruger park, similar detailed investigations, by well-funded research teams, are needed to investigate the role of climate change in the Hluhluwe Imfolozi Park.

Management staff responses indicate that there are presently no particular concerns regarding animal population growth and that climate change has not been considered as a particular threat to the stability of animal populations within the park. They have advised that they feel that as all megaherbivores, except elephant at this stage, have management programmes in place that will mitigate against any ecological concerns that might arise through increasing populations, that there are no concerns in this regard. They believe that the growing populations of other game species are supporting a healthy and diverse

range of predators and it is anticipated by them that a level of self and predator regulation will result for most of the game species.

Community members have also indicated satisfaction with the increasing game species populations and have requested that any offtakes as a result of population control measures in the future should be made available to them. This interacts with social aspects in that a number of community members see the game removal programme as benefiting them and has led to positive perceptions of the park. Organisationally, any reductions of this programme due to funding constraints as a result of budget cuts would have the opposite effect and lead to dissatisfaction on the part of these community members.

There are species specific management strategies in place for key species such as black and white rhino and these are serving to maintain populations at defined levels according to the data for the time scale under consideration.

Figure 3.12 (Appendix B) indicates that the Black Rhino population is growing at a fairly steady rate, with estimates over the period 1993 through to 1999 averaging between 350 and 400 individuals. Management staff members have advised that they believe that these figures are largely correct for the period under review but that it has subsequently been shown that the removals of Black Rhino have caused major disturbances in the population growth of this species and, in fact, retarded it significantly. They have also advised that further concern has been raised about productivity being exported from the park through removing females with unborn calves. They believe that the fact that this population was not entirely known at the time under review resulted in some inaccuracies in estimation. They state that this has led to perceptions that the population is now performing worse than previously whilst the inaccuracies of the past are being corrected. Their position is that this highlights the importance of reviewing strategies and constantly questioning estimates.

Figure 3.13 (Appendix B) similarly indicates that the White Rhino population is stable and increasing, although estimate reliability affects the figures and it is apparent that the

population may have been over estimated for the period 1991 through to 1995. The population was consistently estimated as slightly in excess of 1500 individuals for the period of 1997 through to 1999.

During discussions, the potential of climate change to impact negatively on the black and white rhino populations was indicated to be a concern, as habitat loss due to climate change which promoted alien plant encroachment is regarded as a serious threat to the populations. Community members questioned in this regard have indicated no particular feelings on the subject.

### **3.2.5 Problem Animals**

Prior to the fencing of the park, which has included electrification, there was extensive damage caused to crops and property by animals emanating from the protected area. Hyaena were responsible for predation on livestock and baboons and monkeys raided crops. The predation on livestock by lion escalated as the reintroduced population grew. With the high standard of maintenance of the electric fence, fewer problems are now being experienced, but sporadic incidences still occur, particularly when fences are damaged by flash floods and fires. The lion population has reduced from more than 140 in 1987 to approximately 80 individuals in 1999, as indicated in Figure 3.29 (Appendix B). The recruitment was negatively affected during the period under review by the presence of immuno-deficiency in the population.

The elephant population is increasing rapidly as indicated in Figure 3.14 (Appendix B), which indicates an increase from less than 50 in 1988 to approximately 250 individuals in 1999. Management is concerned that this will lead to problems both internally, due to habitat destruction and aggression towards other species, including humans, as well as externally because of individual animals breaking out of the park. A strategy is being developed to deal with the increasing population before adverse effects are encountered (Hluhluwe Imfolozi Park Management Plan, 2000).

The problem animal policy has now been finalised which allows for financial compensation for livestock and crop losses caused by animals emanating from the park. Although hyaena remain a contentious issue with some neighbours, this has served to alleviate much of the negativity in the neighbouring communities, who are now more satisfied that their concerns are being addressed (Hluhluwe Imfolozi Park Management Plan, 2000).

Management staff member's responses indicate that they feel that the finalisation of the problem animal policy has helped in improving relations with neighbouring communities but the non-resolution of the hyaena issue previously has caused a tremendous amount of friction. They feel that there is, unfortunately, an attitude amongst the majority of influential members of most of the affected communities that this is an issue that management are entirely responsible for. Management feel that there is little to no co-operation from the members of neighbouring communities, with livestock being left out of stockades and unprotected at night and being grazed next to the park boundary fence during the day.

Community member's responses indicate considerable animosity towards the park management in this regard and indicate clearly that they feel that the resolution of the hyaena problem is solely management's responsibility. It is clear that this issue interacts with social aspects in that negativity towards the park management on the part of neighbouring community members has resulted and organisationally due to funding requirements in order to adequately maintain fences and manage populations, as well as the need to financially compensate those neighbours who have suffered losses. Any reduction of funding of this programme would have very serious impacts on the neighbour relations programme.

### **3.2.6 Disease Management**

The threat posed by alien diseases in the park appears to be of a magnitude which is cause for concern. Referring to Figures 3.24 through to 3.29 (Appendix B), dealing with the incidence of Bovine Tuberculosis in the buffalo population, the indication is that this is

increasing and is therefore beginning to pose a significant threat. This possibly represents the second greatest biophysical threat to the park after that posed by alien vegetation and linked to climate change would represent a serious threat to indigenous wildlife populations within the park.

Management staff's responses indicate that they agree with this assessment but they feel that positive developments in this programme subsequent to the period under review are beginning to indicate that the problem may well not be insurmountable as is evidenced by their extremely successful Tuberculosis control programme. Another extremely positive development has been the lion management interventions, which has entailed the introduction of disease free individuals into the population, which have improved the situation with this species. The possible impact of climate change has not been factored into this assessment of the effectiveness of the programme in the future. Community member's responses indicate that they are not particularly concerned in this regard.

### **3.2.7 Security Management and Protection Programme**

The mitigating factors in respect of security ensure that this aspect of the park's management is very carefully controlled and it appears that the threat posed by poaching is diminishing towards the rhino population when referring to Figure 3.30 (Appendix B). This aspect of management is possibly the most reliant of all management aspects on financial resources and the threat, therefore, remains that budgets may be cut or diverted to other priorities, indicating the interaction of this issue with organisational aspects (Hluhluwe Imfolozi Park Management Plan, 2000). Climate change, resulting in the circumstances of communities neighbouring the park becoming more desperate due to their inability to adequately meet their nutritional requirements through subsistence agriculture, is anticipated to increase poaching pressure on the park in the future.

Management staff have indicated that they have concerns regarding the allocation of budgets but they are satisfied that the programme is effective presently. Community members who were interviewed have indicated that they do not consider this a serious

issue and that the individuals involved are normally the local criminal element that they do not interact with.

### **3.3 Summary**

The various biophysical drivers and responses to change have been described in this chapter. The greatest threats biophysically to the park are apparently the danger of habitat loss posed by alien vegetation and bush encroachment into grasslands as well as diseases such as Tuberculosis in the populations of some animal species. As far as vegetation is concerned, in the future there will be a need to manage vegetation more appropriately and grazing and fire will have to be used more cautiously as management tools (Rutherford *et al.*, 1999). A critical role for fire in maintaining plant community structure in many grassland types leaves them vulnerable to vegetation change should changes to temperatures and precipitation occur that are sufficient to alter biomass and fire frequency.

It is clear that these impacts interact with organisational impacts in terms of funding requirements of the programmes designed to reduce them. The training and motivation of staff is also crucial in the successful implementation of these programmes, and, although funding is secure for the immediate future, any reduction in this regard would represent an increased threat. Socially, the management programmes interact with neighbouring communities in that employment opportunities have been created through them, which contribute toward development of these communities and serve to increase the relevance of the park and its operations to these communities.

Climate change and the resultant expected increases in temperature would favour propagation of alien invasive plant species and would require greater input in terms of these programmes, representing increased stressors environmentally and organisationally but socially would increase the relevance of the park to neighbouring communities. Any reduction in the programmes due to funding constraints would negatively impact on this situation and would increase the threat of the park losing relevance to the neighbouring

communities and consequently increase the threat that demands for settlement of the park increase.

The next chapter deals with the social aspects as pertaining to Hluhluwe Imfolozi Park. The human and/or societal dimensions of change are referred to and descriptions of various governance and institutional programmes and activities are provided. The Community Conservation programme is described in some detail, as this has largely been instrumental in forming the relationship between the park and its neighbours.

## **CHAPTER FOUR - SOCIAL ASPECTS**

### **4.1 Introduction**

As with the previous chapter, data gleaned from the yearbooks pertaining to some of the human and/or societal dimensions of change, (presented in figures and tables in Appendix C), are referred to in this chapter. Descriptions of various governance and institutional programmes and activities are also provided. An evaluation of the situation is then given under the discussion section towards the end of the chapter. Although the “Situational Approach” guided the data collection process, it is clear that a serious investigation into vulnerability, involving a more detailed anthropological investigation analysing socio-economic, cultural and political dimensions as well as the drivers shaping societal-environmental interaction in the park is required.

The Community Conservation programme, which is coordinated by the Community Conservation Officer and supported by management staff, has been influenced by the availability of funds and the input by management has increased over time, with funds from the conservation budget being used to augment the reduced community conservation budget. More recently, local boards, which are comprised of senior management staff and representatives from neighbouring communities, have been established to encourage community involvement in programmes in the park and thereby promote an understanding of the objectives of management.

The Community Conservation Strategic Plan is utilised for planning, implementing and evaluating Community Conservation practise in and around the park and the primary vision is to develop processes and protocols for engagement with community stakeholders. This includes promoting and integrating the park into the social, economic, cultural, political and biophysical systems of the area, so as to facilitate the relevance of the park to neighbouring communities. Rural communities bordering protected areas have historically been alienated from ecological concerns (Dasmann, 1984). It has now become evident that, for the effective conservation of the natural environment, communities must become allies in its management rather than being alienated from it



(Davies, 1997). The World Wildlife Fund (WWF, 1993) endorses this approach and views the environment and development as complementary. Economic growth and the socio-economic status of communities depend on the environment because natural resources, among other things, supply the basic needs for development (Arrow *et al.*, 1995).

Ezemvelo KZN Wildlife's policy on Neighbour Relations, which formalises engagement with communities neighbouring protected areas, as well as a Community Conservation Strategic Plan, which involves both the Wildlife Service and representatives of local communities, are the most important guiding philosophies adhered to by management and Community Conservation staff when implementing this programme (Hluhluwe Imfolozi Park Management Plan, 2000). A number of other principles and policies guide the programme and are provided in Table 4.7: Principles and Policies relating to community relations in Appendix C.

Several community-based initiatives have emerged in Africa where the needs of the communities have been integrated with the conservation of natural resources (Kiss, 1990; Wells & Brandon, 1992). Ezemvelo KZN Wildlife has moved towards a more people-orientated approach to conservation and its Neighbour Relations Policy concentrates on job creation and outreach schemes (Krüger and Verster, 2001). The fundamental policy of the KwaZulu Department of Nature Conservation, which has subsequently been amalgamated with the Natal Parks Board in order to create Ezemvelo KZN Wildlife, was that communities neighbouring reserves should derive tangible and financial benefit from conservation and should actively participate in the management of the environment (Elliott & Steele, 1994).

Threats identified by management and community conservation staff to the integrity of the park have been evaluated against the community conservation programme in order to establish the efficacy or otherwise of the programme in mitigating against these identified threats. Climate change will increasingly place pressures on the communities surrounding the park to meet their nutritional and other needs. Efforts made through the community conservation programme, to improve these communities ability to more effectively deal

with these impacts, are therefore becoming more relevant, in reducing the parks vulnerability to demands that these communities be allowed to settle on land within the park or be allowed more access to resources within the park to the extent that this becomes unsustainable.

## **4.2 Discussion**

Over the course of the time scale under examination, the perception of management of the park's neighbours as well as theirs of management has altered significantly. The period from the eighties into the early nineties was characterised by suspicion and fear, as the belief existed amongst a large number of the members of these groups that the objectives of park management and the communities were in direct conflict. Management viewed communities as being opposed to the conservation programmes as they felt that these were not necessarily perceived by them as being aimed at their upliftment and members of the neighbouring communities, by and large, perceived management as agents of the state, determined to deny them access to resources which were rightfully theirs (Hluhluwe Imfolozi Park Management Plan, 2000). Through the efforts of management in dealing with such issues as problem animals and the harvesting of natural resources, these negative impressions have been significantly reduced. The Community Conservation unit has assisted greatly in changing these negative perceptions. However, due to severe funding constraints, the programme has of necessity concentrated in the areas to the east and north of the park and some negative perceptions still remain, in particularly the area to the west of the park. The perception of current management staff, obtained through discussions, is that the process is moving in the right direction, but will take time to achieve the stated objectives. Community member's responses reflect a similar sentiment.

### **4.2.1 Community Conservation Areas**

The Community Conservation programme is aimed at involving all of the communities surrounding the park in nature conservation and, through this, attempts to provide opportunities for upliftment and development. This includes a strategy of establishing

Community Conservation Areas adjacent to the park, which attempts to enable local communities to become involved in eco-tourism partnership projects (Hluhluwe Imfolozi Park Management Plan, 2000).

The involvement of the neighbouring communities in the creation of Community Conservation Areas has represented a great advancement of the Community Conservation programme, in terms of conserving biodiversity as well as contributing to development of the communities and changing perceptions of large numbers of community members regarding Ezemvelo KZN Wildlife (Hluhluwe Imfolozi Park Management Plan, 2000). Both management staff and community members have indicated during discussions that they agree with this assessment and that they are supportive of the process. The increasing importance of tourism generally, and more specifically, in the developing world, is a noteworthy theme in the developing literature (Williams 1998; Dann 2002, 236) and the advocacy of tourism as a so-called “pro-poor” strategy is an emerging theme in development literature (Ashley and Roe, 2002), which will become even more relevant as climate change makes it more difficult for communities to support themselves through traditional methods such as subsistence agriculture. Members of the community largely express support for the programme, although there is a perception amongst certain community members that some chiefs are using the programme to enrich themselves and the communities as a whole are not reaping any meaningful benefits (Zungu, 2003).

South Africa is a major participant in the current global tourist boom (Williams, 1998) and the country’s rich natural resources are a key asset with significant tourism and development potential. Within KwaZulu-Natal, tourism is an important source of direct and indirect jobs (Hill *et al.*, 2006). International evidence reveals that tourism, particularly nature-based tourism, has become an important strategy for rural development (Turner, 2001). The White Paper (South Africa, 1996) on the development and promotion of tourism in South Africa views the tourism sector as a national priority. Key components of the national tourism strategy focus specifically on the economic transformation of the sector and, more specifically, on the potential of the industry to make a positive, direct, substantial and lasting impact on the lives of poor people (Mahony and van Zyl, 2002). Three broad transformation objectives for the tourism

industry are highlighted in various policy position papers of the government and the private sector (DEAT, 2000) and these are the need for increased ownership of tourism businesses by previously disadvantaged individuals (PDIs) (Streek, 2000), increasing effective and direct participation by PDIs in the management of tourism establishments and affording PDIs increased business opportunities linked to the tourism industry (South Africa, 1999).

A major study by the Overseas Development Institute (ODI), the International Institute for Environment and Development (IIED) and the Centre for Responsible Tourism (CRT) analysed the extent to which tourism projects impact on the poor (Ashley *et al.*, 2001). Pro-poor tourism is defined as an approach driven by the state, the private sector or the community, which generates both economic and non-economic net benefits to the poor (Hahony and van Zyl, 2002). Internationally, the promotion of the tourism sector by governments and donor organisations has typically aimed at encouraging private sector investment, macroeconomic growth and foreign exchange earnings, without specifically taking the needs of the poor into account. It was assumed that the benefits of growth in the tourism industry would eventually trickle down to the poor, thus requiring no specific government intervention (Hahony and van Zyl, 2002). Pro-poor tourism strategies represent a reaction to this approach, and highlight the need to introduce specific mechanisms for ensuring that the benefits of tourism growth also accrue to the poor (Ashley *et al.*, 2000).

Poverty alleviation and elimination is the core-focus of “pro-poor tourism” (PPT), which overlaps with ecotourism and community-based tourism, but is not synonymous with either. Ecotourism initiatives may provide benefits to people but they are mainly concerned with the environment. Community-based tourism initiatives aim to increase local people’s involvement with tourism. This is a useful component of PPT, but PPT involves more than a community focus. It requires mechanisms to unlock opportunities for the poor at all levels and scales of operation (Pro-Poor Tourism 2002, 1). Much can be done to enhance the contribution of tourism to poverty reduction, and a pro-poor perspective assists in this endeavour (Ashley and Roe 2002, 61).

Tourism has long been considered an effective catalyst of rural socio-economic development and regeneration (Sharpley 2002, 112), but tourism cannot be considered as a developmental panacea (Sharpley, 2002). Although positive evidence of tourism-based development on communities can be found in a number of localities (Mitchella and Reidb, 2001), the reality is that in many cases control often remains vested in the hands of outsiders, such that local communities are only incorporated at a subservient level. This can lead to negative effects such as resource depletion and the loss or commodification of culture (Tourism Concern 2002, 2). In a number of cases, although ecotourism has spawned development initiatives in local communities, the overall number of local residents affected is probably quite low, due to the limited number of parks that accept significant visitor numbers and the tendency of groups to visit on a day-only basis (Weaver 1998, 91).

The national government is seeking to capitalise on the country's rich natural and cultural resources and if pursued responsibly, the Tourism White Paper (RSA, 1996a) states that tourism has the potential to positively improve the quality of life of all South Africans. Key principles embodied in the white paper include the encouragement of community participation and the sustainable management of natural resources. Tourism has also widely come to be recognised by local authorities in South Africa as a mechanism through which development can be attained, yielding benefits for the host community (Binns and Nel, 2002).

The emergence of tourism as a leading economic activity in recent years is undisputed and is now seen as a catalyst for modernisation, economic development and prosperity in emerging nations in the Third World (Williams, 1998, 1). Tourism-led development has the potential to lay a basis for the re-orientation of local economies and to gradually address the apartheid legacy (Binns and Nel, 2002), but it is important to note that, whilst many centres in South Africa have had their expectations met, there is a danger that market saturation could threaten activities such as game parks and craft centres (Binns and Nel, 2002).

Whilst a move towards pro-poor tourism seems admirable in principle, there are some crucial practical issues to consider, not least how the poor can best be mobilised, and their attention diverted to new ventures which might inevitably detract from other livelihood coping strategies that are fundamental to their survival (Binns and Nel, 2002). Binns and Nel have shown through case studies that there is no doubt that jobs have been created and people empowered and poverty alleviated, but the significance of visionary leaders and their ability to develop crucial linkages and partnerships which embrace diverse expertise and financial support, whilst engendering a spirit of collaboration and transparency in their actions is crucial (Binns and Nel, 2002).

Sharpley (2002) notes that, while the natural environment can serve as a base for a pro-poor approach to tourism development, it cannot be assumed to serve as a panacea or that widespread benefits will ensue (Hill *et al.*, 2006). Issues such as the limited number of jobs created and the risk of grant dependence need to be balanced against the positive gains of development, partnership formation, the collaborative roles of a variety of key organizations and government funding to support community based projects. It has been noted by various researchers that many tourism initiatives in the South African context have not yet proved that they can deliver sufficient economic benefits to radically improve the lives of previously excluded communities (Allen and Brennan, 2004: 46).

Resource-poor communities, such as those residing adjacent to Hluhluwe Imfolozi Park, currently live with a range of stressors and risks including climate risks and HIV/AIDS (e.g. Mano *et al.*, 2003). Because these largely marginalized communities have little access to formal employment, have to deal with the very real social issues of illiteracy, population pressure, limited funds and resource control and education and housing shortages, to name a few (Scheyvens, 2002), tourism as a development option should not be taken in isolation from other sectors, but incorporated into a *holistic economic and development planning process* if all members of host communities are to truly benefit (Hill *et al.*, 2006). Skills development is an essential prerequisite for the initiation of effective, community-based nature-based tourism projects. In their study of community-based tourism developments, Ndlovu and Rogerson, (2004) pointed out that communities

will not always benefit if they do not have all the appropriate management skills (Ndlovu and Rogerson, 2004).

Mahony and van Zyl (2002) note that benefits from tourism development are typically slow to materialise. They point out that it is therefore essential to demonstrate short-term benefits to the community while waiting for the longer-term development programme to unfold. The magnitude of the benefits from tourism investment in relation to the size of many rural communities in South Africa is relatively small and a clear plan for distributing communal benefits to the community needs to be agreed on by all stakeholders at an early stage of the project implementation. Unless specific measures are put in place to target marginalised or vulnerable community groups, it is unlikely that the economic benefits from tourism projects will flow to them. They stress that good corporate governance in institutions responsible for the management of benefits derived from tourism investments is necessary to ensure an equitable and sensible allocation of benefits to the community (Mahony and van Zyl, 2002).

### **Education Programme**

Community Conservation staff have developed partnerships with a number of schools in order to ensure that environment and conservation issues are included in the school curriculum. Climate change will increasingly require that communities are better educated in the conservation of their reduced resources. An educational children's camp operates in the park in order to provide an outdoor classroom for learners and teachers. A Biodiversity Education programme offers children wildlife camps and educational day programmes for paying scholars and students which generates funding for several educational programmes for local schools (Hluhluwe Imfolozi Park Management Plan, 2000).

#### **4.2.2 Local Board and Liaison Forums**

Linked to the Community Conservation Areas have been the extremely positive contribution made towards acceptance of the park and its objectives by neighbouring

communities through the creation of the Local Boards and the Community Levy. The members of the local board are appointed by the responsible provincial environmental and tourism minister. Liaison forums for traditional Chiefs, Headmen and stake-holder interest groups have been created to discuss issues of mutual concern. A levy on all tourists entering the park, 80% of which go towards projects in the neighbouring communities, accrues to a Community Trust which is administered by a Board of Trustees (Hluhluwe Imfolozi Park Management Plan, 2000) (Foggin and Muenster, 2000).

Management staff agree with this assessment and there is evidence of significant support for the process from community members, obtained during discussions, although representation is questioned by some of these community members, as only chiefs and not elected councillors are represented on these Local Boards (Zungu, 2003).

#### **4.2.3 Utilisation of Natural Resources and Curio Sales**

Tourism often comes at a cost to the physical environment in terms of the destruction of natural resources, pollution and loss of cultural identity. For example in Kenya's Maasai Mara National Park and the Ngorongoro Conservation Area in Tanzania, the heavy demand for firewood for use in lodges and camps for cooking and heating has severely depleted the small riverine forests (Kamuaro, 1996). It is important to ensure that the pursuit of tourism-based development is undertaken sensitively in order to ensure sustainability and to minimise negative impacts (Dann, 2002). Threats identified by Hluhluwe Imfolozi management staff, regarding the utilisation of natural resources within the park, are that there may be an unsustainable increase in the consumptive demands on the resources of the park and the over-use of natural resources, especially traditional medicinal plants and resources used for making curios, due to an increase in tourism in areas surrounding the park. The interaction with biophysical aspects is clear in this regard and management staff are adamant that a balance must be maintained between the positive aspects of this programme socially and its environmental sustainability.

Local communities are allowed access to the park for medicinal and material gathering purposes and surplus wildlife resources are also made available to them. Curios made



from these resources as well as those purchased from other sources are sold at the Vukuzame and Vulamehlo curio outlets in the park. The ongoing contribution that the controlled utilisation of vegetation and sale of curios makes to the neighbouring areas development is clear when referring to Figures 4.2 through to 4.7 (Appendix C). Table 4.1 and Table 4.2 as well as Table 4.3 (Appendix C) further indicate the value of the resources provided by park management to the neighbouring communities, although the amount of consumptive utilisation of vegetation reduced significantly in 1998 and 1999.

Management staff have advised that this programme continues to contribute positively to their relations with neighbouring communities, but demand for these resources is beginning to dwindle as the financial circumstances of these communities improve. The results from Davies (1997), Krüger and Verster (2001) and this study indicate that the harvesting of resources, primarily for making craft items, and the sale of these items in a curio outlet in the protected area, is one of the main benefits of being neighbours of protected areas. Climate change will increase pressures on communities to financially sustain themselves through agriculture alone and the benefits derived from their involvement in the tourism industry will become more important as a source of income. Krüger and Verster (2001) found that the handcraft project partnership on Spieonkop Nature Reserve, which is also managed by Ezemvelo KZN Wildlife, has established a line of communication between the community and Ezemvelo KZN Wildlife, involving staff and community members not previously included in neighbour relation forums. The same can be said for the project in Hluhluwe Imfolozi Park, where discussions with staff and community members revealed that similar benefits have materialised.

Social benefits of the projects to the park appear to be the recognition and acknowledgement of their importance by the local chiefs and community members. For a number of committed individual project members the economic benefit is significant, with money from curio sales providing involved households with a necessary source of income (Krüger and Verster, 2001). Those community members involved in the programme indicate that they value the access to resources which is made available to them as well as the provision of curio outlets and they believe that the programme should continue. This programme has served the extremely positive role of maintaining

communication channels between park management and neighbouring communities and has positively promoted relations. The identified threat of over utilisation of natural resources is apparently diminishing presently, but the threat remains that demands will increase as climate change makes it more and more difficult for communities to sustain themselves through other means.

#### **4.2.4 Community Development**

The challenges of addressing rural poverty are immense, and the revitalisation of the rural economy is a key initiative of the national government (Mahony and van Zyl, 2002). The South African government actively encourages the pursuit of local economic development (LED) as part of its “developmental local government” strategy (RSA, 1998) within which Local Economic Development is being reformulated as a “pro-poor” strategy (RSA, 2002). A range of scientific papers variously identify and discuss the impact of tourism development in South Africa on small enterprise development (Kirsten and Rogerson, 2002), rural livelihoods (Mahony and van Zyl, 2002), the poor (Ashley and Roe, 2002), black communities (Goudie *et al.*, 1999) and on regional development (Saayman *et al.*, 2001).

The promotion of tourism is widely recognised as a key growth alternative (Rogerson, 2000). Tourism-led development is an emerging theme in the literature on South African Local Economic Development (LED) (Rogerson, 1997 2001), with tourism promotion geared towards community development being perceived as a viable growth option (Goudie *et al.*, 1999; Kirsten and Rogerson, 2002; Mahony and van Zyl, 2002). LED, in utilising local resources and skills, is recognised by government as a key vehicle for bringing about economic change and alleviating poverty (RSA, 1998; Binns and Nel, 1999 2000; Nel, 1999; Rogerson, 1999b; Nel and Binns, 2001). In the Hluhluwe Game Reserve context, it has been demonstrated by Brooks that the forced removal of communities from the corridor area and the subsequent development of the reserve into a tourism destination has not benefitted the affect communities to meaningful extent (Brooks, 2005)

In the South African context, local action and LED, specifically, have been encouraged by a range of government policy documents and acts of parliament, including the Reconstruction and Development Programme (RDP) (ANC, 1994; Rogerson, 1997). The RDP prioritises community-based development as the way through which the most marginalised sections of the community can be empowered and drawn into employment. The Local Government White Paper (RSA, 1998) and the National Constitution (RSA, 1996b) have charged local governments with promoting economic and social well-being and introducing development and job-creation endeavours in the areas under their jurisdiction. The result has been the emergence of a range of projects, including efforts to encourage tourism-based development (Nel, 2001; Rogerson, 2001). A discernable trend across many developed countries is for LED initiatives to be anchored upon promoting localities as centres of consumption rather than production, applying a tourism-led approach to LED (Rogerson, 2001, 2). Tourism has been identified as a key LED strategy in South Africa (Rogerson, 1999a, 2000).

The State President has launched the Integrated Sustainable Rural Development Strategy (ISRDS) in response to concerns about stagnation and decline in rural areas and rising unemployment. The foremost objective of the ISRDS is to “make rural areas profitable, become viable, and to develop entrepreneurs” (South Africa, 2000). Mahony and van Zyl (2002) note that land is often the only form of economic wealth held by rural people, and it is therefore important to create the financial, institutional and regulatory framework that would enable communities to transact with their land in a transparent and equitable manner. Making use of communal land for tourism investment could be a key element in wealth creation in rural areas (Mahony and van Zyl, 2002).

Mahony and van Zyl (2002) have demonstrated through case studies involving community-based tourism initiatives at Makulele, Manyaleti and Umngazi in South Africa that restructuring objectives can be implemented to varying degrees, under widely differing institutional models and circumstances. They have shown that it is essential to be realistic and practical about the restructuring objectives. The primary goal must be to create the conditions for a sustainable business, since burdening investors with unrealistic

targets may either sink a project, or simply turn investors away (Mahony and van Zyl, 2002).

All three case studies were conducted in relatively marginalised rural areas of South Africa which are similar developmentally to the areas surrounding Hluhluwe Imfolozi Park. They illustrate how different stakeholders – the state, the local community and the private sector – can influence the degree to which tourism investment contributes to rural economic development, and can generate new opportunities and benefits for the poor (Mahony and van Zyl, 2002).

Effective job creation remains perhaps the most elusive objective for the government to date. Unemployment figures remain disturbingly high (Lewis, 2001). Despite a number of focused strategies being in place, and agreement that all of the key macroeconomic indicators are positive, the South African economy still sheds jobs. The average level of total employment fell by 2,9 per cent in 2000, following declines of 3,7 per cent in 1998 and 2,0 per cent in 1999 (SARB, 2001). The 1998 Job Summit recognised the potential of the tourism sector in alleviating unemployment and generating income in rural areas. The expansion of the tourism industry is therefore one of the key sectors being actively promoted by the government and fully supported by the private sector (Mahony and van Zyl, 2002). As far as job creation is concerned, Hluhluwe Imfolozi Park is a significant employer in the region with a total of 170 posts associated directly with the provision of tourism in 2000 and contributing more than R12 000 000.00 to the local economy in wages alone (Hluhluwe Imfolozi Park Management Plan, 2000) (Kibirige, 2003).

Assistance is given by management and community conservation staff in water projects, the training of local community members to sell and market crafts, gardening projects, school building and sanitation projects. Development opportunities which have been facilitated include the establishment of development committees, accommodation in neighbouring community members homes in the form of bed and breakfasts, gardening committees, water supply and sanitation projects, the iziNyanga association, community crèches and resource centres, establishment of curio outlets that are leased out to local business people, an indigenous plant nursery and vegetable gardens providing vegetables

to both the tourist and local market and small service centres at Machibini and Hlabisa. The financial benefits of these programmes for the period 1998 and 1999 are indicated in Figure 4.1 in Appendix C and the ecotourism related opportunities which have been created are noted in Table 4.10: Ecotourism Related Opportunities in Appendix C (Hluhluwe Imfolozi Park Management Plan, 2000).

Mahony and van Zyl (2002) have cautioned that, in relation to the extent of poverty in marginalised areas, benefits of ecotourism initiatives may be relatively small in absolute terms. However, their research demonstrates that involved communities are significantly better-off than they would have been had the initiative not taken place. The initiatives examined in their study all led to additional infrastructure investment and improved service delivery by the government, private sector and parastatals, improved income levels, created a range of small and medium enterprise opportunities, and often brought about new private sector investment based on the success of the initial investment. They noted that it is, however, essential to be realistic about the impacts of tourism investment on rural development and economic growth. Although tourism initiatives contribute to addressing local socio-economic needs, they feel that investment in the tourism sector should not be regarded as the panacea for rural development, but rather be a component of a larger rural development programme (Mahony and van Zyl, 2002).

#### **4.2.5 Problem Animals**

The dangers posed to people, livestock and crops by problem animals remains the single greatest hurdle to acceptance of the park by neighbouring communities, particularly those members of the communities living immediately adjacent to the park, but the positive aspects of development facilitation in these communities are beginning to outweigh these concerns. The finalisation of the problem animal policy is also beginning to reap positive results (Hluhluwe Imfolozi Park Management Plan, 2000). As indicated under the previous chapter, management staff member's responses during discussions indicate that they feel that the finalisation of the problem animal policy has helped in improving relations with neighbouring communities but the previous non-resolution of the hyaena issue has caused a tremendous amount of friction up until the end of the period under

review. They feel that there is, unfortunately, an attitude amongst the communities that this is an issue that management are entirely responsible for. Management feel that there is little to no co-operation from the neighbouring communities, with livestock being left unprotected at night, by being left out of stockades overnight, and being grazed next to the park boundary fence during the day. Community member's responses during discussions indicate clearly that they feel that the resolution of the hyaena problem is the park management's responsibility. There is considerable animosity towards the park by members of neighbouring communities in this regard.

### **4.3 Summary**

Although the "Situational Approach" guided the data collection process during the compilation of this report, a serious investigation into vulnerability, involving a detailed anthropological investigation analysing socio-economic, cultural and political dimensions as well as the drivers shaping societal-environmental interaction in the park is required. This was clearly beyond the scope of this report, but it is recommended that future research into these aspects is undertaken in order to begin developing a better appreciation of the situation in the areas surrounding the park.

The strategy of Community Conservation staff during the period under review has largely been to concentrate on improving the neighbouring community's perception of the park through increasing opportunities for development of these communities through their involvement, either directly or indirectly, with the park. Climate change in the future will have the effect of increasing the necessity of this strategy, in order to ensure that increasing pressure is not placed on the park, through demands for land and other natural resources as well as a perception amongst neighbouring communities that the park is not relevant in assisting their efforts to sustain themselves. Inadequate support for the objectives of the park from large sectors of the public surrounding the park together with poverty leading to unsustainable natural resource use and social instability have been prioritised by staff as a very real threat to the integrity of the park. It is felt that without the park achieving the status of being relevant to neighbouring communities, support will not be forthcoming for the various programmes within the park from these communities

and will increase the likelihood that demands will increasingly be made for settlement of land within the park by these communities.

During the later part of the period under review it was felt by management and Community Conservation staff that, due to economic constraints, it had become necessary that services provided outside of the organisation's immediate terms of reference should be funded by the beneficiaries of such services. The feeling at that time was that, for example, advice to commercial game farmers and assistance in compiling management plans for Community Conservation Areas should be paid for by the individuals and groups concerned. This stance has subsequently changed and management staff members have advised that the present thinking is that these services are in fact part of their terms of reference, which include encouraging biodiversity conservation outside of protected areas.

An extremely positive development during the period under review has been the involvement of the neighbouring communities in the creation of Community Conservation Areas which has represented a great advancement of the Community Conservation programme, in terms of conserving biodiversity as well as contributing to development of the communities and thereby changing perceptions of large numbers of community members regarding Ezemvelo KZN Wildlife. The creation of a Local Board has further served to enhance this positive development. The involvement of conservation management staff has assisted in ensuring that the programme has become more equitably shared around the park, with the section management staff becoming more involved over the period from 1996 to 2000. Having said this, the lack of funding of the programme remains the limiting factor and many actions recommended by the plan have, of necessity, been placed on hold, clearly indicating the interaction of this programme with organisational aspects. This programme is extremely reliant on adequate funding and has not been as effective as it could have been due to budget constraints. Any reduction in the state subsidy would have massive impacts on the effectiveness of the programme and would increase pressure on the park.

The next chapter focuses on the institutional and political aspects which have impacted on the organisation and, more specifically, the park. The amalgamation process of the Natal Parks Board and the KwaZulu Department of Nature Conservation represents a major impact and the process is described together with management procedures which are adhered to in order to mitigate against this impact.



## **CHAPTER FIVE - ORGANISATIONAL ASPECTS**

### **5.1 Introduction**

This chapter, finally, examines the institutional and political aspects which have impacted on the organisation and the park during the period under review. The major impact examined is the recently completed amalgamation process of the Natal Parks Board and the KwaZulu Department of Nature Conservation. The process is described together with management procedures which are adhered to in order to mitigate against this impact. As with the previous chapters, data gleaned from the yearbooks, which are presented in tables in Appendix D, are referred to in this chapter. Under the discussion section an evaluation is provided in order to describe the impact.

### **5.2 Discussion**

The greatest threat organisationally, as identified by staff, is the very real possibility of a severe reduction in the state subsidy which will threaten not only individual posts with redundancy but also all aspects of the biodiversity and community conservation programmes (Hluhluwe Imfolozi Park Management Plan, 2000). As has been shown in the previous chapters, these programmes have proved to be relatively successful in reducing impacts on the park and allowed for resilience on the part of the park. As climate change is expected to increase impacts, both biophysically and socially, any reduction of funding of these programmes would represent heightened impacts on the park.

Over and above this, the loss of motivated, experienced, skilled and qualified staff through resignations, as a result of the amalgamation process, has been noted by management as the single largest threat to the motivation of the remaining staff of the organisation.

The Natal Parks Board and the KwaZulu Department of Nature Conservation amalgamated in 1997, combining the precedent of accountability to an independent Board with ultimate responsibility to a department of provincial government. During a speech

delivered by the KwaZulu-Natal MEC of Agriculture and Environmental Affairs, Mr. Narend Singh, at a dinner to officially launch Ezemvelo KZN Wildlife in Pietermaritzburg, on 8 March 2002, a number of the identified threats and reservations of staff were addressed (Office of the MEC for Agriculture and Environmental Affairs, KwaZulu-Natal, 2002 ).

Mr. Singh (2002) stated that it was clear to those tasked with administering the amalgamation process that the new organisation was over-staffed at that time. Salaries accounted for 85% of expenditure, while it was also clear that amalgamation had been only partial. The services of an outside consultant, Jon Cole, were engaged for a reorganisation process and this resulted in a flattened organisation structure, which entailed significant retrenchment within the organisation (Singh, 2002).

The wish was expressed by Mr. Singh (2002) that the organisation would become less dependent on the government subsidy, but that this should not be construed as meaning that the provincial government had any intention of reducing the subsidy in the foreseeable future. He stated that he believed that a reduction should only be considered if a point was reached when revenues from eco-tourism made the full subsidy unnecessary. In order to substantiate this, he pointed out that his Department had provided a special grant of R30 million to the organisation in the 2001 financial year, over and above the subsidy of R166 million for that year (Singh, 2002).

A further aspect which he highlighted was the need at the time for a thorough overhauling of accounting procedures during the amalgamation process (Singh, 2002). He explained that this was necessitated partly by the stringent provisions of the Public Finance Management Act and partly by inadequate accounting in the past, caused mainly by inexperienced staff and poor authorisation procedures. The international financial consultants, Deloitte and Touche, had been appointed to intervene and the result, in Mr. Singh's estimation, was that they had been able to rectify shortcomings in the system and had contributed to the development of a well-trained and highly motivated accounting staff within the organisation, who operate according to a sound accounting system (Singh, 2002).

During the period under review, although there was considerable movement of staff out of and into Hluhluwe Imfolozi Park, this was not seen by management staff, during discussions, as being any more extreme than that experienced at other times in the history of the organisation. It has been noted by management staff during these discussions that the vast majority of the staff in the park had remained relatively stable over this period, with the majority of management staff being employed in their present position or other management positions for periods of three or more years.

The retrenchment of posts referred to by Mr. Singh (2002) left Hluhluwe Imfolozi Park relatively unaffected. However, management staff statements during discussions indicate that this is perceived as an increasing threat, as staff retrenchments and resignations on other protected areas managed by the organisation are beginning to result in the possibility of a general drop in levels of capacity within the organisation as a whole. This is seen as a big challenge for management staff in the immediate future, as it is felt that there is a growing inability of senior managers, who have been promoted through the affirmative action programme, to manage effectively due to inexperience, which leaves reserves vulnerable to slackening local management. This clearly interacts with biophysical aspects as the programmes are reliant on staff who are able to carry these out effectively. The same applies to social aspects, with those staff involved in the community conservation programme acting as representatives of the park and the organisation. The hope is generally expressed that staff turnover will remain slow so as to allow for the retention of a culture of performance and standards. Community member's responses largely indicate a lack of interest in these issues, although staff turnover is clearly a frustration to them at times, as they have to constantly begin new relationships with the new incumbents.

Stated objectives of the park management, regarding organisational aspects, are to efficiently manage the manpower, financial, mechanical and infrastructure resources needed for the reserve and to meet the administrative and technical standards as set out in the Staff Manual, Technical Manual, Law Book, Management Plan and Service Orders (Hluhluwe Imfolozi Park Management Plan, 2000). These objectives are clearly

deliberately being strived for by management staff and it becomes apparent, when discussing this with them, that they are satisfied with the results of their efforts.

Standards are rigorously being maintained through a number of strictly adhered to control mechanisms such as the various Management Meetings which are very structured in terms of frequencies and formats. It becomes clear (e.g. Table 5.3, Appendix D) that these meetings cover all aspects of management and deal with issues such as bi-annual Reserve Management Meetings, bi-monthly Community Conservation Meetings, monthly Section Management Meetings and biological programme management meetings.

The same applies to staff meetings, which are strictly adhered to. A range of meetings such as the annual Staff Management Meeting with the Chief Executive Officer, bi-annual Staff Management Meetings with the Regional Manager, bi-monthly Shop Stewards Meetings with Conservation Managers and monthly Section Management Meetings which emphasise participatory management are held (Table 5.4, Appendix D). (Hluhluwe Imfolozi Park Management Plan, 2000)

According to staff, these formalised meetings have served to build trust between management and staff and have negated some of the negative perceptions which were prevalent prior to the commencing of the amalgamation process. Staff appraisals are conducted on an annual basis in order to recognise and acknowledge excellence on the part of staff and to assess training and capacity building requirements. Other aspects in this regard are also noted (Table 5.5, Appendix D).

The administration objectives are to run the administrative operation as accurately and efficiently as possible and to provide an administrative service to relevant staff, informing them of updates and changes to budgets, staff records and procedures and providing assistance wherever possible (Table 5.6, Appendix D). This is achieved through ensuring that approved systems are used in all areas of work which are open for audit checks and maintaining all records in auditable order and as per the organisation's Staff Manual.

The management of finances is very strictly controlled by the procedures laid down in the management plan and all budgets are very strictly adhered to. Staff members who are involved with funds are personally responsible for all monies and the financial implications of contracts they enter into on behalf of Ezemvelo KZN Wildlife. The extremely formalised and controlled financial system is referred to in Table 5.7 (Appendix D) and indicates that a very high level of control ensures that acceptable procedures are adhered to. A general satisfaction by management staff that the controls in place are effective was expressed during discussions.

### **5.3 Summary**

Institutions can be considered as social tools for the management of scarcity and uncertainty as they are able to minimise vulnerability and conflict, and have the ability to enhance sustainable management of resources.

The greatest threat to the organisation is the very real possibility of a severe reduction in the state subsidy, which will threaten not only individual posts with redundancy but also all aspects of the biodiversity and community conservation programmes, which have proved to be relatively effective in ensuring resilience within the park (Hluhluwe Imfolozi Park Management Plan, 2000). Climate change is anticipated to increase pressures on the biophysical and social programmes as has been shown in the previous chapters. During the period under review, reductions in the budget were not severe enough to result in large-scale redundancies in the park and the majority of posts remained secure. The affirmative action programme also did not result in a large-scale replacement of individuals within the park.

Continuity of standards and practices appears to be ensured for the foreseeable future through the adherence to a very structured administrative programme. The morale of staff remains high by their own admission and the feeling is that the amalgamation process has reached some form of finality. Community members with some perception of the internal

political processes express similar sentiments but, by and large, there is limited appreciation of this issue by community members.

Strict adherence to Station Standing Orders and Domestic Regulations has ensured that discipline has been maintained at acceptable standards. It is clear that an overriding objective of management is that staff members are empowered to carry out their functions by ensuring that they remain well trained and efficient. Management staff are deliberately and continuously striving to introduce new methods that will improve opportunities for skills enhancement and the promotion of staff. Morale has remained high and according to staff has improved with the finalisation of the amalgamation process.

It is clear that a deliberate effort is being made at an organisational and park level to ensure that a lack of control will not be allowed to creep into the system. It is apparent that, should there be major staff changes in the future, the controls are regulated sufficiently rigorously to prevent a breakdown of the system.

The next, and final, chapter details conclusions which have been arrived at during the course of this research report. It indicates that, although climate change issues need to be integrated into the management objectives of the park in order to ensure sound environmental management, a range of other interacting factors, including park governance and other social factors, have also emerged as being of concern.

## **CHAPTER SIX - CONCLUSIONS**

The research has resulted in identifying a range of “drivers” of vulnerability, including biophysical change (e.g. climate variability) as well as other potential stressors (e.g. various social, governance and institutional factors). As far as climate change is concerned, the South African perspective is that political intervention is extremely important in order to ensure a credible outcome to the ongoing discussion around global change. The resolution of matters of climate change is critical towards achieving the regions’ long-term goal of sustainable development. The climate change issues need to be integrated into the management objectives of the park in order to ensure sound environmental management. However, as is highlighted below and throughout this document, it is not only climate that is of concern. A range of other interacting factors, including park governance and other social factors, have also emerged as being of concern.

### **6.1 Biophysical Aspects**

#### **6.1.1 Climate**

This aspect is not indicated in the management plan as a principle threat and no management actions are noted as a result. Predictions are that, although the tropical cyclone Domoina in 1984 appears from the data to be unusual and unpredictable, no management action was in place to mitigate against this type of event. These types of events could, however, become more frequent and less predictable due to climate change (Rutherford *et al.*, 1999). It is likely that more intense and frequent floods can now be viewed as a regular possibility and should therefore be incorporated into management decision making and improved risk-reduction planning. As can be seen in Chapter 3, there is no indication, from the data that either temperature or rainfall is becoming more erratic or that the climate of the park is becoming drier, wetter, hotter or colder and this clearly requires more detailed investigation.

### **6.1.2 Hydrology/Aquatic Systems**

The most important threats identified in this regard are an increased flooding regime due to upstream catchment alteration and increased sedimentation from rivers with catchments outside the park. Climate change, however, is not indicated as a perceived threat and the management plan does not make any reference to strategies to deal with the threats of potential increased flooding or sediment deposition and no efforts are reported in the Yearbooks. I believe that the threat to water flow from sedimentation is cause for concern, but it is presently unknown if the cause of these changes is due to any variation in precipitation, or due to changes in the runoff characteristics of the catchments (Hlulhuwe Imfolozi Park Management Plan, 2000).

### **6.1.3 Flora**

The major threats to vegetation are the encroachment of woody plants into grasslands and the proliferation of invasive alien plants, especially *Chromolaena odorata*. Strategies are in place to mitigate against both of these threats, however, I feel that a greater sense of urgency needs to become evident in management's strategising, including the factoring in of the additional impacts which climate change will ensure.

### **6.1.4 Alien Flora**

This potentially represents the greatest threat to the park at all levels, particularly in the north of the Hlulhuwe section. The alien plant removal programme has suffered very badly due to a lack of funding, negating gains made, through the lack of sustained follow up programmes. Up until 1999 the lack of funds had virtually reduced the programme to being totally ineffective. The Department of Water Affairs and Forestry Working for Water programme injected funding into the programme and through partnerships with local communities the programme had been resurrected and was functioning effectively after the period under review. Climate change will increase impacts in this regard and programmes need to take this into account. The social aspects of this impact are also becoming more important to the park, as the revitalized Working for Water programme has created increased employment opportunities within the park, serving to increase the



relevance of the park to more and more of the neighbouring communities. This is a primary objective of the community conservation programme and as climate change is predicted to enhance propagation requirements of alien invasive plants, it is predicted that this programme will of necessity need to expand. Organisationally this aspect is extremely reliant on funding, and will place more and more strain on provincial budgets which are dealing with issues such as the HIV epidemic, other health concerns, education and housing requirements. As funding is presently provided by DWAF, it is felt that this is ensured for the foreseeable future, but should this be reduced, will result in the park's budget being placed under increased pressure.

#### **6.1.5 Fauna**

The potentially most important threats to fauna are alien diseases and loss of habitat. The habitat loss threat has to be very seriously considered in light of the possibility of grasslands being replaced by savanna type vegetation or even more intensive bush encroachment due to climate change as well as the threat posed by alien vegetation. This threat is of particular concern regarding the megaherbivores such as white rhino and buffalo.

The animal populations appear to be growing and stable and, for the period under examination, there is no indication that there is cause for concern in this regard. There are species specific management strategies in place for key species and these are serving to maintain populations at defined levels, but climate change has not been factored into these management programmes and needs to be seriously considered. Socially, these programmes are serving to improve neighbour's perceptions of the park in that meat offtakes are provided to these people, but organisationally the programmes are reliant on adequate funding in order to maintain their intensity and any reductions would lead to negative perceptions.

#### **6.1.6 Problem Animals**

Socially, this has been a major cause of the negative perception of neighbours living adjacent to the park, but the problem animal policy has served to alleviate much of the

negativity in the neighbouring communities, who are now more satisfied that their concerns are being addressed. As with the majority of the biophysical programmes, this is reliant on funding and should this not be forthcoming in the future due to budget constraints, has the potential to lead to renewed negativity towards the park.

#### **6.1.7 Alien Diseases**

The threat posed by alien diseases appears to be cause for concern. It is clear that the incidence is increasing and is therefore beginning to pose a significant threat and possibly represents the second greatest biophysical threat to the park after that posed by alien vegetation. Socially, the bovine tuberculosis monitoring programme results in the removal of considerable amounts of animals and the meat sales to neighbouring communities is appreciated by them, leading to improved perceptions. The reliance on funding therefore poses the threat that any reductions in this funding will have the opposite effect.

#### **6.1.8 Security Management and Protection Programme**

This aspect of the park's management is very carefully controlled and it is apparent, when referring to the statistics, that the threat to the rhino population posed by poaching is diminishing. Due to the security programme's reliance on financial resources, the very real threat remains that budgets may be cut or diverted to other priorities and that climate change will increase pressures on neighbouring communities, who may resort more to poaching as an alternative source of income and nutrition as their efforts at creating sustainable livelihoods adjacent to the park are placed under heightened pressure.

### **6.2 Social Aspects**

As highlighted in Chapter 1, the "Situational Approach" is suggested as a useful means of obtaining the data required for this report. It, however, became apparent during the process of compiling this report that this approach is more complex than anticipated, and, due to the scope of this report, although this approach shaped the data gathering process, it was not used to its fullest extent. Although the "Situational Approach" guided the

data collection process, a serious investigation into vulnerability, involving a detailed anthropological investigation analysing socio-economic, cultural and political dimensions as well as the drivers shaping societal-environmental interaction in the park is required. It is recommended that future research into these aspects is undertaken in order to begin developing a better appreciation of the situation in the areas surrounding the park.

The strategy used by the park management for dealing with the threats posed socially and politically has been to concentrate on the neighbouring community's perception of the park and to increase opportunities for development of these communities through their involvement, either directly or indirectly, with the park, thereby increasing the relevance of the park to these communities. Climate change is expected to increase the importance of this programme in reducing pressures on the park which would result from the inability of neighbouring communities to adequately sustain livelihoods due to increasingly stressed resources.

Over the course of the time scale under examination, the perception of management of the neighbours as well as theirs of management has altered dramatically. Through the efforts of management in dealing with such issues as problem animals and the harvesting of natural resources, the negative perceptions of many of the neighbouring communities have been reduced significantly.

The Community Conservation unit has assisted greatly in this regard, but due to severe funding constraints, the programme has of necessity concentrated in the areas to the east and north of the park and negative perceptions still remain, particularly in the area to the west of the park. The Community Conservation plan recognises that the Community Conservation programme was not as effective as it could have been, due to the funding constraints, and therefore has involved management more directly in the programme, utilising finances and resources.

The involvement of the neighbouring communities in the creation of Community Conservation Areas has represented a great advancement of the programme and has assisted in the changing of negative perceptions by neighbouring communities. Despite

this awareness creation, it is very clear, from this work, that a serious investigation into vulnerability, involving a detailed anthropological investigation analysing socio-economic, cultural and political dimensions as well as the drivers shaping societal-environmental interaction in the park is required. Extremely positive contributions have also been made through the creation of the Local Boards and the Community Levy. Problem animals remain the single greatest hurdle to acceptance of the park by neighbouring communities but the finalisation of the problem animal policy is beginning to show positive results.

### **6.3 Organisational Aspects**

The greatest organisational threat to is the possibility of a severe reduction in the state subsidy, which will threaten not only individual posts with redundancy, but also all aspects of the biodiversity and community conservation programmes. These programmes have effectively mitigated against threats to the park and have served to reduce impacts and bolster resilience. Climate change will heighten these impacts and any reduction in the programmes due to budget reductions or reduced capacity of staff would increase vulnerability of the park in a number of biophysical and social aspects as has been shown under these specific aspects.

The loss of motivated, experienced, skilled and qualified staff has been noted as the single greatest threat to the motivation of the remaining staff, but despite this, the majority of the staff in the park have remained stable and continuity of standards and procedures appears to be ensured for the foreseeable future. Climate change is expected to increase pressures in this regard but there is no indication in the management plan that consideration is being given to this presently.

The management of finances and staff is very strictly controlled by the procedures laid down in the management plan and it appears that a lack of control will not be tolerated by management or supervisory staff in the foreseeable future. Should there be major staff changes in the future, it appears that the controls are regulated sufficiently rigorously to prevent a breakdown of the system.

## 6.4 Summary

It is clear from the literature cited that vulnerability, adaptation and resilience is a key emerging discourse in GEC science. In the past, resilience has focused on the capacity to absorb shocks and still maintain function but the capacity for renewal, re-organisation and development is now considered to be essential for the sustainability of various systems. Resilience is currently considered to be the capacity of a system to absorb disturbance and re-organise while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks. The necessity to learn to manage change rather than simply to react to it and the key role that individuals and small groups or teams of individuals play in this context are now considered essential. Adaptive capacity deals with the degree to which adjustments are possible in practices, processes, or structures of systems to projected or actual changes. The ability to design effective response strategies depends on the understanding of key factors of success at the threshold of sustainability transitions.

Institutions such as Ezemvelo KZN Wildlife and, more specifically, the Hluhluwe Imfolozi Park are considered as social tools for the management of scarcity and uncertainty as they are able to minimise vulnerability and conflict, and have the ability to enhance sustainable management of resources.

This study is a useful baseline but clearly the system is complex, requiring more research on specific aspects of climate and how it impacts on biophysical aspects of the park such as that conducted in Kruger by N. Owen-Smith and others. More research is also required on adaptive governance and the role of institutions at local, provincial and national scales. This research report begins to point to areas of possible robustness within the park and the surrounding areas that could be enhanced in the future to withstand change and provides a *preliminary assessment* of the overarching array of factors that influence the fragility of the park. Clearly, given this initial baseline assessment, much more detailed analysis of the complex drivers of change in this area awaits further investigation.

## APPENDIX A

### History of Formal Protection

Table 1.1: History of Formal Protection of Hluhluwe Imfolozi Park

1895	Conservator in charge of Lower Imfolozi district appointed.
1897	Imfolozi Game Reserve established.
1905	Government Notice No. 93 of 1905 proclaimed all of what is now the Corridor together with the land to the east as far as Lake St Lucia, as a game reserve. However, this was deproclaimed shortly afterwards.
1907	Reserve extended by the addition of 23 200 hectares in the south; however, in the same year the Provincial Administration deproclaimed the extension in response to a deputation of farmers from the Lower Imfolozi Magisterial district. Thus the size of the reserve was reduced to approximately 30 000 hectares.
1916	Special Shooting Areas were proclaimed in an effort to eliminate nagana through the destruction of the game which supported the tsetse fly.
1920	Reserve deproclaimed (P.N. 231/20 of 13 August 1920) as a result of an outcry from farmers
1922	Campaign launched by the Provincial Administration to reduce the numbers of game in the Southern Crown Lands, to the south of the White Imfolozi river. On account of complete disorganisation, it proved to be an utter failure
1929	Second campaign launched. Strictly organised, and carried out only by paid employees controlled by selected rangers.
1930	Deproclamation repealed (P.N. 15/1930 of 15 January 1930).
1932	Control of game and the anti-nagana operations handed to the Division of Veterinary Services of the Department of Agriculture.
1943	Removal of Zulu people from Northern Crown Lands (The Corridor), primarily to create a stock-free zone surrounding all the game reserves, in an endeavour to check the spread of nagana.
1945	The farming community made successful representations to the Minister for Agriculture to make a clean sweep of all game inside the Imfolozi Game Reserve.
1945	Imfolozi Game Reserve deproclaimed.

1952	Control of the area vested in the Natal Parks, Game and Fish Preservation Board. The Division of Veterinary Services succeeded by 1952 in eradicating the area of nagana, tsetse fly and most of the game animals. As a result practically all the big game animals (Rhinoceroses excepted), numbering close on 24,000 head, were destroyed.
1953	Corridor fenced into the Hluhluwe-Imfolozi-Corridor Complex and managed as part of the park.
1962	Southern and western Crown (State) Lands were added to the existing game reserve bringing the total area of the Imfolozi Game Reserve to 47 753 hectares.

(Hluhluwe Imfolozi Park Management Plan, 2000)

# Hluhluwe - Umfolozi Park

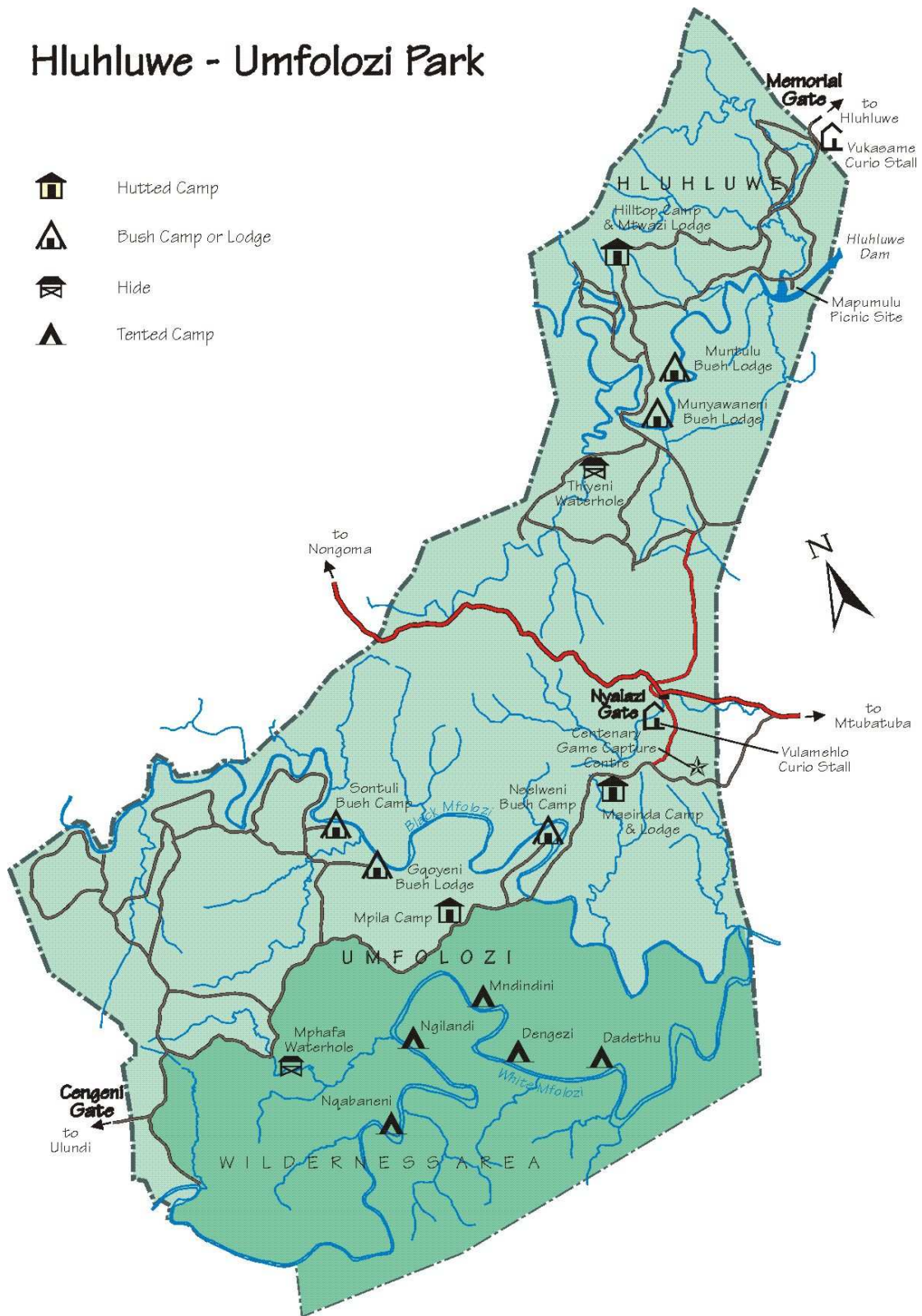


Figure 2.1: Map of Hluhluwe Imfolozi Park  
(Hluhluwe Imfolozi Park Management Plan, 2000)



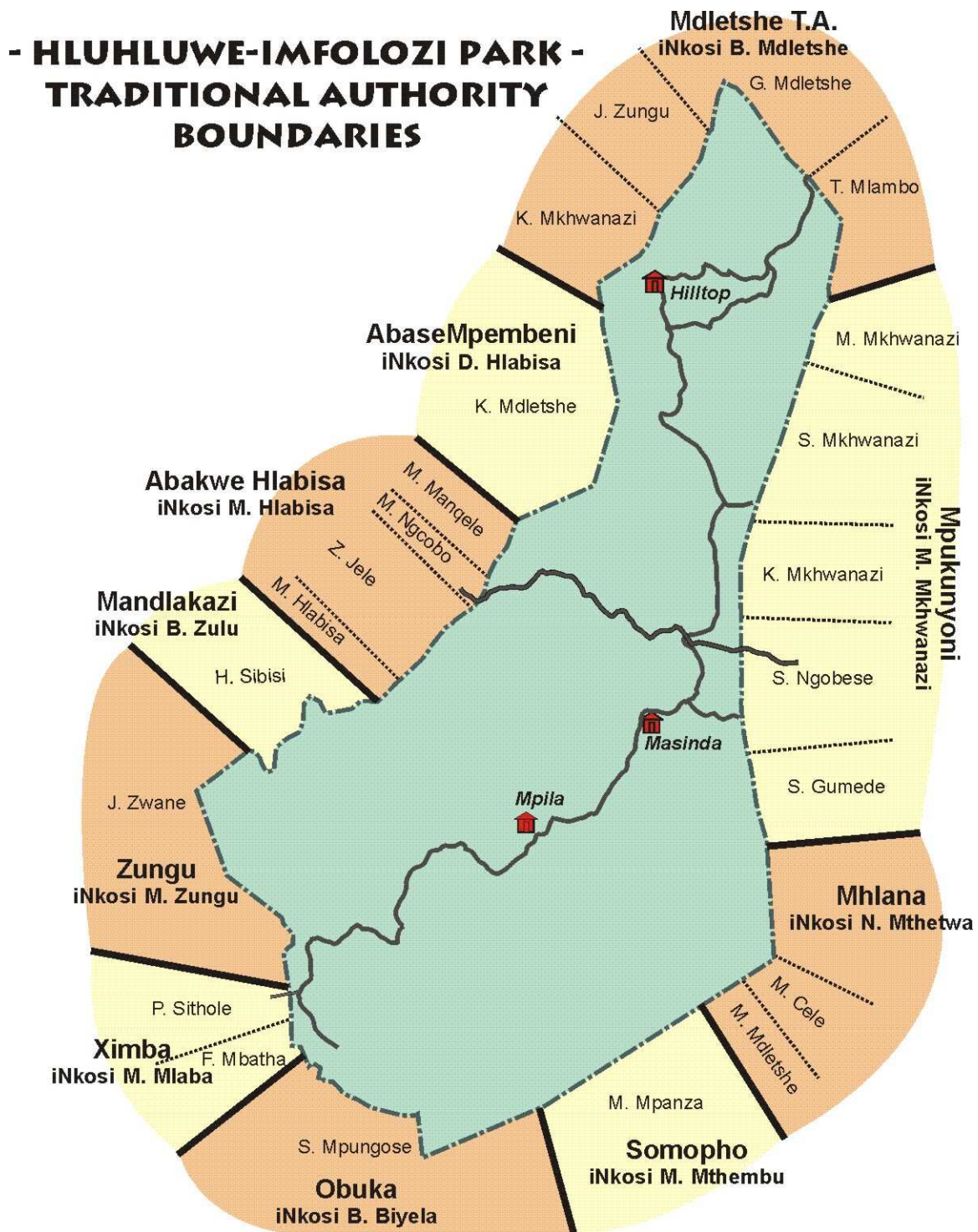


Figure 2.2: Map of the park showing Traditional Authority Boundaries  
(Hluhluwe Imfolozi Park Management Plan, 2000)

Biophysical Aspects

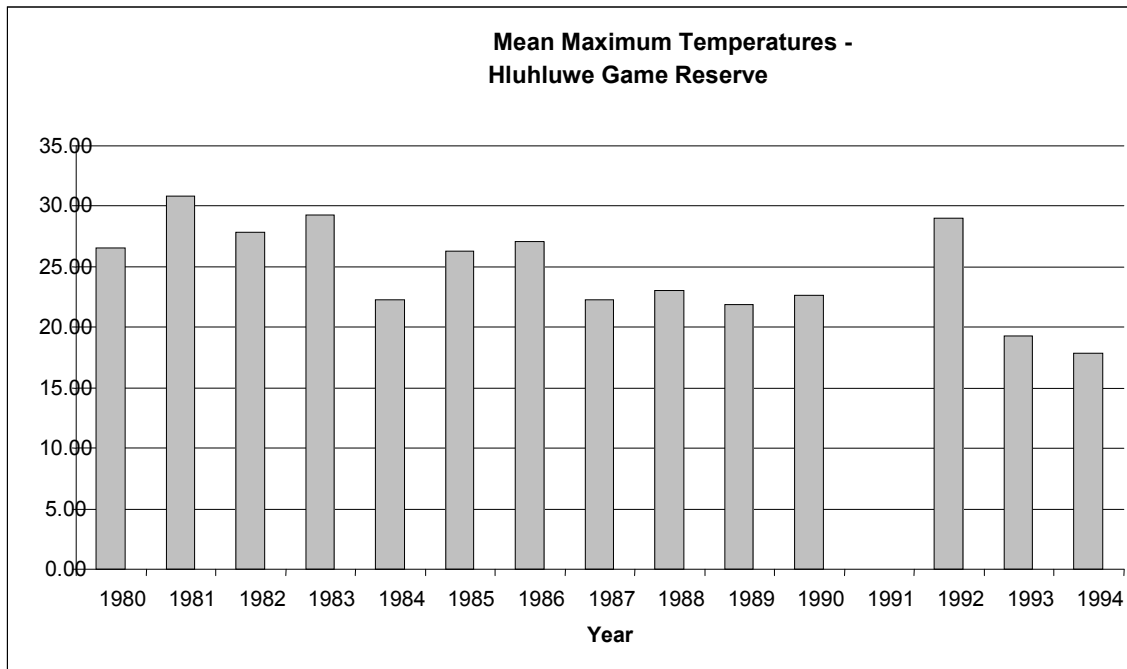


Figure 3.1: Mean Maximum Temperatures – Hluhluwe Game Reserve.

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 1994)

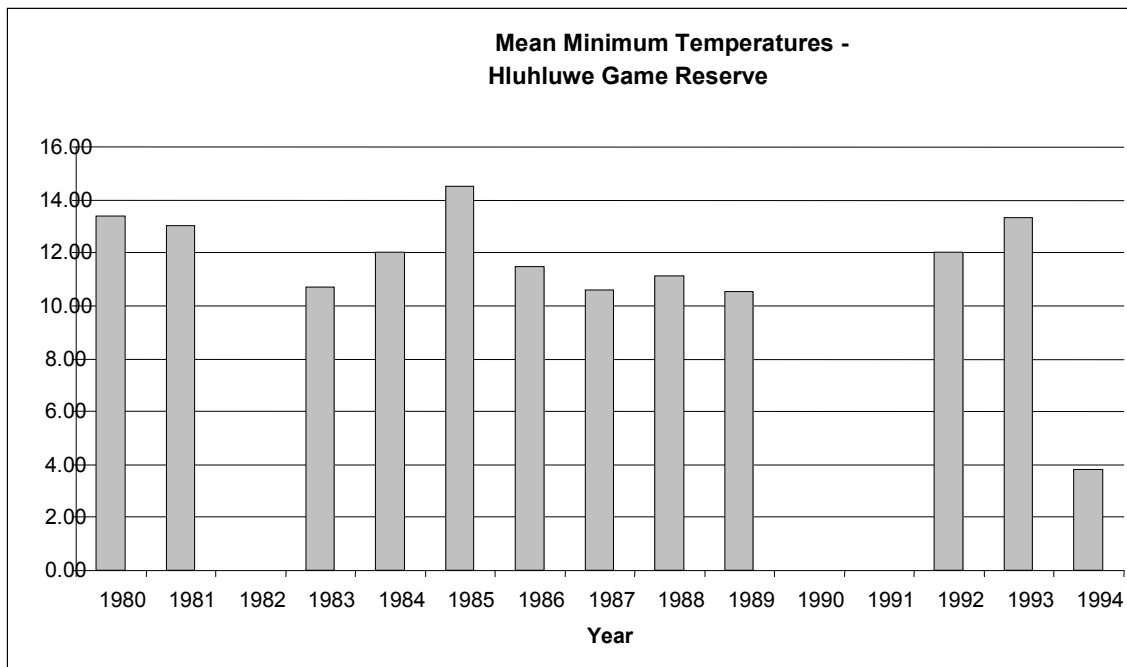


Figure 3.2: Mean Minimum Temperatures – Hluhluwe Game Reserve

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 1994)

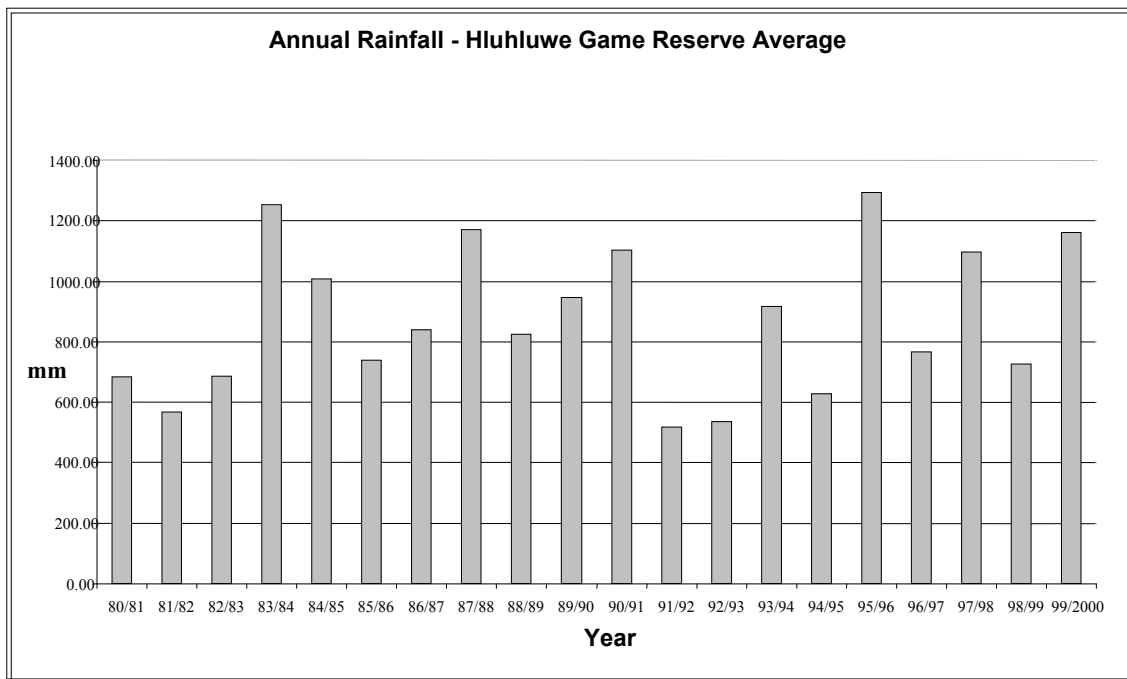


Figure 3.3: Annual Rainfall Hluhluwe Game Reserve Average  
(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

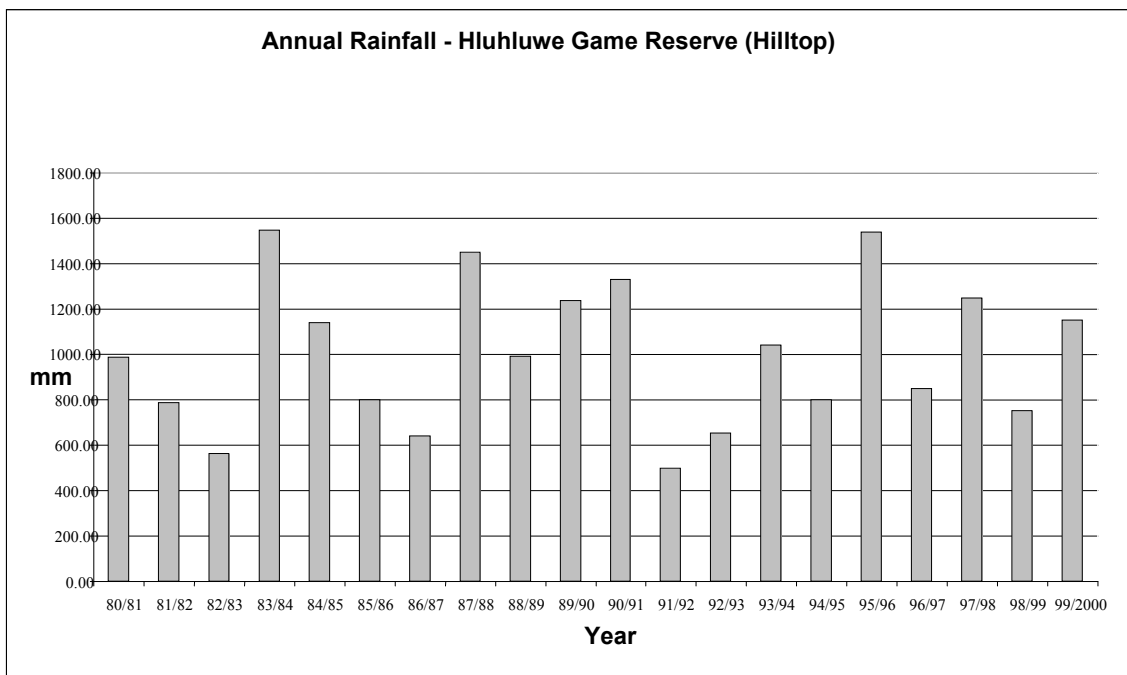


Figure 3.4: Annual Rainfall Hluhluwe Game Reserve (Hilltop)  
(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

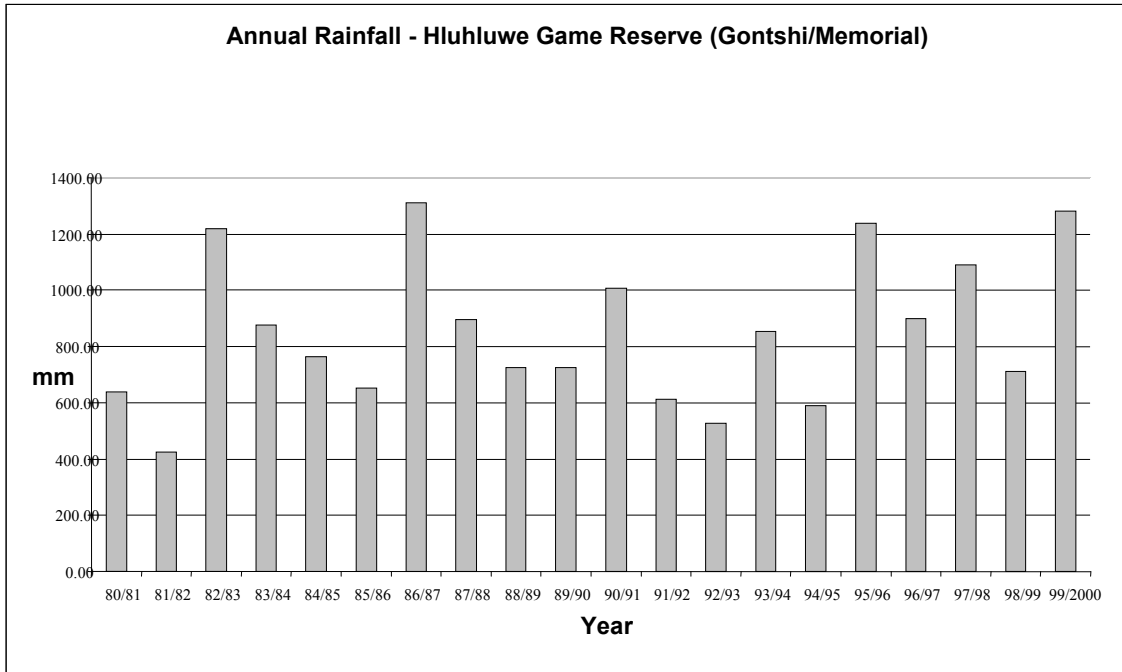


Figure 3.5: Annual Rainfall Hluhluwe Game Reserve (Gontshi/Memorial)  
(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

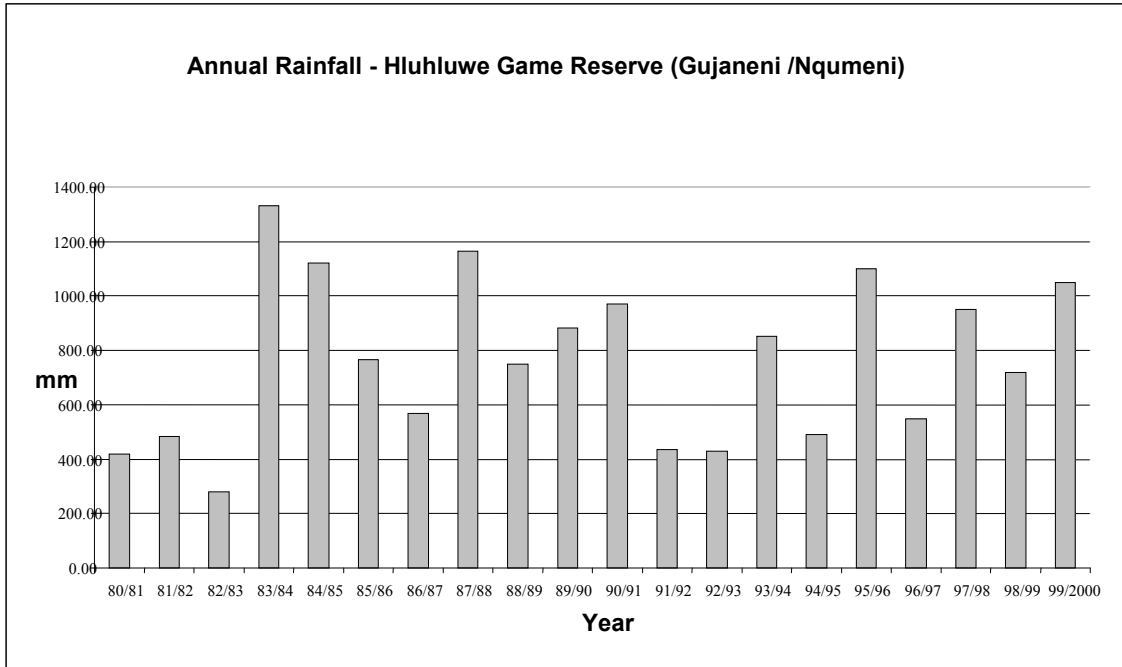


Figure 3.6: Annual Rainfall Hluhluwe Game Reserve (Gujaneni/Nqumeni)  
(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

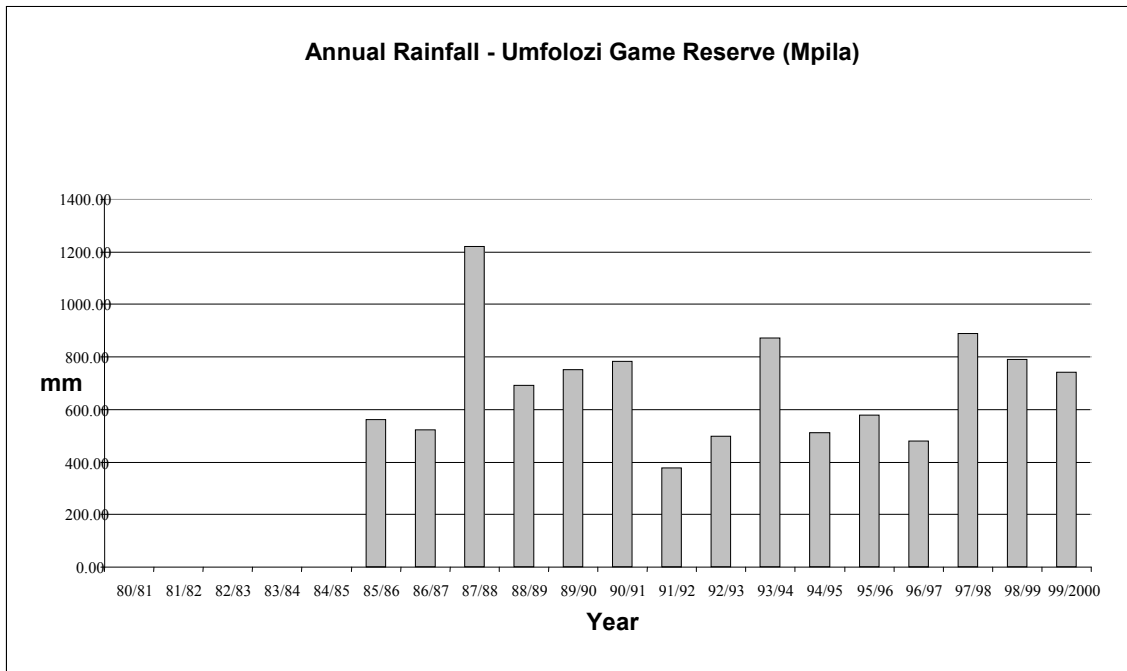


Figure 3.7: Annual Rainfall Imfolozi Game Reserve (Mpila)  
 (Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

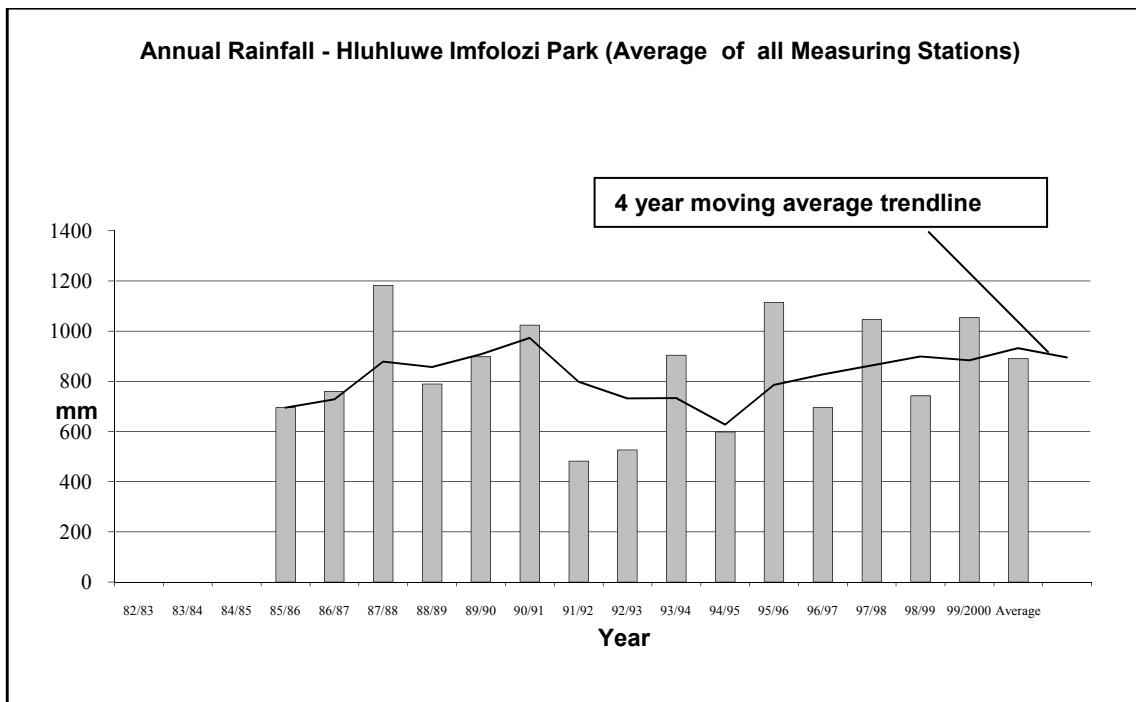


Figure 3.8: Annual Rainfall Hluhluwe Imfolozi Park (Average of all Stations)  
 (Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

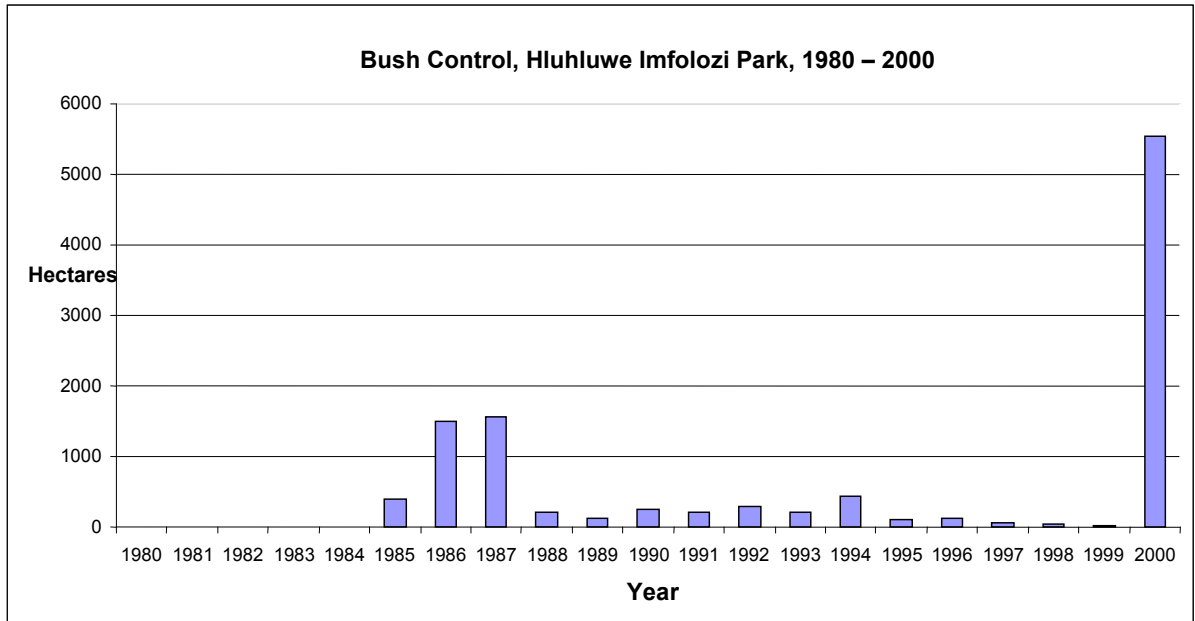


Figure 3.9: Bush Control, Hluhluwe Imfolozi Park, 1980 - 2000

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

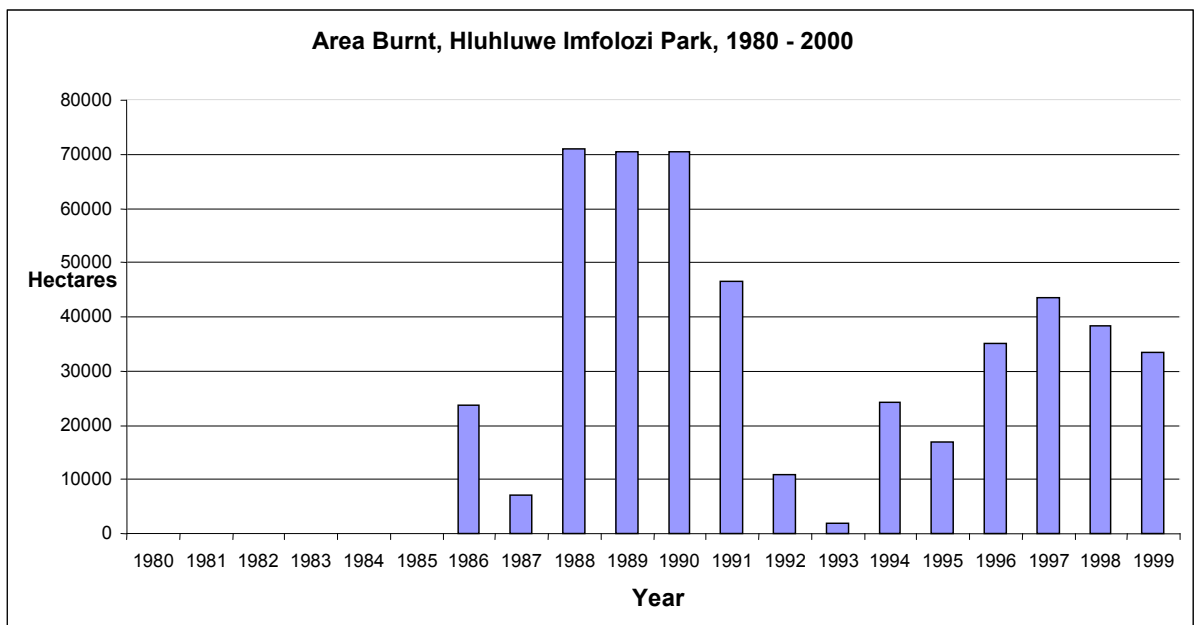


Figure 3.10: Area Burnt, Hluhluwe Imfolozi Park, 1980 - 2000

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

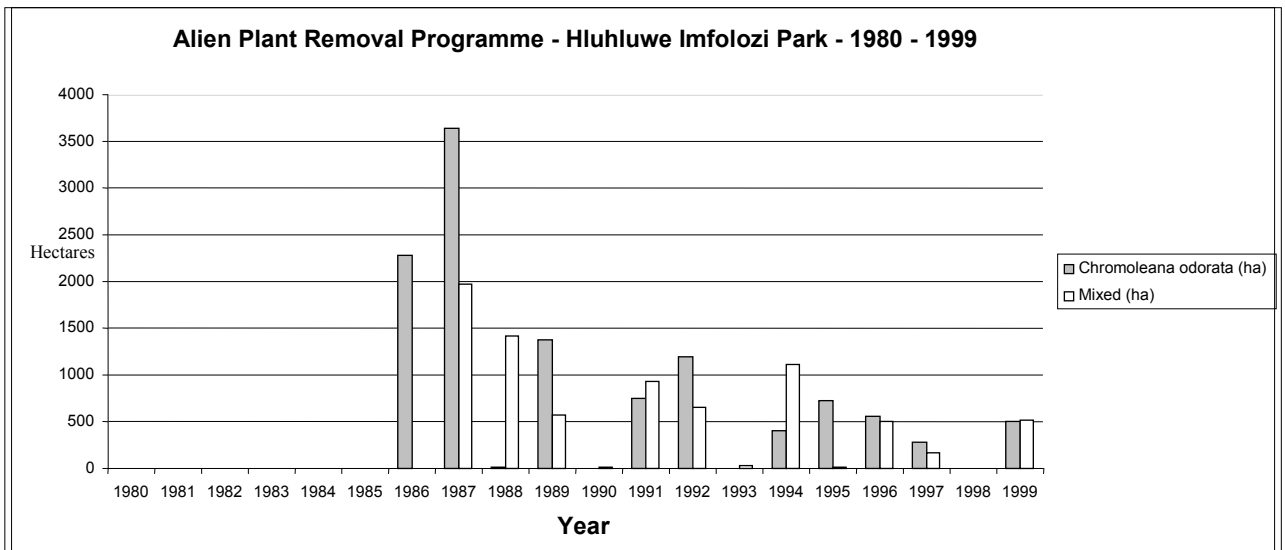


Figure 3.11: Alien Plant Removal Programme HIP – 1980 - 1999  
(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

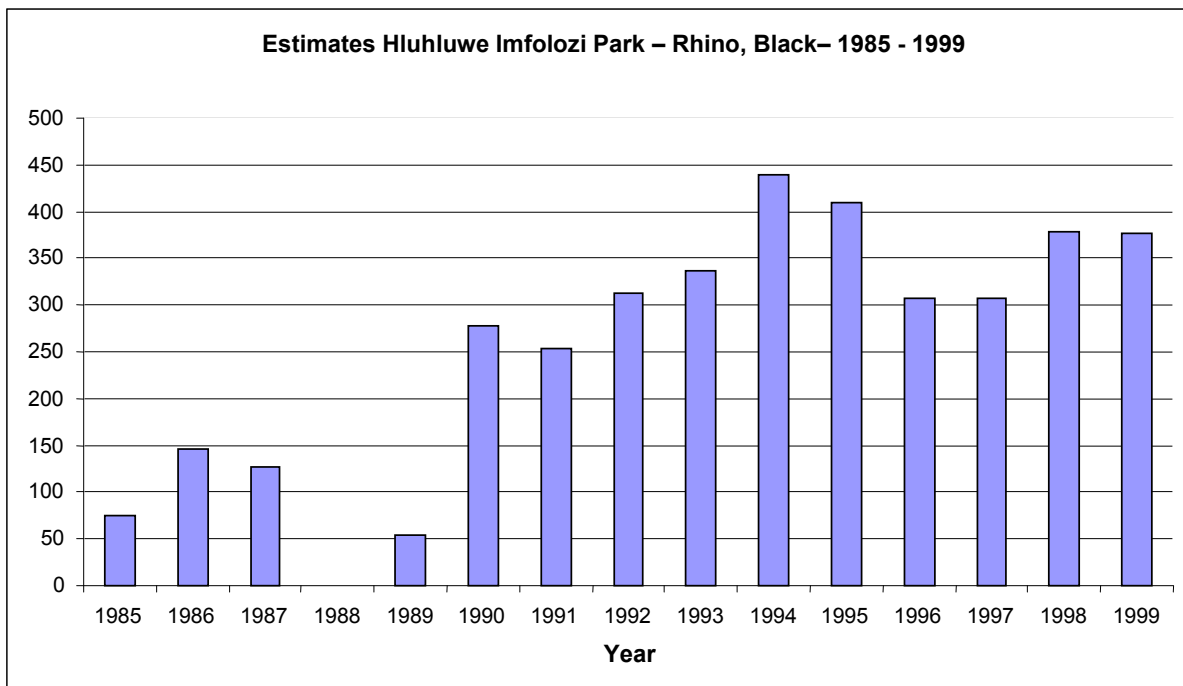


Figure 3.12: Estimates HIP – Rhino, Black – 1985 - 1999  
(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

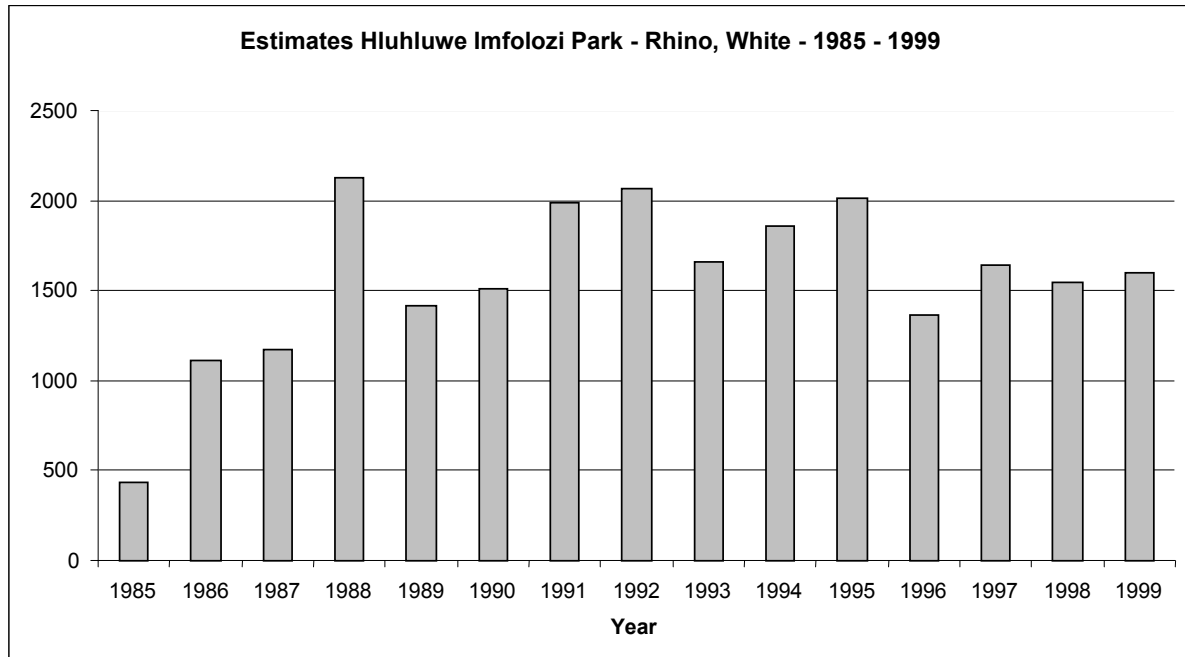


Figure 3.13: Estimates HIP - Rhino, White – 1985 - 1999  
 (Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1991 – 1999)

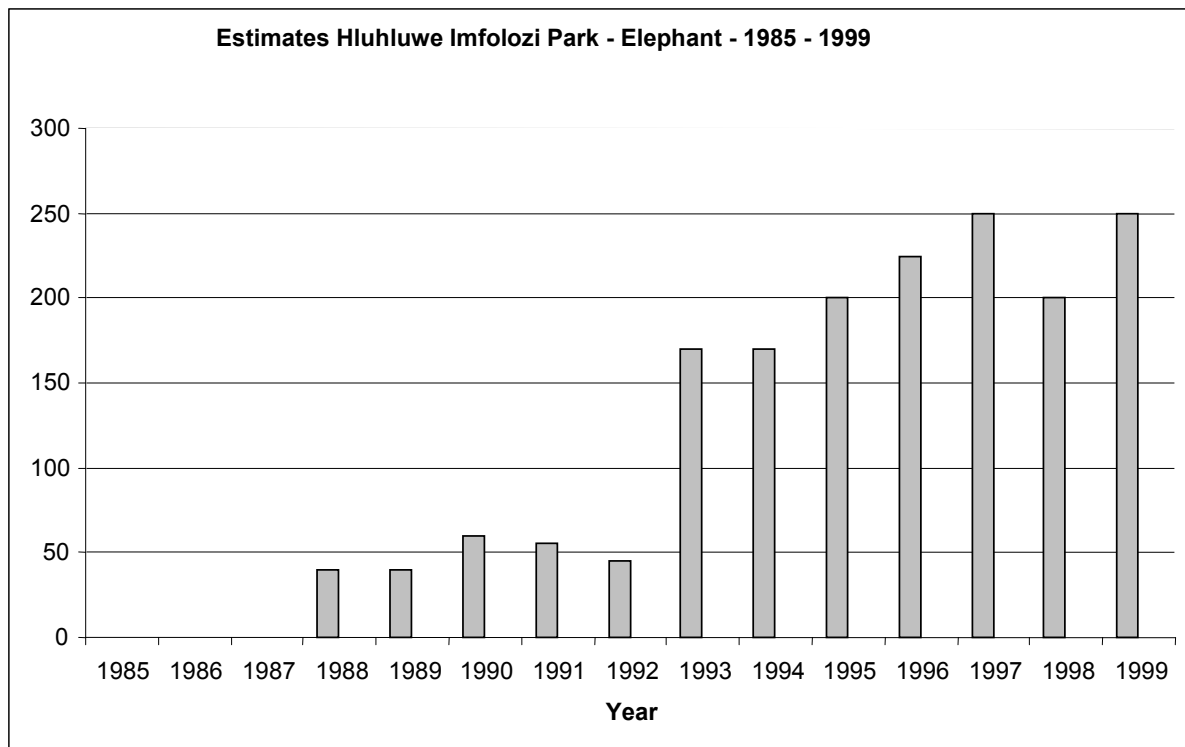


Figure 3.14: Estimates HIP – Elephant – 1985 - 1999  
 (Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 1999)



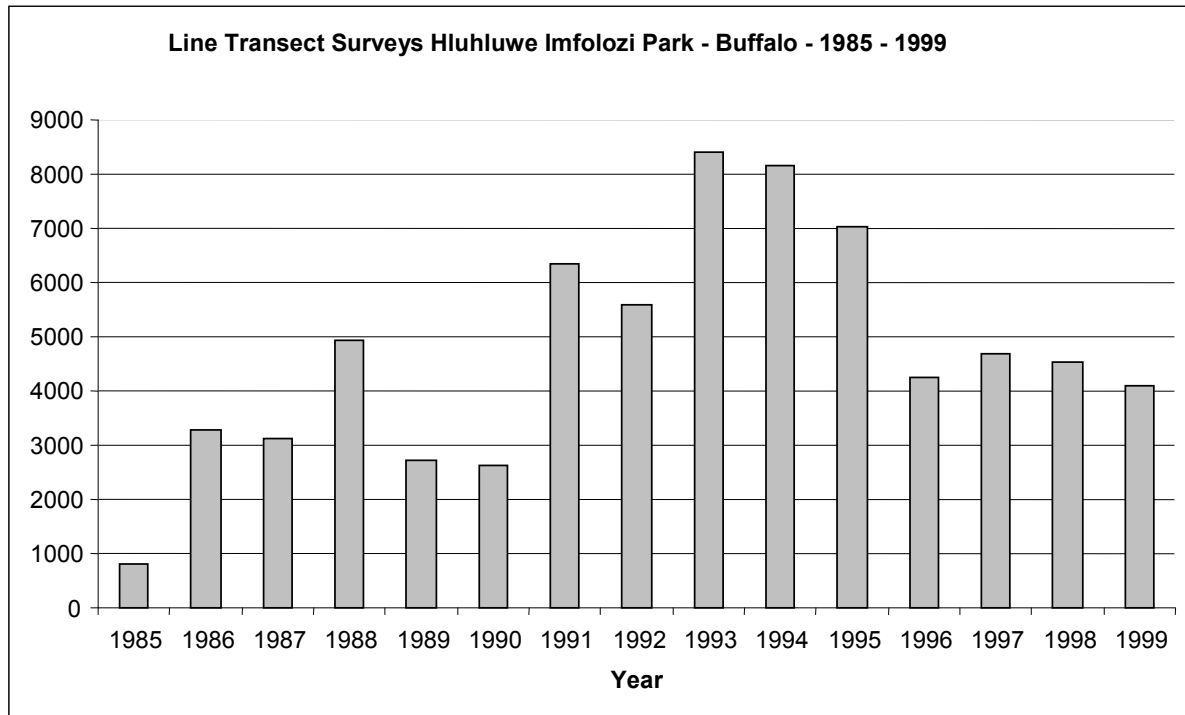


Figure 3.15: Line Transect Surveys HIP - Buffalo – 1985 - 1999

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

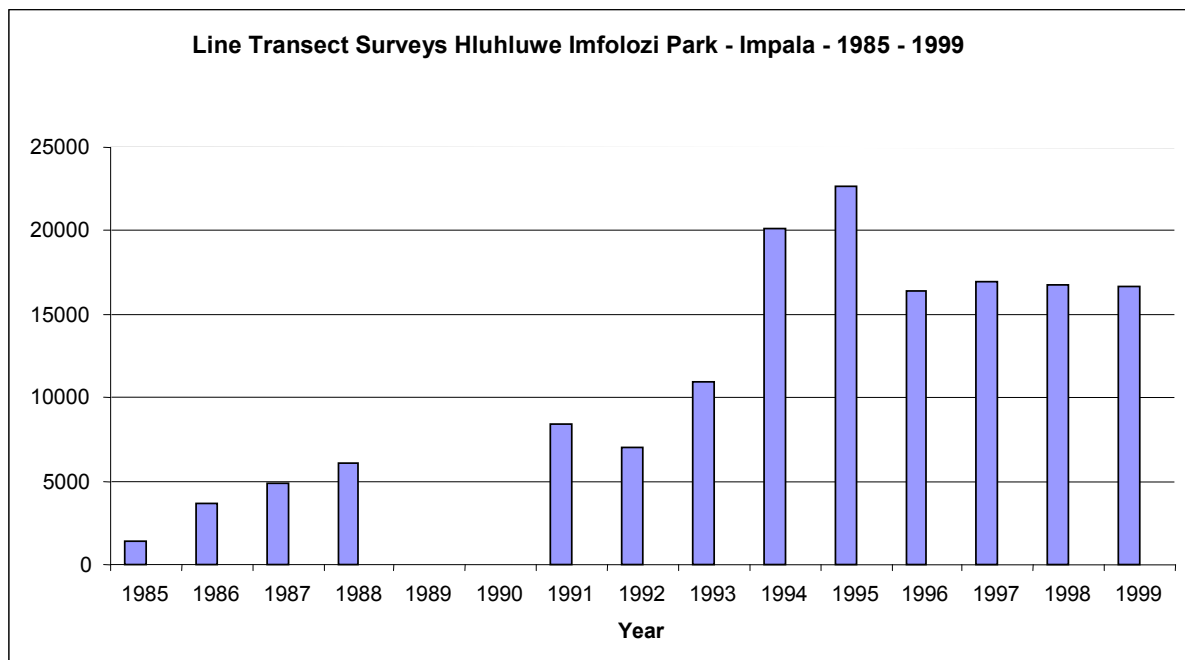


Figure 3.16: Line Transect Surveys HIP – Impala – 1985 - 1999

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

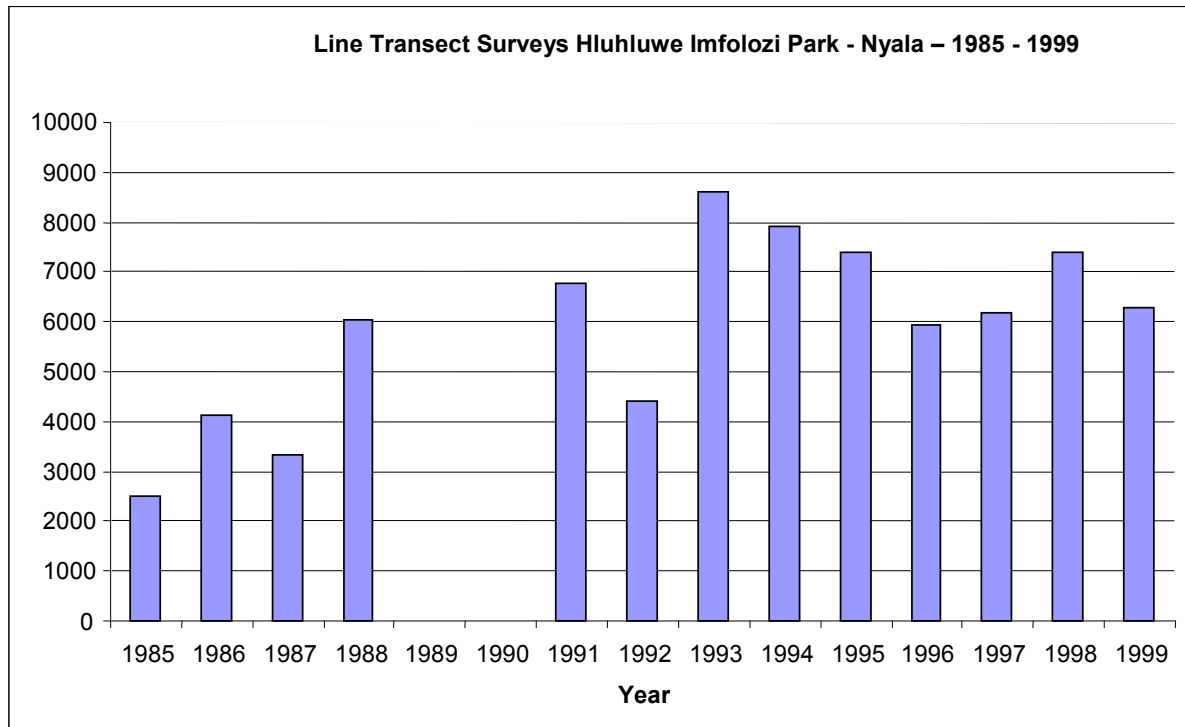


Figure 3.17: Line Transect Surveys HIP – Nyala – 1985 - 1999

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

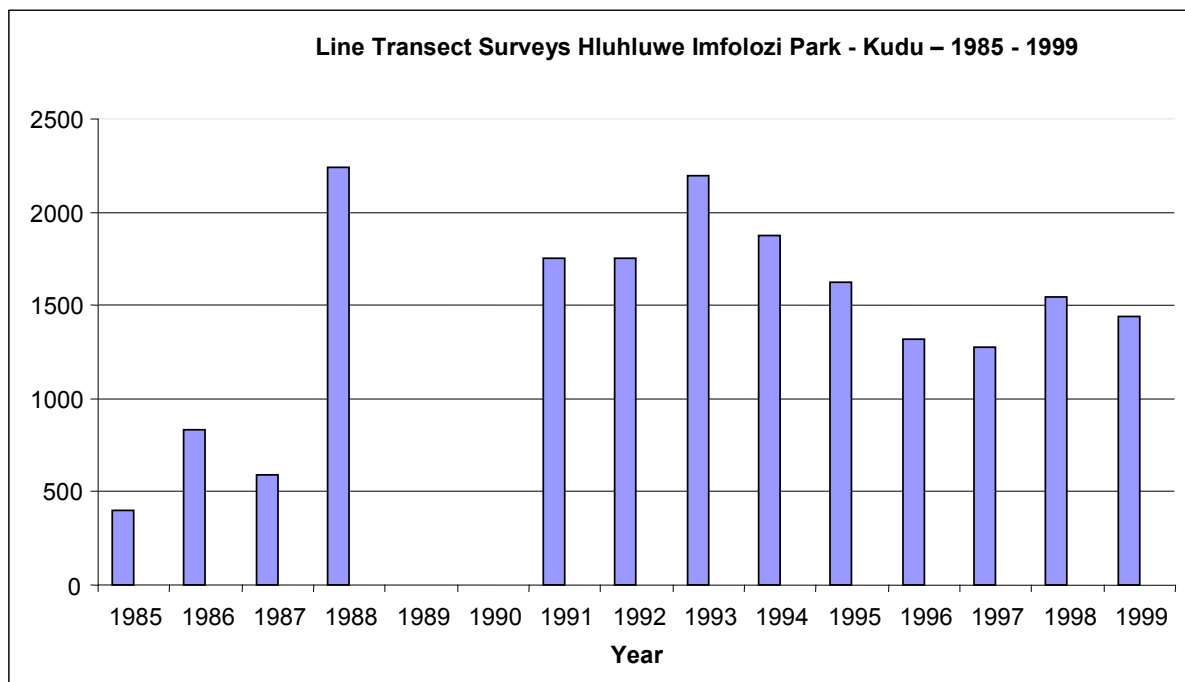


Figure 3.18: Line Transect Surveys HIP – Kudu – 1985 - 1999

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

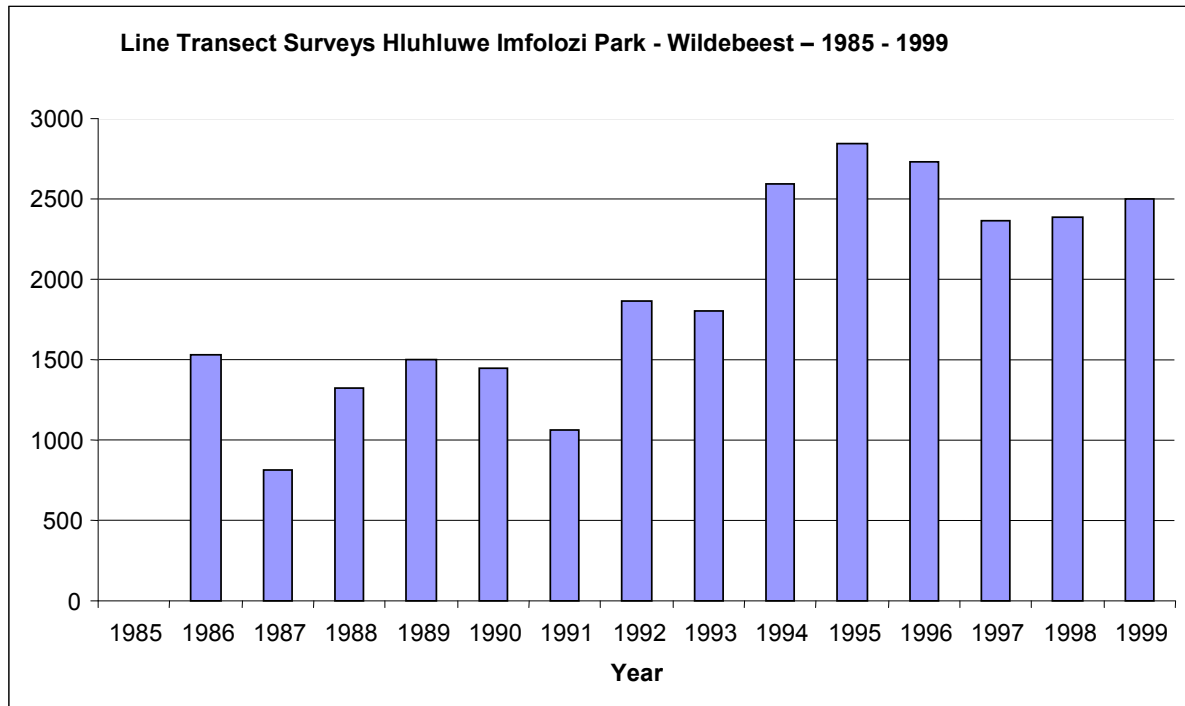


Figure 3.19: Line Transect Surveys HIP – Wildebeest – 1985 - 1999  
 (Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

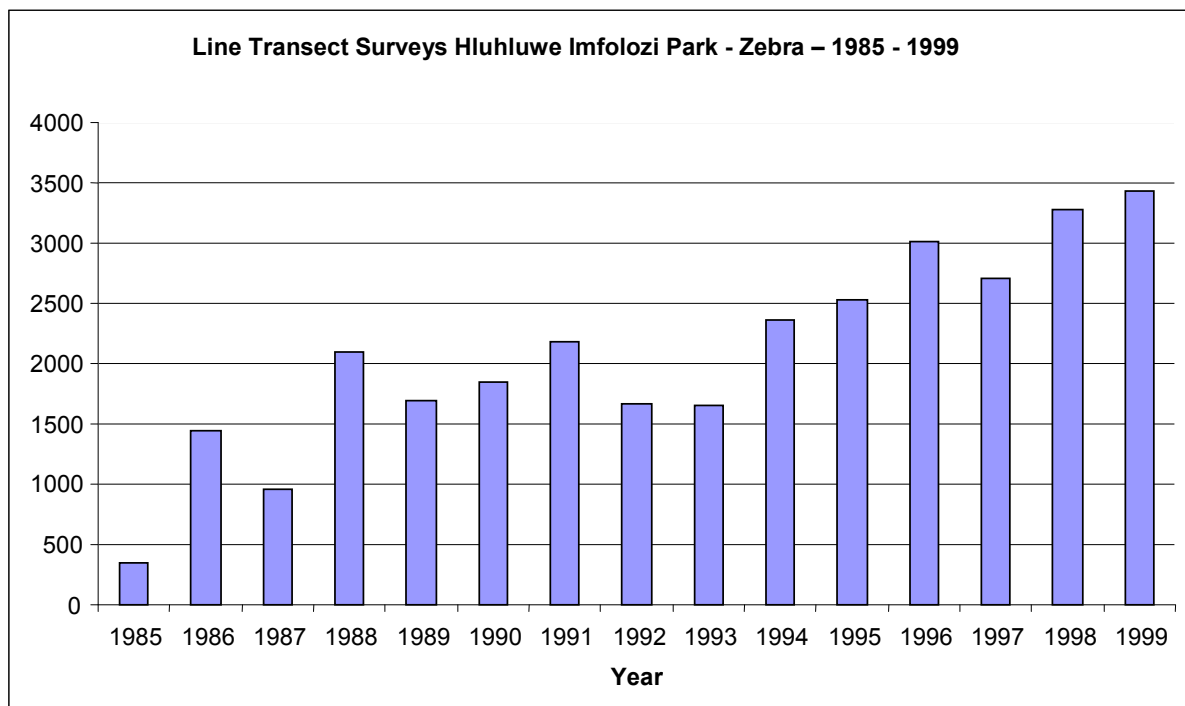


Figure 3.20: Line Transect Surveys HIP – Zebra – 1985 - 1999  
 (Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

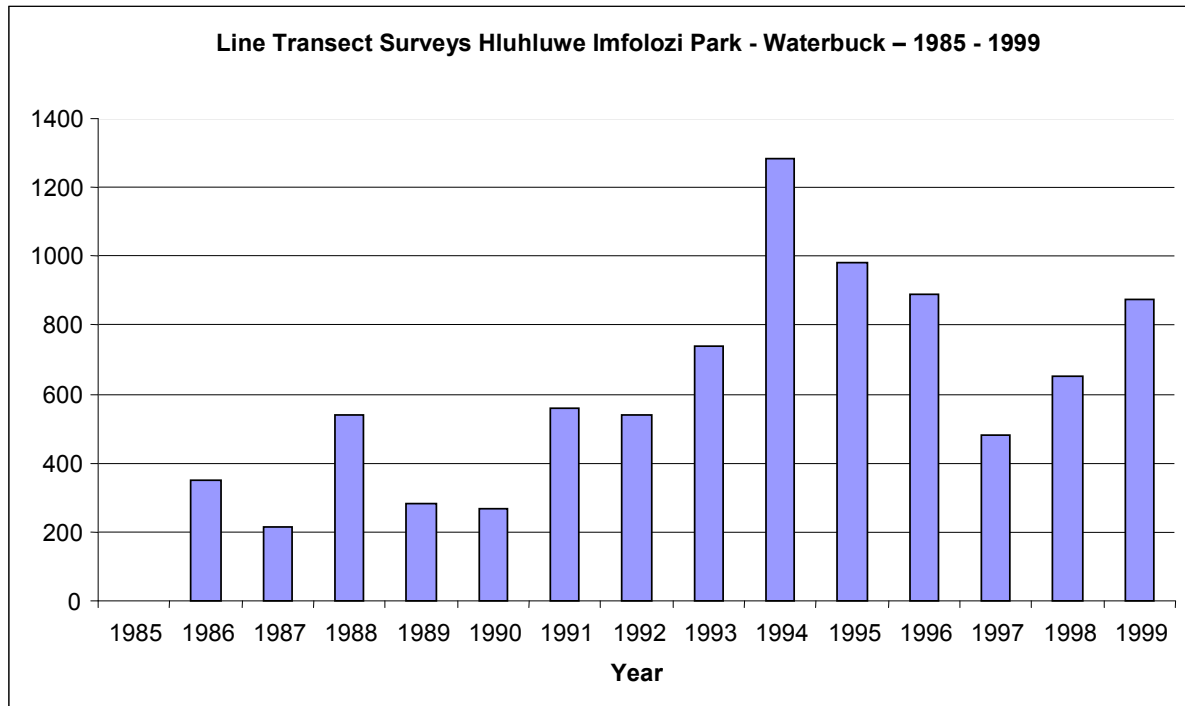


Figure 3.21: Line Transect Surveys HIP – Waterbuck – 1985 - 1999

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

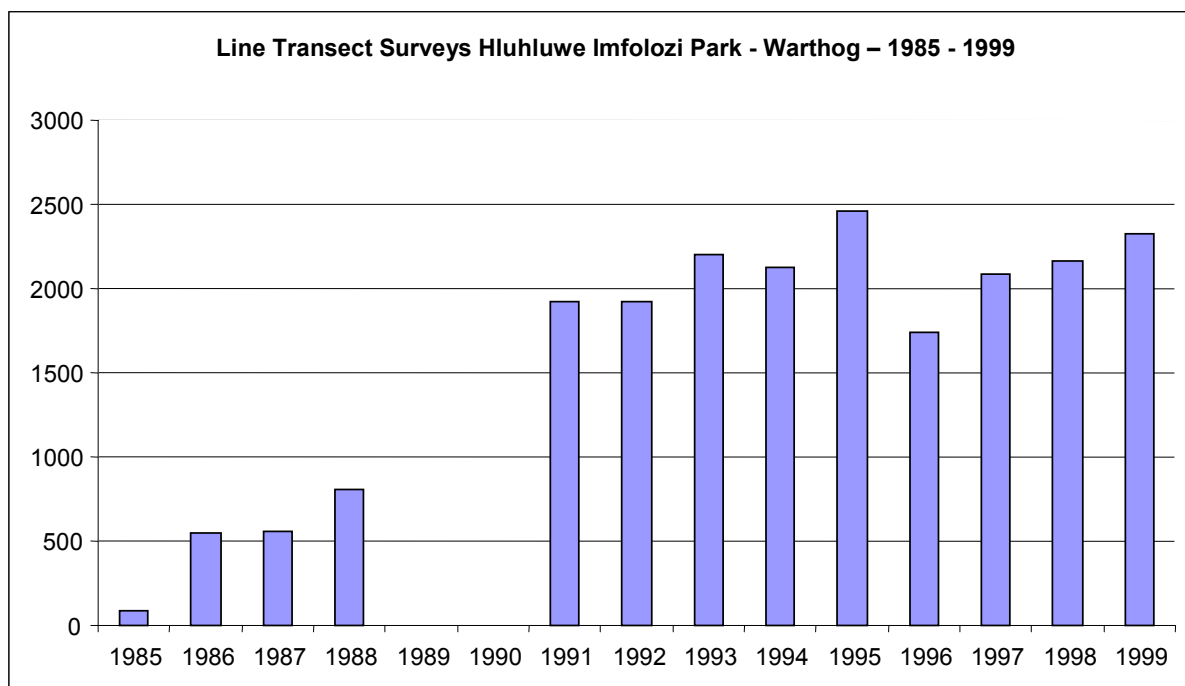


Figure 3.22: Line Transect Surveys HIP – Warthog – 1985 - 1999

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

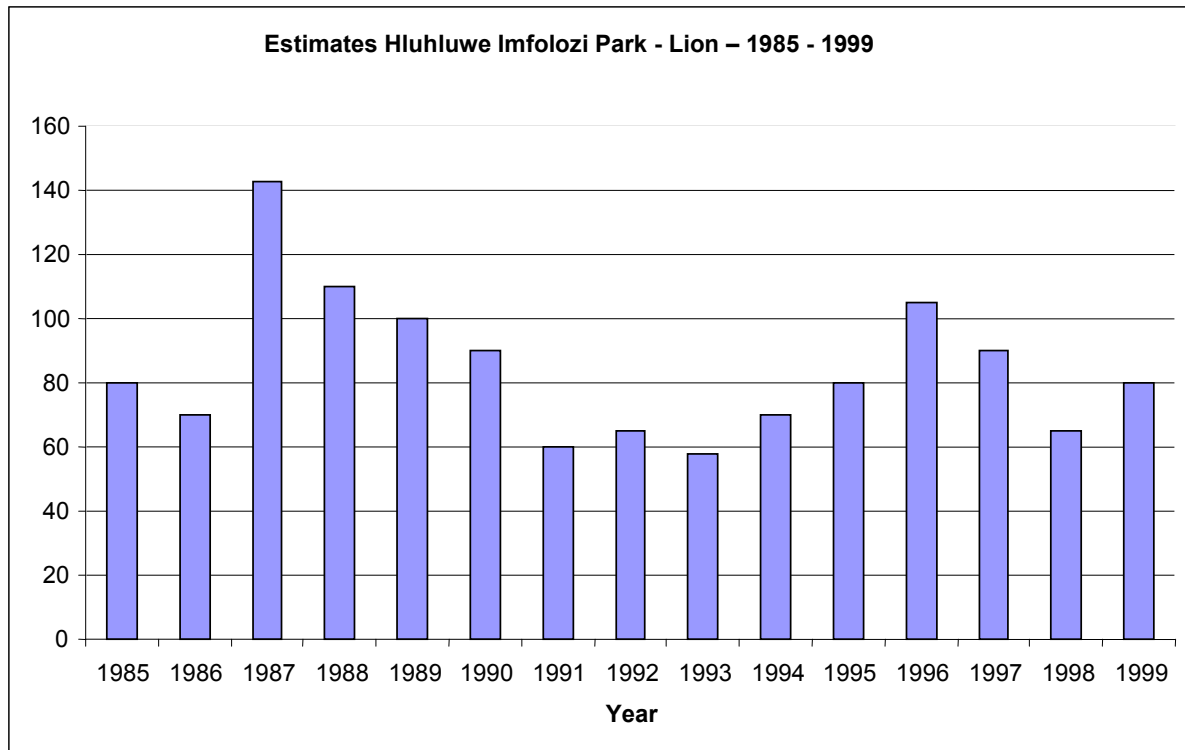


Figure 3.23: Estimates HIP – Lion – 1985 - 1999

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

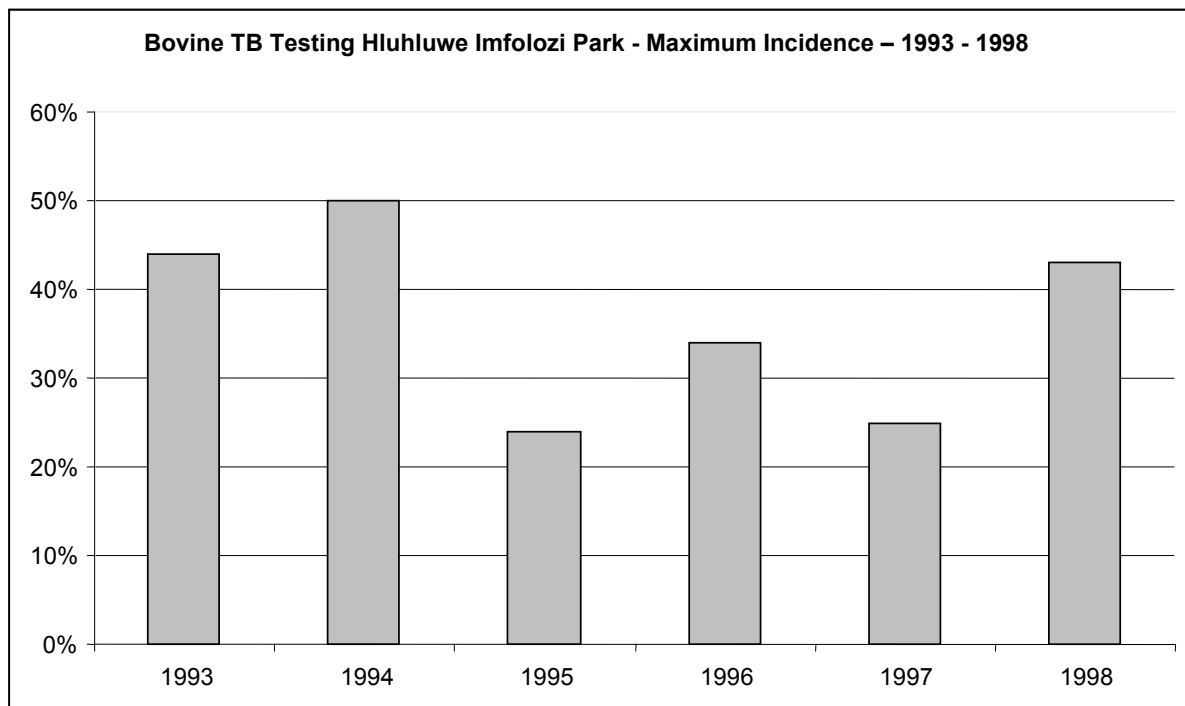


Figure 3.24: Bovine TB Testing HIP - Maximum Incidence – 1993 - 1998

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1993 – 1998)

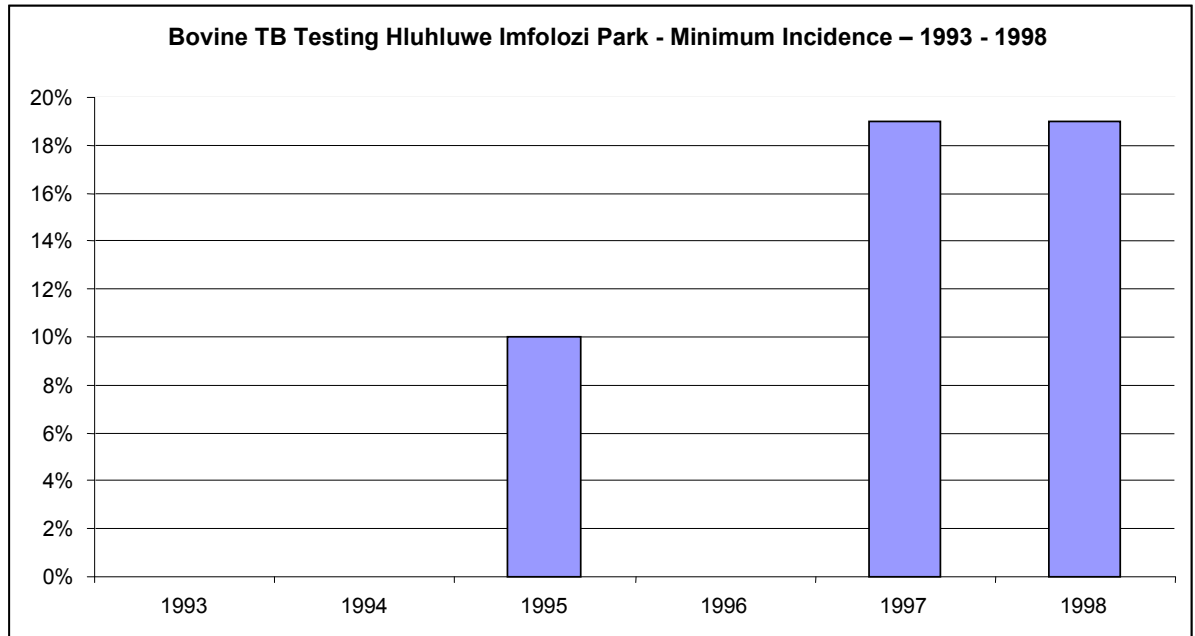


Figure 3.25: Bovine TB Testing HIP - Minimum Incidence – 1993 - 1998  
 (Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1993 – 1998)

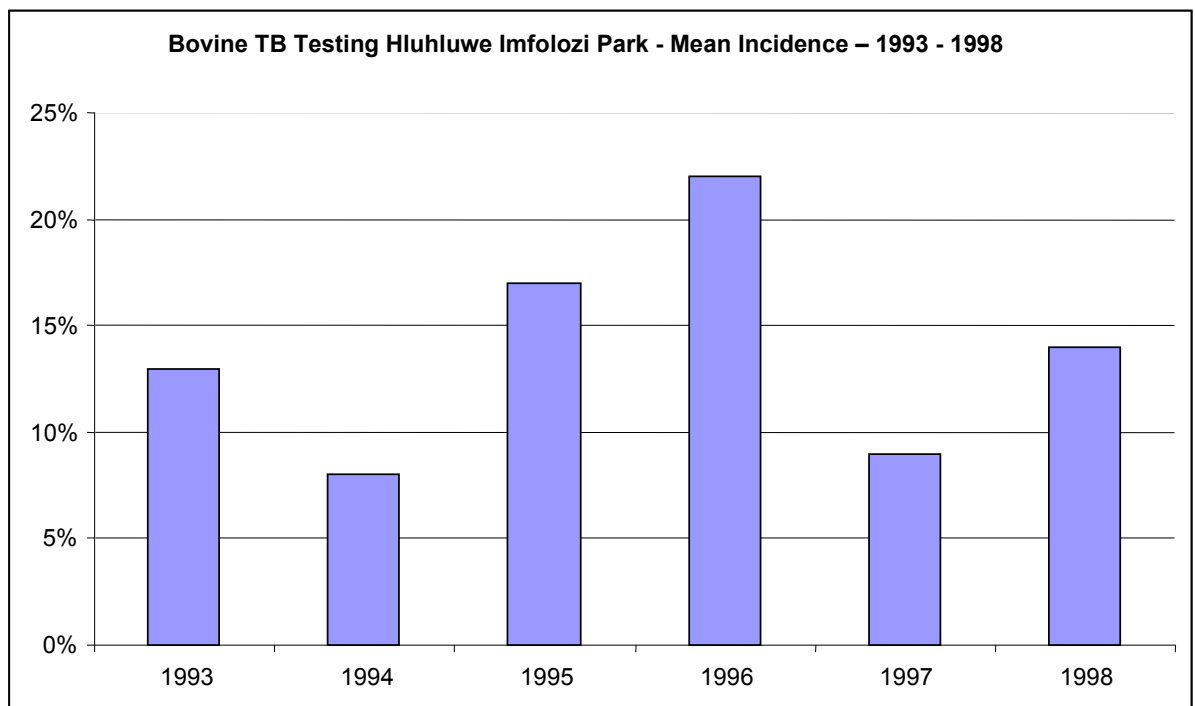


Figure 3.26: Bovine TB Testing HIP- Mean Incidence – 1993 - 1998  
 (Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1993 – 1998)

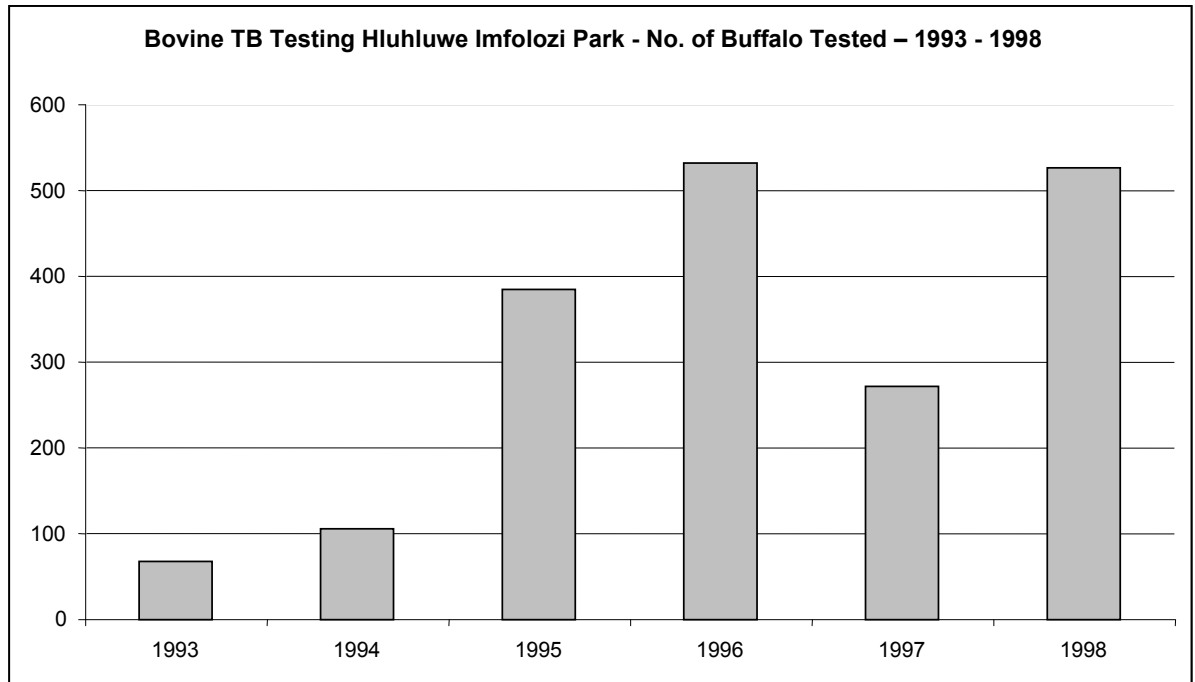


Figure 3.27: Bovine TB Testing HIP – No. of Buffalo Tested – 1993 - 1998  
(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1993 – 1998)

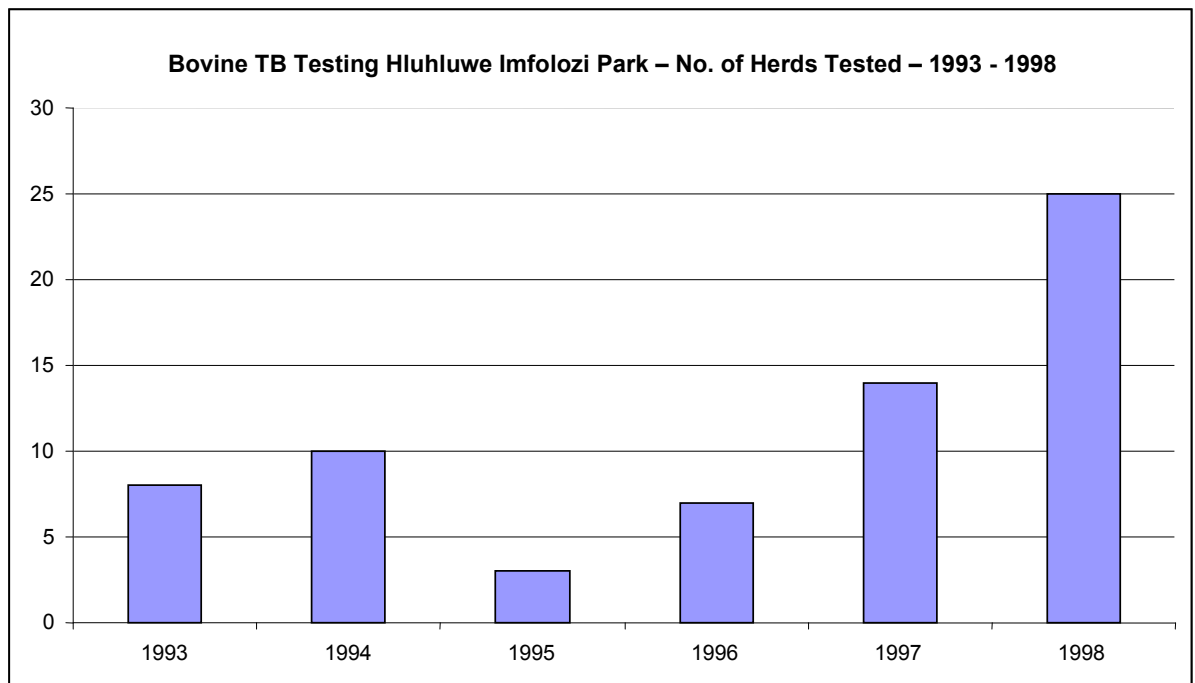


Figure 3.28: Bovine TB Testing HIP – No. of Herds Tested - 1993 - 1998  
(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1993 – 1998)

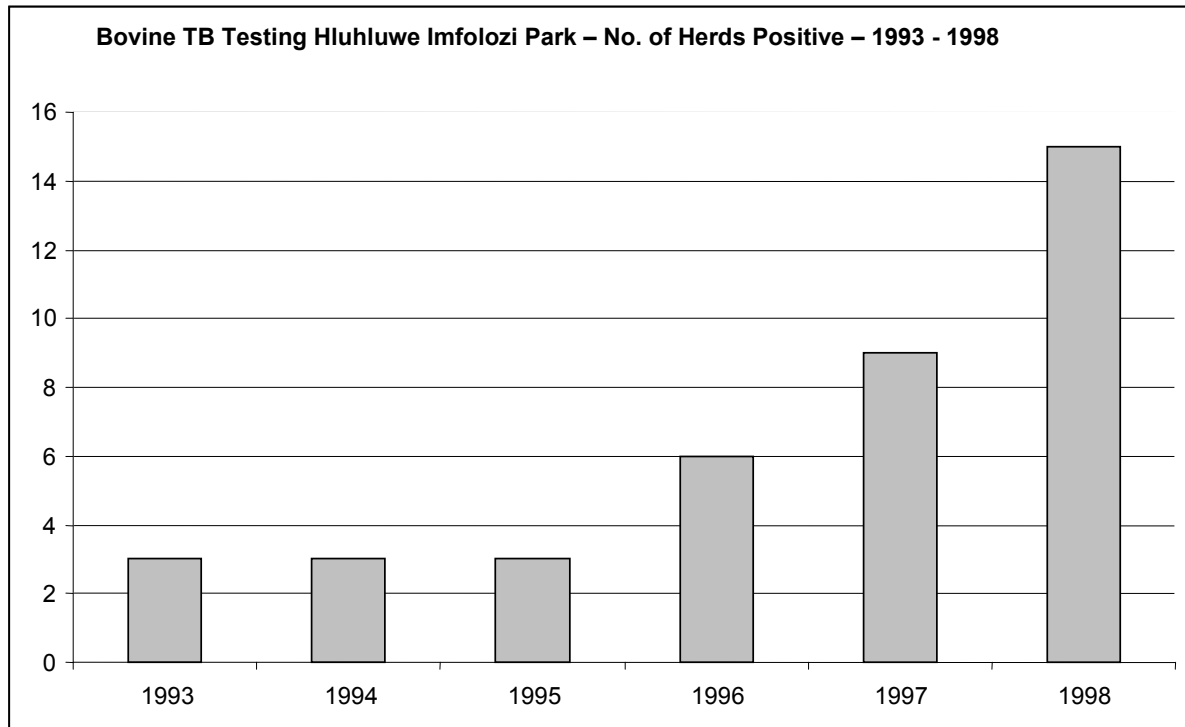


Figure 3.29: Bovine TB Testing HIP – No. of Herds Positive – 1993 - 1998  
(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1993 – 1998)

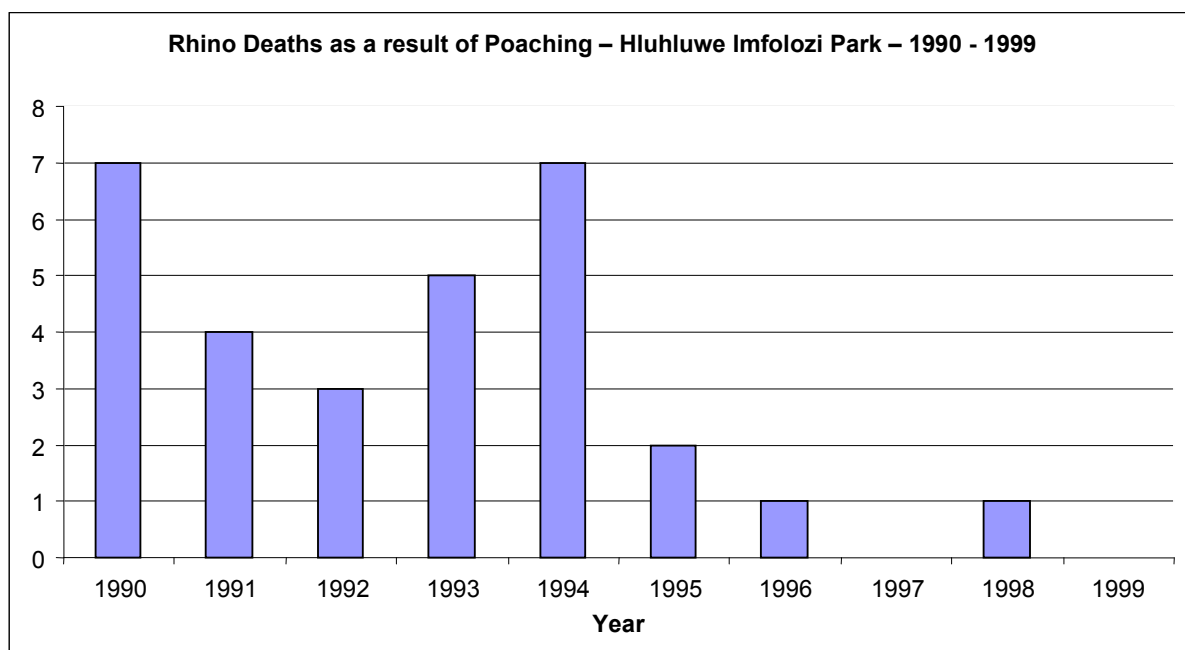


Figure 3.30: Rhino Deaths as a Result of Poaching – HIP – 1990 - 1999  
(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)



Table 3.1: Important Conservation Aspects

A complete intact compliment of indigenous fauna including the “big five” is present
A diversity of habitats which are dynamic at a landscape scale and over decades is present
A remnant natural area containing a diverse range of indigenous fauna and flora amidst a surrounding area that is rapidly transforming through human activities
Black and white rhino populations have been categorised by the African Rhino Specialist Group of the World Conservation Union as Key 1 populations in Africa and Globally and are rated as extremely important for the re-establishment of new populations in their former range
Contains a full compliment of predators, including raptors and has a significant genetic stock for many plant and animal species
Currently holds 19% of the global population of White Rhino and about 17% of the global population of black rhino.
First wilderness area set aside in Africa
Functionally intact in that it maintains an intact set of processes and has large increasing populations of plains game which can enable founder populations in other areas.
The rivers flowing through the park are catchments for Lake St. Lucia.
Key representative examples of eastern seaboard habitats are present
Large enough to contribute to the conservation of wild dogs
Large enough to maintain benchmark samples of ecological processes
Only remaining sanctuary in the world in the 1920's of the southern white rhino from which all current populations emanate
Original genetically uncontaminated and viable populations of black and white rhino
Represents the southernmost distribution of a number of free ranging species
The wilderness area comprises approximately one third of the park at 29 770 ha and has international recognition
Zululand thornveld is present in a relatively unmodified state

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.2: Biodiversity Management Objectives

The overall objectives are to restore and maintain all components of the indigenous biodiversity and to form a nucleus from which conservation related activities and benefits radiate
Restore components of biodiversity within an effective, efficient management framework and to make a significant contribution to a National and Continental Conservation effort
Acquire status of international significance for the park and be regarded as a vital component of national and international biodiversity conservation as well as having the status as a core of a wider conservation area by being a biosphere reserve, linking areas of biodiversity importance within and beyond the park's boundary
The biological objectives are to conserve and where appropriate restore the structure, dynamic temporal and spatial pattern and diversity of natural communities
The administrative objective is to maintain an effective and efficient law enforcement programme to ensure the integrity of the park
The objectives regarding the Wilderness Area are to manage the area in a manner compatible with wilderness principles for human benefit

(Hlulhuwe Imfolozi Park Management Plan, 2000)

Table 3.3: Biophysical Threats

Exotic disease such as Tuberculosis, parvo virus, distemper and rabies in domestic animals adjacent to the park
Invasive plant proliferation
Natural resource depletion
Possible damming of the Black or White Imfolozi Rivers
Possible mining adjacent to the park
Possible raising of the Hlulhuwe Dam wall
Predation and inter-breeding by feral animal species
The degradation of water quality and increased silt loads of rivers
Use of environmentally unfriendly herbicides and pesticides in the control of indigenous diseases such as nagana and malaria

(Hlulhuwe Imfolozi Park Management Plan, 2000)

Table 3.4: Aquatic Systems Management Objectives

Ensure that natural distributions of wildlife is not altered by the creation of artificial water bodies more than 1 km from natural open surface water or silt or sand covered water
Ensure that no pollutants enter any water system through management activities
Maintain natural water bodies in an unaltered condition
Maintain the distribution of surface water such that the viability of populations of dependant species is not threatened
Minimise negative external influences on the hydrology and aquatic systems of the park

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.5: External Originating River Objectives

Eradicate alien plants along the banks of all rivers
Maintain rivers litter free
Maintain the natural free flow of all rivers
Promote sound conservation in catchment areas upstream of the park
Promote the use of environmentally friendly dips fertilisers and other industrial chemicals in communities living upstream

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.6: Threats to Aquatic Systems

Increased flooding regime due to upstream catchment alteration
Increased sedimentation from rivers with catchments outside the park
Over extraction for use by staff , visitor facilities and the capture bomas and pens
Possible damming of the Umfolozi Rivers
Possible raising the Hluhluwe Dam wall
Water flow is compromised in some systems due to alien plant infestation, causeways, roads and bridges forming unnatural barriers to water flow
Water pollution due to inadequate design of sewerage treatment facilities, inflow of polluted waters from upstream of the park and the use of chemicals for alien plant eradication or other pollutants in water bodies for example the Game Capture bomas and quarries

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.7: Management of Surface Water for Animals

A burning regime, not detrimental to the hydrology of the catchment, is applied
Artificial water holes provided for tourism are closed when the surface water or water just below introduced silt dries up
Artificial water supplies provided because of siltation or fenced off access are as close to the natural distribution as possible, with the distance from the source being no further than 1 km, or by pumping to identified pans
Game densities are maintained at levels such that they do not have a negative effect on the hydrology of the catchment
Holes are excavated in the silt of the rivers to provide access to water
The present distribution of water in the reserve approximates past natural distribution and this is maintained

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.8: Indigenous Vegetation Objectives

Carry out road verge clearing of indigenous problem plants to improve game viewing
Conduct an intensive survey of alien plant distribution every three years
Control alien plants in identified priority habitats
Develop an appropriate species or community specific strategy to ensure their survival
Identify degraded areas and re-establish indigenous vegetation
Identify priority species and communities
Manipulation of herbivore numbers to protect species and habitats
Monitoring is carried out which includes mapping, recording and reporting on activities at annual management meetings
Prevent loss of important habitat through the encroachment of alien plants
Prevent loss of indigenous species through the encroachment of alien plants
Prevent reduction in priority vegetation types or species and, where encroachment is occurring, to re-establish representative grasslands for bio-diversity
Protection of priority species or communities
Re-establish indigenous plants that occurred in the area, that have declined or have become extinct through the actions of man and to provide appropriate protection for re-established plants
The physical removal of encroaching vegetation if appropriate

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.9: Utilisation of Indigenous Vegetation Objectives

Adherence to a resource harvesting policy relating to thatch, firewood and reed collection
Allow and regulate sustainable use of indigenous vegetation
Allow no collection of natural firewood in the field, except for the wilderness trails operation and then only from an approved bush clearing operation
Allow the harvesting of browse for the game capture operation on a controlled basis
Map, measure and record all cases of authorized removal of vegetation
Make limited use of untreated indigenous timber in the construction of facilities

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.10: Vegetation Monitoring Objectives

Facilitate an understanding of the dynamics of specific plant species and the vegetation as a whole, in particular in relation to climate, soil, herbivory and fire
Map the driving forces behind vegetation dynamics, particularly herbivores and fire.
Monitor alien plant spread and impact on herbivore populations
Quantify and map spatial changes in vegetation communities
Quantify the status and relative trend of selected plant species

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.11: Fire Management Objectives

Create habitats of different post fire ages which would favour different species
Manage habitat structure
Reduce the a fire hazard situation by reducing the fuel load around infrastructure
Remove moribund grass material
Use fire to assist in controlling alien plants, particularly the early stages of invasion in grasslands

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.12: Threats to Vegetation

Encroachment of woody plants in grasslands
Inappropriate fire management including arson
Inappropriately high stocking densities of herbivores particularly elephants
Invasive alien plants especially <i>Chromolaena odorata</i>
Unsustainable use of natural resources

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.13: Importance of the Park in Respect of Fauna

47% of KwaZulu-Natal's threatened vertebrates, totalling 24 species, occur
59% of KwaZulu-Natal's estimated 872 vertebrates, excluding fishes, occur
67% of KwaZulu-Natal's birds occur
86% of estimated 514 vertebrates, are rated as threatened
All large carnivores, namely lion, Hyaena, cheetah, leopard and wild dog occur
All megaherbivores, being both species of rhino, elephant, hippo and giraffe occur
Relatively large size, topographical and habitat variation
The big five, being elephant, rhino, buffalo, lion and leopard occur
The only endangered mammals indigenous to KwaZulu-Natal, wild dog and black rhino, occur

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.14: Vertebrate Species Declining

Blue Duiker <i>Philantomba monticola</i>
Bushbuck <i>Tragelaphus scriptus</i>
Common Reedbuck <i>Redunca arundinum</i>
Grey Lourie <i>Corythaeides concolor</i>
Hippopotamus <i>Hippopotamus amphibious</i>
Jackal <i>Canis mesomelas</i>

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.15: Successfully Reintroduced Vertebrate Species

Cheetah <i>Acinonyx jubatus</i>
Elephant <i>Loxodonta africana</i>
Lion <i>Panthera leo</i>
Wild Dog <i>Lycaon pictus</i>

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.16: Unsuccessfully Reintroduced Vertebrate Species

Brown Hyaena <i>Hyaena brunnea</i>
Eland <i>Taurotragus oryx</i>
Klipspringer <i>Oreotragus oreotragus</i>

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.17: Threatened Vertebrates Classified by IUCN as Endangered

Black Rhino <i>Diceros bicornis</i>
Wild Dog <i>Lycaon pictus</i>

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.18: Threatened Vertebrates Classified by IUCN as Vulnerable

Aardvark <i>Orycteropus afer</i>
African Rock Python <i>Python sebae</i>
Bateleur Eagle <i>Terathopius ecaudatus</i>
Cape Vulture <i>Gyps coprotheres</i>
Honey Badger <i>Mellivora capensis</i>
Lappet-faced Vulture <i>Torgos tracheliotus</i>
Martial Eagle <i>Polemaetus bellicosus</i>
Nile Crocodile <i>Crocodylus niloticus</i>
Pangolin <i>Manis temminckii</i>
Rock Kestrel <i>Falco tinnunculus</i>
Striped Harlequin Snake <i>Homoroselaps ralis</i>

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.19: Threatened Vertebrates Classified by IUCN as Rare

Aardwolf <i>Proteles cristatus</i>
Blue Duiker <i>Philantomba monticola</i>
Hippopotamus <i>Hippopotamus amphibious</i>
Leopard <i>Panthera pardus</i>
Lesser Black-winged Plover <i>Vanellus lugubris</i>
Palmnut Vulture <i>Gypohierax angolensis</i>
Peregrine Falcon <i>Falco peregrinus</i>
Red Duiker <i>Cephalophus natalensis</i>
Samango Monkey <i>Cercopithecus mitis</i>
Serval <i>Felis serval</i>
White Stork <i>Ciconia ciconia</i>
White-headed Vulture <i>Trigonoceps occipitalis</i>

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.20: Threatened Vertebrates Classified by IUCN as Peripheral

Angolan Green Snake <i>Philothamnus angolensis</i>
Bat Hawk <i>Macheiramphus alcinus</i>
Black Coucal <i>Centropus bengalensis</i>
Eastern Wolf Snake <i>Lycophidion semiannule</i>
Forest Cobra <i>Naja melanoleuca</i>
Lemon-breasted Canary <i>Serinus citrinipectus</i>
Marabou Stork <i>Leptoptilos crumeniferus</i>
Openbill Stork <i>Anastomus lamelligerus</i>
Pel's Fishing Owl <i>Scotopelia peli</i>
Pygmy Goose <i>Nettapus auritus</i>
Red-winged Pratincole <i>Glareola pratincola</i>
Sacred Ibis <i>Threskiornis aethiopicus</i>
Southern Banded Snake Eagle <i>Circaetus fasciolatus</i>
White Pelican <i>Pelecanus onocrotalus</i>
Woolly-necked Stork <i>Ciconia episcopus</i>

(Hluhluwe Imfolozi Park Management Plan, 2000)



Table 3.21: Threatened Vertebrates Classified by IUCN as Isolated

Delagorgue's Pigeon <i>Columba delagorguei</i>
Stanley's Bustard <i>Neotis denhami</i> .

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.22: Key Fauna Species

Black rhino <i>Diceros bicornis</i>
Buffalo <i>Syncerus caffer</i>
Elephant <i>Loxodonta africana</i>
Impala <i>Aepyceros melampus</i>
Lion <i>Panthera leo</i>
Nyala <i>Tragelaphus angasii</i>
White rhino <i>Ceratotherium simum</i>
Wild dog <i>Lycaon pictus</i>

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.23: The Principles for the Management of Fauna

The principles of Processed Based Management are followed
To control the effect of alien diseases
To envisage the animal populations as part of a meta-population
To re-establish and maintain viable indigenous animal populations and communities
To remove alien species.

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.24: Fauna Management Objectives

To contribute to meta-population management of species
To ensure that any utilisation of animal populations is sustainable
To maintain the genetic integrity of all species
To maintain viable functioning populations of indigenous species
To prevent negative impacts to neighbours, their property or their crops by any animal originating in the park
To prevent the introduction and minimise the effects of foreign diseases
To remove all alien animal species
To serve as a source area for the establishment of new populations for individual species

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.25: Threats to Fauna

Alien diseases
Ill-considered management decisions
Inbreeding
Loss of habitat
Uncontrolled emigration
Uncontrolled poaching

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.26: Mitigating Factors Regarding Threats to Fauna

Population control
The deliberate control of diseases
The maintenance of an effective boundary fence
The management of individual species according to a strategic plan
The ongoing control of problem animals
The re-introduction of locally extinct or declining species
The supplementation of potentially in-bred populations from appropriate gene-pools

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.27: Animal Population Monitoring Programmes

Black rhino monitoring programme which is ongoing
Carnivore / rare species sightings which are ongoing
Large herbivore transect counts which are conducted biannually
Lion call up programme which is done triannually
Mortality sightings which are ongoing
Small herbivore sightings which are ongoing
White rhino sink counts which are done annually

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.28: Animal Population Monitoring Objectives

Allow wise decision-making on rhino removals with respect to numbers, ages and sexes
Determine and predict progress towards South Africa's conservation goals for each ecotype
Improve management of the populations for maximum productivity in terms of rhino numbers and rates of increase
Improve management's understanding of factors affecting population performance namely breeding rates, mortalities and social behaviour
Improve management's understanding of rhino density in relation to estimated carrying capacity and climatic and management events
Improve management's understanding of rhino distribution in relation to other rhino, food and water
Refine estimates of ecological carrying capacity

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.29: Herbivore Management Objectives

Ensure that all the processes that naturally regulate herbivore populations are in place or are simulated
Ensure that the herbivore populations are present at relative densities that approximate the free ranging situation
Ensure that the objectives follow a format in line with the process-based management style
Ensure the continued survival of individual endemic herbivore populations
Ensure the integrity of the soil and prevent widespread erosion through intense grazing

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.30: Management Objectives regarding Disease Surveillance

Early recognition and diagnosis of Notifiable Diseases particularly Foot and Mouth Disease, Rabies, Nagana, Tuberculosis and Rinderpest before they spread to domestic stock
Undertake a percentage of post mortem examinations on species routinely culled
Undertake post mortems on animals that have died in the field

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.31: Threats posed by Bovine Tuberculosis

A moratorium would be placed on the movement of all species from the park which would have serious financial implications as rhino and other species would no longer be translocated
Dead removals of game, especially buffalo, are seriously complicated by the presence of Tuberculosis
Infected animals breaking out of the park and sharing water sources with neighbour's cattle, thereby spreading the disease, would have serious implications for neighbour relations and the community conservation programme
The disease being transmitted from baboons and monkeys to people visiting the park would have serious implications for tourism
The importance of the black and white rhino populations for the conservation of rhino in Africa would be reduced as it would no longer be possible to establish new populations from the park
The threat of spill over into other species, as has already occurred in lion, would have a negative impact on those populations and subsequently the ecology and bio-diversity of the park would be compromised

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.32: Summary of Bovine Tuberculosis Surveys

Year	Maximum Incidence	Minimum Incidence	Mean Incidence	No. of Buffalo Tested	No. of Herds Tested	No. of Herds Positive
1993	44%	0%	13,3 %	67	8	3
1994	50%	0%	7,5 %	105	10	3
1995	24,2 %	10%	17,1 %	385	3	3
1996	33,8 %	0%	21,5 %	532	7	6
1997	25%	<20 %	8,9 %	271	14	9
1998	43%	<20 %	13,5 %	527	25	15

(KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1993 – 1998)

Table 3.33: Security Management Objectives

Acquire the necessary equipment for dealing with potential security related incidents
Contribute to national action plans for the protection of rhino
Create conditions in terms of security to maximise wildlife population growth
Ensure that all security related staff are adequately trained and equipped
Ensure that all staff members are aware of their specific roles in the event of an incident
Ensure that supervisor involvement in the field is maintained at an optimum level
Establishment and maintenance of an intelligence network
Establishment and maintenance of local and regional rhino action plans
Minimise losses due to poaching
The successful conviction of perpetrators of poaching crimes

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.34: Security Threats

A breakdown in formal security training
A breakdown of social structures
A breakdown of the judicial system
A diminishing and uncertain budget and an inadequate intelligence network.
An increase of criminal activities outside the park
Demotivated staff
Instability caused by work stoppages or industrial action or intimidation of staff
Land invasions
Political instability or unrest
Social impoverishment in neighbouring areas
Uncontrolled public access to the Corridor Road

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.35: Staff Sergeant Responsibilities

Attend all relevant meetings held in his area
Overall commander of all the field rangers
Report all findings directly to the Section Ranger of the area and to the Conservator
Report directly to the Section Ranger and Conservator any matters relating to the staff
Responsible for the welfare, discipline and general well being of all the field rangers
Unannounced field ranger camp inspections

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.36: Section Corporal Responsibilities

Assist the Section Ranger
Check the areas where reported poaching has occurred
Ensure that the fence line staff are carrying out their duties satisfactorily
Evaluate the field rangers and ensure that they are getting out into the field
Hold regular firearm and ammunition checks
Patrol with the Field Rangers
Read the camp diaries weekly, initial and date them
Responsible for the welfare and discipline of staff
Visit Field Ranger camps both announced and unannounced, on an <i>ad hoc</i> basis
Visit all reported unnatural game deaths personally

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.37: Types of Patrols

Clandestine operations concentrating along the corridor road
Day or night anti poaching patrols
Fence line patrols to check for crop damage immediately adjacent to the Reserve fences
Fence line patrols to check for illegal activities
Fence line patrols to check on work done by Fence Line General Assistants
High visibility aerial patrols of the boundary and corridor road
Horseback patrols to inspect areas not usually visited on foot patrols
Observation patrols where Field Rangers can clearly be seen from outside the park
Overt Patrolling along the corridor road running through the reserve
Regular vehicle patrols maintaining a high visual presence

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.38: Fence Line General Assistants Responsibilities

Maintain the fence, ensure the electric offsets are functioning and repair any damage
Patrol the boundary fence daily
Report by radio any boundary crossings by humans or animals to the Lance Corporal

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.39: Patrol Radio Reporting Procedures

All serious incidents are reported by radio immediately
Any shots fired are reported by radio immediately stating the reason and the area
Any shots heard are reported by radio immediately and investigated
Tracks of people either entering or leaving the reserve are reported by radio immediately

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.40: Security Controls and Procedures

A firearm and ammunition register is maintained at each camp and at reserve base
A formal firearm and ammunition handover takeover procedure is adhered to
All ammunition issued is marked
All expended cartridges are handed in and accountable for
Each member of staff is reviewed on at least a six monthly basis
Firearms are sent to the South African Police Service's Forensics department for firing so as to have the bullet head characteristics recorded
No staff member is left at one picket camp for an indefinite period

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.41: Geographic Positioning System Procedures

A reporting form has been developed which the Field Rangers complete on a daily basis
Field Rangers on patrol take a reading every half hour and write it down in a note book
Also record rare animal or mortality information
Once back at camp, the reporting form is completed
The completed forms are collected and checked by the Section Rangers monthly
The forms are then entered into a data base at the Hluhluwe Research Centre
Various reports are generated and distributed to Section Rangers
The biological data is used by research to develop reports, statistics, numbers etc
These reports are discussed with Field Rangers on training days
The reports are used extensively in planning the protection strategy of the protected area
All security related incidents are entered into the Wildlife Investigations database
Staff have electronic access to this database via a dedicated computer and modem

(Hluhluwe Imfolozi Park Management Plan, 2000)



Table 3.42: Security Aspects of the Black Rhino Monitoring Programme

Assists in raising the alarm when a specific rhino has not been sighted for 6 months
Micro chipping of all rhino immobilised is done
Pans favoured by rhino in vulnerable positions are filled with quarry material
Rhino on the boundary or high risk areas such as the corridor road are removed
Searches are initiated to locate any unsighted animals
Shade trees favoured by rhino in vulnerable positions are removed

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.43: Anti Poaching Unit Responsibilities

Assist in black rhino monitoring programme
Assist in instances where crowd control is needed
Assist in raids on homesteads of suspects outside the reserve.
Assist with anti poaching in all sections
Carry out road blocks and observation posts on the corridor road
Conduct field ranger camp checks in order to enforce domestic regulations
Monitor certain activities outside the reserve
Monitor field ranger camps and internal staff activities
Operate in areas as designated by the Conservator.
Receive training in respect of fire arms, patrolling, anti insurgency, map reading, etc.
Required to camp away from their base camp

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.44: Law Enforcement Officer (Zululand) Responsibilities

Ensure all information is collected on the scene of all rhino poaching incidents
Ensure where possible that he is first on the scene of all rhino poaching incidents
Establish a working relationship and formal liaison with the Conservator Investigations
Establish an informal intelligence network
Investigation of rhino poaching incidents and poaching cases
Maintain formal external liaison the Endangered Species Protection Unit
Maintain formal external liaison the relevant South African Police Service units
Maintain formal external liaison with Magistrates and Public Prosecutors
Maintain formal internal liaison with the Conservators in the Zululand Region

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 3.45: Investigations Unit Responsibilities

Maintain a crime data base and make it available to assist in investigations
Serve those reserves in KwaZulu-Natal which have rhino populations
Set up and run informer networks
Source information on threats against the rhino populations in KwaZulu-Natal

(Hluhluwe Imfolozi Park Management Plan, 2000)

Social Aspects

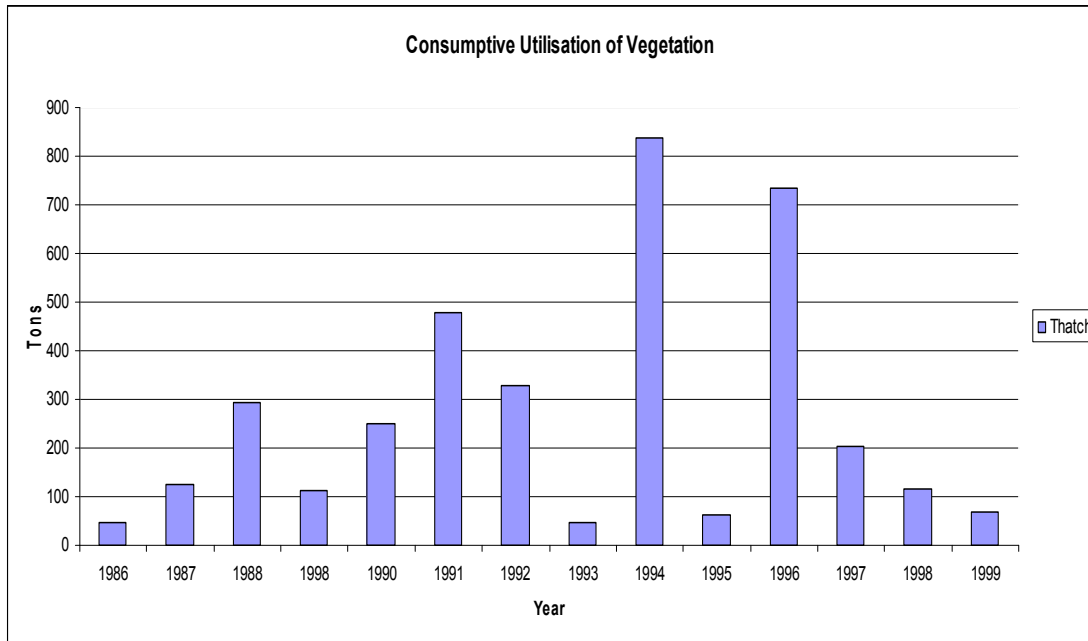


Figure 4.1: Consumptive Utilisation of Vegetation (Thatch)

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

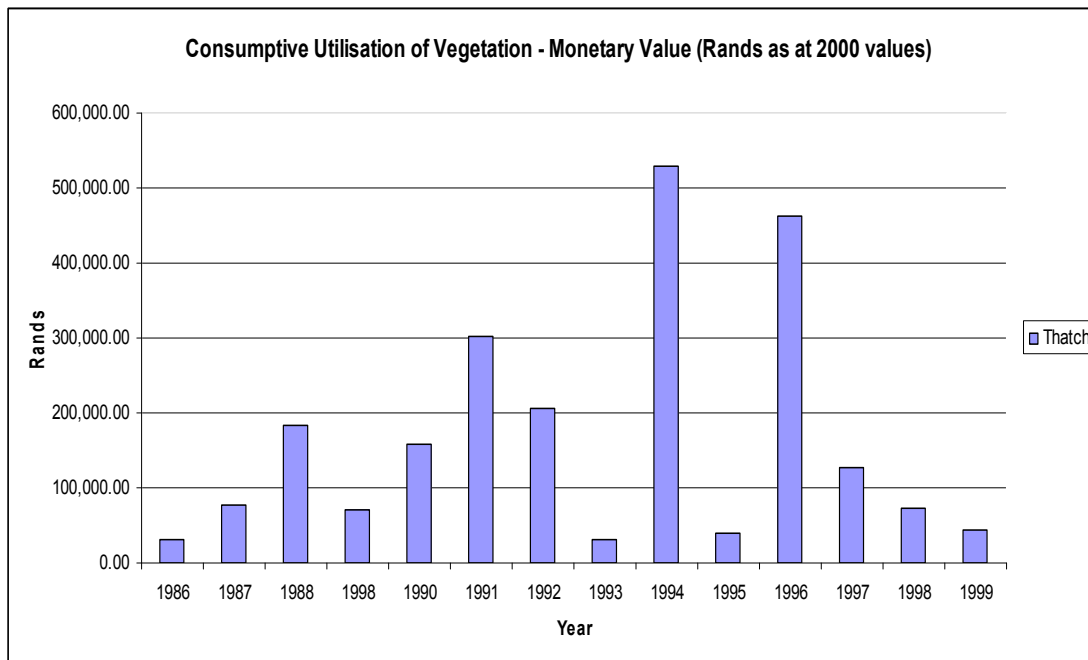


Figure 4.2: Consumptive Utilisation of Vegetation - Monetary Value (Thatch)

(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

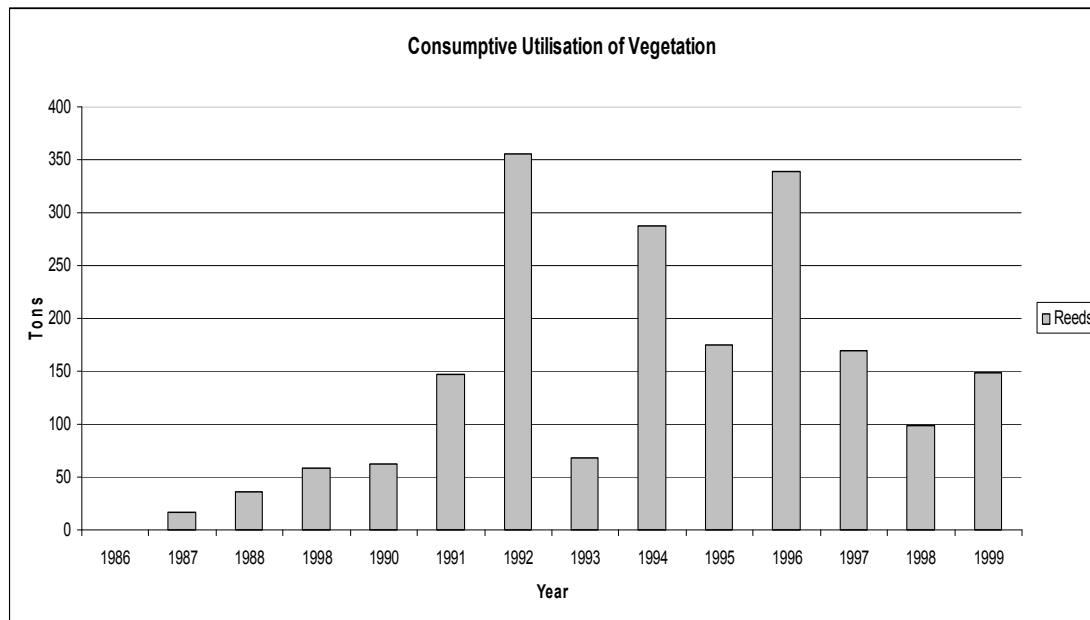


Figure 4.3: Consumptive Utilisation of Vegetation (Reeds)  
(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

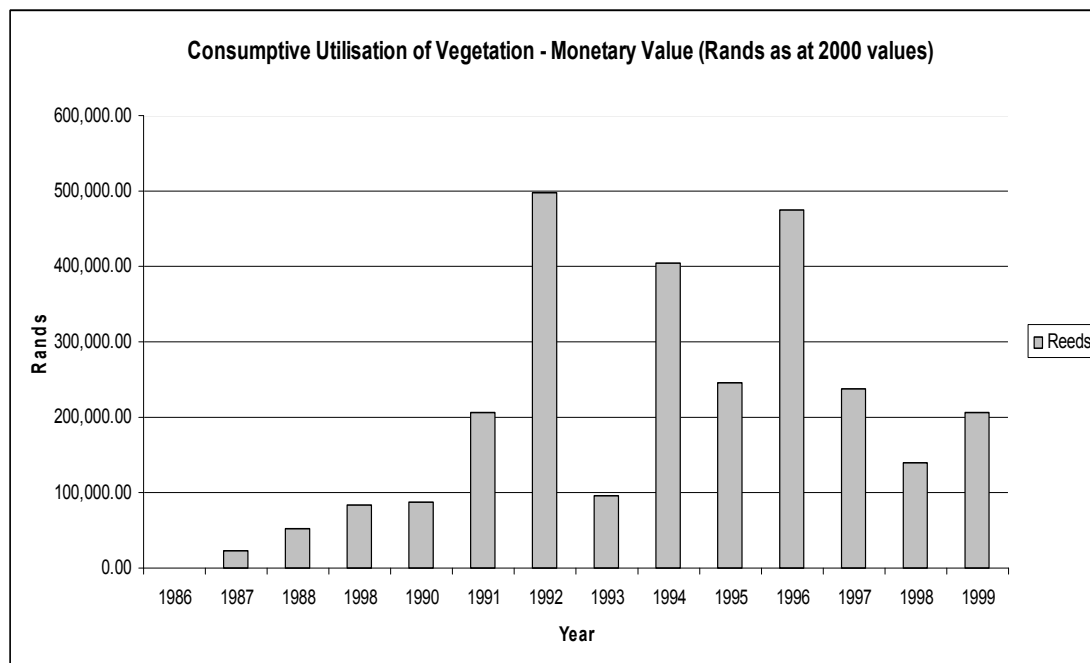


Figure 4.4: Consumptive Utilisation of Vegetation - Monetary Value (Reeds)  
(Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

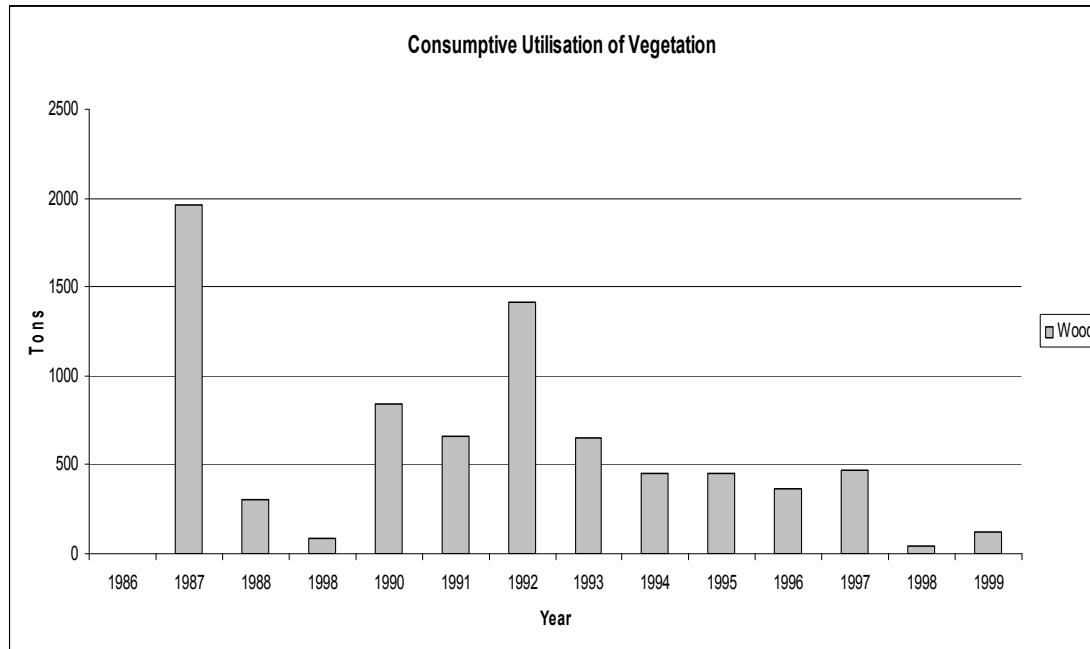


Figure 4.5: Consumptive Utilisation of Vegetation (Wood)  
 (Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

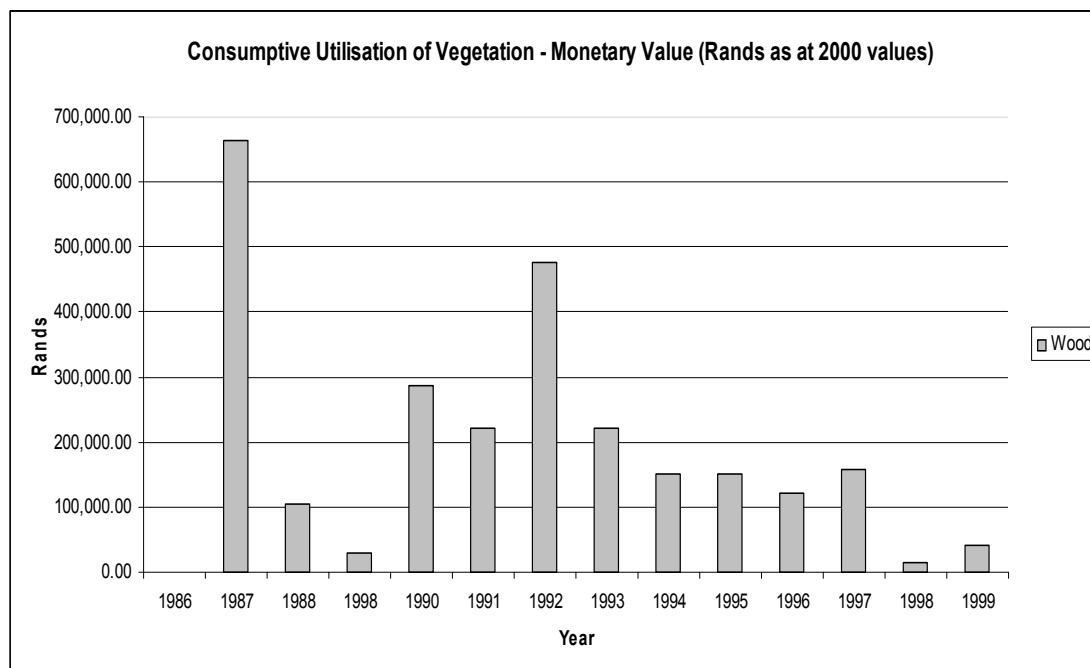


Figure 4.6: Consumptive Utilisation of Vegetation - Monetary Value (Wood)  
 (Source: KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

Table 4.1: Income Earned from Economic Opportunities during 1998/99

Name of project	Description	Earned
Community Gardens:	Mpindesweni	R 500-00
	Zizamele	R 100-00
	Dakaneni	R 682-00
	uMzamdweni	R 2 000-00
Community Guides	Providing guiding services to researchers and schools	R 9 600-00
Cwakeme High School Dancers	Performances for Bonamanzi	R 8 084-00
	Performances at Shezi house	R 1 000-00
Ibuya Zulu dancers	Performances to tourists at Memorial Gate	R 5 000-00
Mchunu Bed & Breakfast Establishment	Providing accommodation and catering for tourists	R 9 500-00
Shezi Cultural home	Interpretive tour of homestead	R 600 00
Vukuzame Curio market	Selling of traditional and contemporary crafts	R500 000-00
Vulamehlo Curio market	Selling of traditional and contemporary crafts	R406 860-00
TOTAL		R943 926 00-00

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.2: Trust Funds for Neighbour Programmes in 2000

Name of project	Description of project	Funds available
Biodiversity Education Centre	Biodiversity Centre adjacent to Centenary Centre	R 757 920-00
Children's Camp Trust	This amount to be added to Mambeni Education Centre	R 89 587-00
Community Tour Guide Development	Programme to develop Community Field Guides for Hluhluwe Imfolozi Park	R 22 398-00
Education Resources (Conservation Trust)	To provide resources to the Biodiversity Education Centre	R 49 748-00
Hluhluwe Nursery Project	Establish and support indigenous Plant Nursery at Hilltop camp	R 257 634-00
JSB Cultural Zulu Dance	Funding from former JSB to promote Cultural Dance competitions	R 665-00

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.3: Total Tonnage and Monetary Value for the period 1986 to 1999

	Total Tons	Total (at 2000 values)
Thatch	3,705	R 2,334,087.00
Reeds	1,965	R 2,750,300.00
Wood	7,808	R 2,639,104.00

(KwaZulu-Natal Wildlife Service Zululand Region Yearbooks 1987 – 2000)

Table 4.4: Social Threats

An economically exploitable coal deposit to the east of the park could have negative impacts on the park including an increase in sulphate content of water draining from exposed mines
An increase in rhino, elephant and subsistence poaching such that the integrity of the system is compromised or the area becomes unattractive for visitors
An unsustainable increase in the consumptive demands on the resources of the park
An increase in traffic on the Corridor road
Increase in illegal wildlife trade, poaching, illegal occupation and or use of park land
Inadequate support from large sectors of the public
Over-use of natural resources, especially traditional medicinal plants and resources used for making curios
Poverty leading to unsustainable natural resource use and social instability
Reliance in most households on income derived from migrant labour (ZAI, 1994)
Poverty, overcrowding and land degradation hindering development
Uncontrolled human population growth leading to environmental degradation
The intensification of human activity on the boundaries of the park could change the character of the park through electrification, aeroplane over flights, etc.
Unchecked development will impact on aesthetics and the natural environment
Violence, crime and socio-economic instability

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.5: Political Threats

A reduction of the state subsidy
Land claims by some Tribal Authorities resulting in the loss of land to the park or land being put to non conservation uses

(Hluhluwe Imfolozi Park Management Plan, 2000)



Table 4.6: Community Conservation Objectives

Build trust, co-operation, and partnerships with park neighbours and visitors
Define the value of nature conservation to society with all stake holders, within a framework of developing partnerships in communities neighbouring the park
Develop partnership projects based on nature conservation principles and ethics
Engage in Biodiversity Education processes which foster nature conservation value amongst protected area visitors, neighbours, schools, communities and other interest groups
Facilitate and promoting community development in order to promote sustainable living and an improved quality of life
Maintain Community Conservation services around the park by developing co-management structures at various levels with neighbouring and other stakeholder communities
Maximise and develop the capacity and skills of staff so that they can perform and contribute to the Community Conservation function
Maximise and enhance the visitor experience to the park through developing and sourcing interpretive and educational resources
Promote and support the sustainable use of natural resources within and around the park
Promote the integration of the park into the social, economic, cultural, political, and biophysical systems at landscape level

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.7: Principles and Policies relating to community relations

Hluhluwe Imfolozi Park/KwaZulu-Natal Wildlife Service Problem Animal Policy / Stock and crop losses policy
Hluhluwe Imfolozi Park User Rights Policy/principles in the Concept Development Plan (1999)
KwaZulu-Natal Wildlife Service Community Conservation Programmes - Towards the development of a new policy and strategy (Sandwith, T. (1999))
Policy on Community Conservation Programmes (1999)
Policy on Community Trust Policy (1999)
Policy on Concessions for Welfare groups (1999)
Policy on Disposal of venison from KwaZulu-Natal Wildlife Service Management Operations (1999)
Policy on Educational Concessions (1999)
Policy on Herbalists (1999)
Policy on Neighbour Relations (1999)
Policy on Neighbours access to Board-Protected Areas (1999)
Policy on Promoting use of SMME sector (and formerly disadvantaged communities) (1999)
Policy on Relationship with Local Boards (1999)
Protocol to set up Community Conservation Areas (1997)
(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.8: Community Conservation Evaluation Methods

Local Board meetings
Monthly report-backs
Quarterly community conservation meetings
Three monthly neighbour stakeholder meetings
Tourism Operator Liaison meetings
(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.9: Ecotourism Objectives

Build trust, co operation, and partnerships between Ezemvelo KZN Wildlife and its' neighbours and visitors
Develop co-management structures at various levels with neighbouring and other stake holder communities
Develop partnership projects based on nature conservation principles and ethics
Engage in biodiversity education processes which foster nature conservation values amongst visitors, neighbours, schools, communities and other interest groups
Facilitate and promote community development in order to promote sustainable living and an improved quality of life
Maximise and enhance the visitor experience to the park through developing and sourcing interpretive and educational resources
Promote and support the sustainable use of natural resources within and around the park
Promote ecotourism within the park
Promote the integration of the park into the social, economic, cultural, political, and biophysical systems at landscape level
Provide facilities that promote responsible tourism and an ethic of sustainable living which benefits the local and regional economy and contributes to the efforts of conservation

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.10: Ecotourism Related Opportunities

Accommodation in the form of Bed and Breakfasts
Curio markets and shops in the park that are leased out to local business people and
Gardens providing vegetables to both the tourist and local market
Small service centres at Machibini and Hlabisa
The park contributes more than R12 000 000.00 to the local economy in wages alone
The park is a significant employer in the region with a total of 170 posts associated directly with the provision of tourism

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.11: Composition of the Hluhluwe Imfolozi Park Local Board

A representative from each of the 10 Tribal Authorities neighbouring the park
Agriculture (Farmers Associations)
Business stakeholders
KwaZulu-Natal Wildlife Service Observers: Community Conservation Co-coordinator, Conservator Hluhluwe, Conservator Imfolozi, Regional Ecologist Northern Zululand, Camp Managers and Community Conservationists.
Other Observers: By prior arrangement with the Local Board
Transitional Local Council (Nyala)
Transitional Local Council (Ulundi)
uThungulu 3 Member standing committee on Tourism
Wildlife and Environmental Society of South Africa
Wilderness Leadership School
Wildlife Service Ex officio member: Chief Conservator Zululand Reserves
ZEAL

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.12: Composition of the iNkosi Liaison Forum

The Chief (iNkosi)
Headmen (iziNduna)
Ward Councillors
Regional councillors
uThungulu Standing Committee on Tourism
Ward Development Committee Members
Senior park management staff
Community Conservationists and Control Field Rangers

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.13: Terms of Reference of the iNkosi Liaison Forum

Community and park issues
Development issues
Management issues
The Community Conservation Programme
Tourism issues

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.14: Composition of the iNduna Liaison Forum

The ward iNduna
The ward councillors
Stake-holders in the community
Community conservationists
The relevant section ranger
A control field ranger
A relevant principle field ranger

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.15: Terms of Reference of the iNduna Liaison Forum

Community conservation report- back
Conflict resolution
To arrange Open and field days in the park for representatives of the community
To discuss issues of mutual concern which include community based tourism initiatives
To discuss issues relating to employment opportunities
To discuss issues relating to law enforcement
To discuss issues relating to problem animals and resource harvesting.
To facilitate the establishment and management of Community Conservation Areas
To provide information to the community

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.16: Composition of Stake-holder Interest Groups Forum

Craft market committees
iziNyanga's Associations
The Nyala TLC
Organic gardening committees
Publicity and tourism associations
School committees
Traditional dance groups
The uThungulu Regional Council (Development and Tourism)
Senior park management staff
Community conservation staff
Section rangers
Community conservation staff

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.17: Partnership Projects Objectives

Attract or access partners for funding
Define and develop stake-holder equity
Define and develop Ezemvelo KZN Wildlife's role and equity
Develop a business and management plan
Develop a sustainable process in which partnership projects can take place
Develop a tendering process
Facilitate access to capacity building
Facilitate planning, training, implementation and evaluation
Identify and evaluate opportunities in collaboration with all stake-holders for joint eco-tourism partnerships that are not directly consumptive of natural resources
Identify opportunities for partnership projects
Promote an economic multiplying effect through outsourcing

(KwaZulu-Natal Wildlife Service Zululand Region Yearbook 1999/2000)

Table 4.18: Internal Biodiversity Education Programme Objectives

Develop and maintain partnerships and forums with educational institutions and resource-user stakeholders
Develop the concept of clusters of 6 school groups in each iNkosi ward and establish a core committee to represent all clusters and to liaise with Ezemvelo KZN Wildlife
Engage in biodiversity education programmes with schools, community stake-holders, interest groups and staff of the park
Include evaluation and reflection as an integral aspect of the process
Introduce biodiversity education support courses such as WESSA, Goldfields and UNISA courses
Introduce educational resources such as Sharenet, Umgeni Water Enviroteach and Service Environmental Officers
Introduce networking resources such as Environmental Educators Association of South Africa, PINSSA and the National Youth Symposium
Orientate stake-holders to the resources and activities that the park has to share to support Outcomes Based Education such as the rhino bomas, logistical resources and educational resources
Plan a yearly Outcomes Based Education programme to support environment as a phase organizer in Outcomes Based Education in the school curriculum and in support of sustainable resource use with cluster groups and resource users
Undertake teacher and resource user workshops with each cluster group or stakeholder to establish issues and problems

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 4.19: External Biodiversity Conservation Awareness Objectives

Assist with the development of appropriate decision-making and management practices
Assist with the preparation of management and rehabilitation plans by providing appropriate formats and reviewing plans
Contribute towards the evaluation of sustainable use of biodiversity outside protected areas
Establish guidelines for the sustainable use of biodiversity outside of the park
Promote co-operative management through community conservation areas, community participation reserves, management forums, natural heritage sites and sites of conservation significance
Promote the use of Integrated Environmental Management including Environmental Impact Assessments and environmental auditing
Provide advice for the implementation of nature conservation management

(Hluhluwe Imfolozi Park Management Plan, 2000)



**Organisational Aspects**

Table 5.1: Organisational Objectives

To acquire and efficiently manage the manpower, financial, mechanical and infrastructure resources needed for the reserve
To meet the administrative and technical standards as set out in the Staff Manual, Technical Manual, Law Book, Management Plan and Service Orders

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 5.2: Organisational Threats

A severe reduction in the state subsidy
Extreme environmental activism resulting in forced policy changes not beneficial to biodiversity conservation
Imposed appointment of unskilled and unqualified staff
Industrial action by staff resulting in instability and the inability to perform their functions
The loss of corporate identity, integrity, commitment, competence
The loss of motivated, experienced, skilled and qualified staff
The possibility of imposed policy changes which conflict with Ezemvelo KZN Wildlife's mission

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 5.3: Management Meetings held on Hluhluwe Imfolozi Park

Bi-annual Reserve Management Meetings.
Bi-monthly Community Conservation Meetings.
Monthly Section Management Meetings.
Quarterly Black Rhino Management Meetings.
Quarterly Camp Management Meetings.
Quarterly Rhino Security Group Meetings.
Quarterly Senior Officers Meetings.

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 5.4: Staff Meetings held on Hluhluwe Imfolozi Park

Annual Staff Management Meeting with Chief Executive Officer
Bi-annual Staff Management Meetings with Chief Conservator Zululand (Reserves)
Bi-monthly shop stewards with Conservators
Monthly Section Management Meetings (participatory management

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 5.5: Personnel Management Issues

Continue a comprehensive and orderly transformation of Ezemvelo KZN Wildlife with a view to making it fully representative in terms of race and gender
Continuously review the efficacy of existing systems of staff training and development
Ensure that the staff are empowered to carry out their functions
Have a highly motivated, well trained and efficient staff compliment
Introduce new methods that will improve opportunities for skills enhancement and promotion of staff
Recognise and acknowledge excellence on the part of the staff
Staff training and capacity building requirements are assessed on an annual basis
Strict adherence to Station standing orders and domestic regulations.

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 5.6: Administration Objectives

To run the administrative operation as accurately and efficiently as possible
To provide an administrative service to relevant staff informing them of updates and changes to budgets, staff records and procedures and providing assistance wherever possible

(Hluhluwe Imfolozi Park Management Plan, 2000)

Table 5.7: Financial Management

All budgets are strictly adhered to
All payments are made from Finance Division on receipt of completed Goods Received Advice
Approved systems are used in all areas of work and are open for audit checks
Maintenance of all records in auditable order and as per the organisation's Staff Manual
Only expenditure authorised by the Expenditure Review Committee permitted
Orders only done with official order unless paid from imprest or a Business Card
Reconciliation with the Financial Service reports and station commitment ledgers is strictly enforced
Staff members who are involved with funds are personally responsible for all monies and financial implications of contracts they enter into on behalf of Ezemvelo KZN Wildlife
The monitoring of the financial system is carried out through Head Office financial reports and reconciliations.
The submission of monthly financial returns i.e. Imprest, revenue, overtime etc
Transfer vouchers and budget adjustments are emphasised as essential to maintain an accurate budget and reflection of expenses
Transfer Vouchers are completed when services or purchases are provided from one Organisational Unit to another or between votes on the same Organisational Unit.

(Hluhluwe Imfolozi Park Management Plan, 2000)

## REFERENCES

- Adger, W.N., Kelly, P.M., 1999: Social vulnerability and the architecture of entitlements, *Mitigation and Adaptation Strategies for Global Change* 4 (1999) 253-266.
- Adger, W.N., 2003. Social capital, collective action and adaptation to climate change. *Economic Geography* 79, 387-404.
- Adger, W.N., Huq, S., Brown, K., Conway, D., Hulme, M., 2003. Adaptation to climate variability in the developing world. *Progress in Development Studies* 3 (3), 179–195.
- Adger, W.N., Vincent, K., 2005. Uncertainty in adaptive capacity. *Compus Rendus Geoscience* 337, 399–410.
- African Development Bank, and others, 2003. Poverty and Climate Change, Reducing the Vulnerability of the Poor through Adaptation. Presented at the Eighth Conference of the Parties to the United Nations Framework Convention on Climate Change in New Delhi, 2002.
- Allen, G., Brennan, F., (2004). Tourism in the New South Africa: Social Responsibility and the Tourist Experience. I.B. Tauris, London.
- Armitage, D., 2005. Adaptive capacity and community-based natural resource management. *Environmental Management* 35, 703-715.
- Arrow, K., Bobin, B., Constanza, R., *et al.*, 1995. Economic growth carrying capacity and the environment. *Science*, 268: 520–1.
- Ashley, C., Roe, D., 2002. Making tourism work for the poor: strategies and challenges in southern Africa. *Development Southern Africa* 19 61-82.

Aysan, Y., 1993. Keynote paper: vulnerability assessment. In: Merriman, P., Browitt, C. (Eds.), *Natural Disasters: Protecting Vulnerability Communities*. Telford, London.

Bellwood, D.R., Hughes, T.P., Folke, C., Nystrom, M., 2004. Confronting the coral reef crisis. *Nature* 429, 827-833.

Berkes, F., Colding, J., Folke, C. (Eds.), 2003. *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press, Cambridge, UK.

Berkes, F., Folke, C., 1998. *Linking Social and Ecological Systems*. Cambridge University Press, London.

Biggs, R., Scholes, R.J., 2002. Land-cover changes in South Africa 1911-1993. *South African Journal of Science*. Vol. 98, no. 9-10, p. 420. Sep-Oct 2002.

Binns, T., Nel, E., 1998. Beyond the development impasse: local economic development and community self reliance in South Africa. *Journal of Modern African Studies*, 37 389-408.

Binns, T., Nel, E., 2002. Tourism as a local development strategy in South Africa. *The Geographical Journal*, Vol. 168, No. 3, September 2002, pp. 235-247.

Blaikie, P.M., Cannon, T., Davies, I., Wisner, B., 1994. *At Risk: Natural Hazards, Peoples Vulnerability and Disasters*. Routledge, London.

Bohle, H., 2001. Vulnerability and criticality: Perspectives from social geography. *IHDP Update* 2 1, 3-5.

Bohle, H., Downing, T.E., Watts, M., 1994. Climate change and social vulnerability: the sociology and geography of food security. *Global Environmental Change* 4 (1), 37-48.

- Bond, W. J., Archibald, S., 2003. Confronting complexity: fire policy choices in South African savanna parks. *International Journal of Wildland Fire*, 12, 381-389.
- Bond, W.J., Smythe, A., Balfour, D.A., (2001). Acacia species turnover in space and time in an African savanna. *Journal of Biogeography* 28 (1), 117–128.
- Brooks, S., 2005. Images of “Wild Africa”: nature tourism and the (re)creation of Hluhluwe game reserve, 1930-1945. *Journal of Historical Geography* 31 (2005) 220-240
- Cannon, T., 2000. Vulnerability analysis and disasters. In: Parker, D., (Eds.), *Floods*, vol. 1. Routledge, London, pp. 45–55.
- Carney, D., (Eds.), 1998. Sustainable rural livelihoods: What contributions can we make. Papers presented at DFID’s Natural Resources Advisers’ Conference, July 1998. London. Department for International Development (DFID).
- Carpenter, S.R., Gunderson, L.H., 2001. Coping with collapse: Ecological and social dynamics in ecosystem management. *BioScience* 51, 451-457.
- Carpenter, S.R., Walker, B., Anderies, J.M., Abel, N., 2001. From metaphor to measurement: Resilience of what to what? *Ecosystems* 4, 765–781.
- Chambers, R. (Ed.), 1989. Editorial Introduction: vulnerability, coping and policy, *IDS Bulletin* 21, 1–7.
- Chambers, R., Conway, G., 1992. Sustainable Rural Livelihoods: Practical Concepts for the 21st Century. *IDS Discussion Paper* 296, Brighton. IDS.
- Cutter, S.L., 2001: A Research Agenda for Vulnerability Science and Environmental Hazards. *Update*. Number 2 (2001).

Dann, G.M.S., 2002. Tourism and development in Desai V and Potter R B eds. *The companion to development studies*. Arnold, London 236-40.

Danter, K.J., Greist, D.L., Mullins, G.W., Norland, E., 2000. Organisational change as a component of ecosystem management. *Society and Natural Resource* 13, 537-547.

Dasmann, R.F., 1984. The relationships between protected areas and indigenous people. In McNeely, JA & Miller, KR (Eds), *National parks, conservation, and development: the role of protected areas in sustaining society*. Washington, DC: Smithsonian Institution Press.

Davies, K.J., 1997. A review of the Natal Parks Boards Neighbour Relations Policy and its implementation at Spioenkop Nature Reserve. MSc thesis. London: University of London.

Department of Environmental Affairs and Tourism (DEAT), 2000. Transforming the South African tourism industry. Unpublished paper. Pretoria: DEAT.

Department of Environmental Affairs and Development Planning Western Cape, 2005. A Status Quo, Vulnerability and Adaptation Assessment of the Physical and Socio-economic effects of Climate Change in the Western Cape.

Devereux, S., Edwards, J., 2004. Climate change and food security. *Climate Change and Development. IDS Bulletin* 35 (3), 22–30.

DFID, 1999. Sustainable Livelihoods Guidance Sheets, London, [www.livelihoods.org](http://www.livelihoods.org)

Dietz, T., Ostrom, E., Stem, P.C., 2003. The struggle to govern the commons. *Science* 302 (2003), 1907-1912.

Downing, T.E., Patwardhan, A., 2003. Vulnerability Assessment for Climatic Adaptation. APF Technical Paper 3, United Nations Development Programme, New York City, NY.

Elliott, W., Steele, N., 1994. Community management of natural resources in wildland areas: the KwaZulu experience. In Hendee, JC & Martin, VG (Eds), *International wilderness allocation and research*. Los Angeles: International Wilderness Leadership Foundation.

Engelbrecht, F., 2005. Simulations of Climate and Climate Change over Southern Africa and Tropical Africa with the Conformal-Cubic Atmospheric Model. In: Schulze, R., (Ed), *Climate Change and Water Resources in Southern Africa*.

Foggin, T., Muenster, D.O., 2000. Enhancing Linkages Between Rural Communities and Protected Areas in KwaZulu-Natal Through Tourism - Abantu Bayasizana (People helping people). *Journal of Tourism Studies*, Volume 11, no. 1.

Folke, C., Carpenter, S., Walker, B., Scheffer, M., Elmqvist, T., Gunderson, L., Holling, C.S., 2004. Regime Shifts, Resilience, and Biodiversity in Ecosystem Management. *Annual Review of Ecology, Evolution, and Systematics*, Volume 35 (2004), 557-581.

Fussler, H.-M., Klein, R.J.T., 2005. Climate change vulnerability assessments: an evolution of conceptual thinking, *Climatic Change*, pp. 1–29, in press.

Galaz, V., 2005. Social-ecological resilience and social conflict: institutions and strategic adaptation in Swedish water management. *Ambio* 34, 567-572.

Gallopin, G.C., Funtowicz, S., O'Connor, M., Ravetz, J., 2001. Science for the 21st century: from social contract to the scientific core. *International Social Science Journal* 168, 219–229.

Gallopin, G.C., 2006. Linkages between vulnerability, resilience and adaptive capacity. *Global Environmental Change* 16 (2006) 293-303.



- Girof, P., 2002. Scaling up: resilience to hazards and the importance of cross-scale linkages. Paper presented at the UNDP Expert Group Meeting on Integrating Disaster Reduction and Adaptation to Climate Change, Havana, Cuba, 17–19 June 2002.
- Gordon, J., Vincent, D., Haberkorn, G., MacGregor, C., Stafford-Smith, M., Breckwoldt, R., 2001. Indicators within a decision framework: social, economic and institutional indicators for sustainable management of the rangelands. *National Land and Water Resources Audit*, Canberra.
- Goudie, C.S., Khan, F., Kilian, D., 1999. Transforming tourism: black empowerment, heritage and identity beyond apartheid. *South African Geographical Journal* 81 21-33.
- Grumbine, R.E., 1994. What is ecosystem management? *Conservation Biology* 8, 27-38.
- Gunderson, L.H., Holling, C.S., (Eds.), 2002: Panarchy: Understanding Transformations in Human and Natural Systems. Island Press, Washington DC.
- Hannah, L., Midgley, G.F., Lovejoy, T., Bond, W.I., Bush, M., Lovett, J.C., Scott, D., Woodward, F.I., 2002. Conservation of biodiversity in a changing climate. *Conservation Biology*. Number 16 (2002) 264 - 268.
- Hansen, L.J., Biringer, J.L., Hoffman, J.R., 2003: Buying Time: A User's Manual for Building Resistance and Resilience to Climate Change in Natural Systems. WWF Document.
- Hewitson, B., Tadross, M., Jack, C., 2005. Climate Change Senarios: Conceptual Foundations, Large Scale Forcing, Uncertainty and the Climate Context. In: Schulze, R., (Ed), *Climate Change and Water Resources in Southern Africa*.
- Higgins, S.I., Bond, W.J., Trollope, W.S.W., (2000). Fire, resprouting and variability: a recipe for grass-tree coexistence in savanna. *Journal of Ecology* 88 (2), 213–229.

Hilhorst, D., Bankoff, G., 2004. Introduction: Mapping Vulnerability. In: Bankoff, G., Frerks, G., Holhorst, T. (Eds.), *Vulnerability, Disasters, Development and People*. Earthscan, London, pp. 1–24.

Hill, T., Nel, E., Trotter, D., 2006. Small-scale, nature-based tourism as a pro-poor development intervention: Two examples in Kwazulu-Natal, South Africa. *Singapore Journal of Tropical Geography* 27 (2006) 163-175.

Holling, C.S., 1973. Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics* 4, 1-23.

Huq, S., Reid, H., 2004. Mainstreaming adaptation in development. *IDS Bulletin* 35 (3), 15–21.

IPCC, 1995. Impacts, Adaptations and Mitigation of Climate variability. Scientific Teaching Analysis. Contribution of Working Group II to the Second Assessment Report of the Intergovernmental Panel of Climate variability.

IPCC, 2001. Climate Change 2001: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. IPCC/WMO/UNEP.

IPCC, 2001. Climate variability 2001. In: McCarthy, J.J., Canziani, O.F., Leary, N.A., Dokken, D.J., White, K.S., (Eds.), *Impacts, Adaptation, and Vulnerability*. Cambridge Press, Cambridge.

IPCC, (2005): The Economic, Developmental and Livelihood Implications of Climate Induced Depletion of Ecosystems and Biodiversity in Africa. IPCC Working Group II, Fourth Assessment Report. [Dr. Anthony Nyong], Cambridge University Press.

IPCC, 2007. Climate Change 2007: The Physical Science Basis. Summary for Policymakers (SPM). Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC/WMO/UNEP.

Institute of Development Studies, (IDS), 2004. *Climate Change and Development*, vol. 35(3). IDS and WWF.

IUCN-The World Conservation Union, International Institute for Sustainable Development (IISD), Stockholm Environmental Institute – Boston Centre (SEI-B) and the Swiss Organisation for Development and Cooperation (Intercooperation), 2004. Sustainable Livelihoods and Climate Change Adaptation. A Review of Phase One activities for the Project on “Climate Change, Vulnerable Communities and Adaptation”.

James, B.M., 1995: Umfolozi Wilderness Trails, Information and Operations Manual. Natal Parks Board, Pietermaritzburg.

Janssen, M.A., Ostrom, E., 2006: Resilience, vulnerability, and adaptation: A cross-cutting theme of the International Human Dimensions Programme on Global Environmental Change. *Global Environmental Change* 16 (2006) 237-239.

Joubert, A., Mason, S., 1997. Simulated changes in extreme rainfall over southern Africa. *Journal of Climatology* 17, 291–301.

Kamuaro, O., 1996. Ecotourism: Suicide or development? Voices from Africa. *Sustainable development*, issue No. 6 UN Non-governmental Liaison Service, Geneva.

Kasperson, J.X., Kasperson, R.E., Turner, II, B.L., Hsieh, W. and Schiller, A. 2002: Vulnerability to global environmental change. In *The Human Dimensions of Global Environmental Change*, ed. Andreas Diekmann, Thomas Dietz, Carlo C. Jaeger, and Eugene A. Rosa. Cambridge, MA: MIT Press (forthcoming).

Kasperson, R.E., Kasperson, J.X., 2001a. Climate variability, Vulnerability and Social Justice. Stockholm Environment Institute, Stockholm.

Kasperson, R.E., Kasperson, J.X., 2001b. International Workshop on Vulnerability and Global Environmental Change: A Workshop Summary. Stockholm Environment Institute, Report 2001–2001, Stockholm.

Kelly, P.M., Adger, W.N., 1999. Assessing Vulnerability to Climate variability and Facilitating Adaptation. Working Paper GEC 99-07, Centre for Social and Economic Research on the Global Environment, University of East Anglia, Norwich.

Kelly, P.M., Adger, W.N., 2000: Theory and practice in assessing vulnerability to climate change and facilitating adaptation, *Climate Change* 47 (2000) 325-352.

Kibirige, R., 2003. The socio-economic impacts of tourism on poor rural communities: the Mpembeni community, Hluhluwe-Umfolozi Park, Kwazulu-Natal, South Africa. *Africa Insight* Vol.33(1/2): 23-28

Kinzig, A., Starrett, D., Arrow, K., Bolin, B., Dasgupta, P., Ehrlich, P.R., Folke, C., Hanemann, M., Heal, G., Hoel, M., Jansson, A.-M., Jansson, B.-O., Kautsky, N., Levin, S.A., Lubchenco, J., Maler, K.-G., Pacala, S., Schneider, S., Siniscalco, D., Walker, B.H., 2003. Coping with uncertainty: a call for a new science-policy forum. *Ambio* 32, 330-335.

Kirsten, M., Rogerson, C.M., 2002. Tourism, business linkages and small business enterprise development in South Africa. *Development Southern Africa* 19 29-60.

Kiss, A., 1990. Living with wildlife: wildlife resource management with local participation in Africa. World Bank Technical Paper No 130. Washington, DC: World Bank.

Krüger, S, 1998. The Vulamehlo Handcraft Project. Unpublished report.  
Pietermaritzburg: KwaZulu-Natal Nature Conservation Service.

Krüger, S., Verster, R., 2001. An appraisal of the Vulamehlo Handcraft Project.  
*Development Southern Africa* Vol 18, No 2, June 2001.

KwaZulu-Natal Nature Conservation Service, 1998: East Division Yearbook 1997 –  
1998. KwaZulu-Natal Nature Conservation Service, Pietermaritzburg.

KwaZulu-Natal Nature Conservation Service, 1999: Zululand Region Yearbook 1998 –  
1999. KwaZulu-Natal Nature Conservation Service, Pietermaritzburg.

KwaZulu-Natal Nature Conservation Service, 2000: Zululand Region Yearbook 1999 –  
2000. KwaZulu-Natal Nature Conservation Service, Pietermaritzburg.

KwaZulu-Natal Wildlife Service, 2000: Hluhluwe Imfolozi Park Management Plan.  
KwaZulu-Natal Wildlife Service, Pietermaritzburg.

Lambin, E. F., 2005. Conditions for sustainability of human-environment systems:  
Information, motivation, and capacity. *Global Environmental Change*. Part A. Volume  
15, Issue 3, October 2005, Pages 177 – 180.

Langeweg, F., & Gutierrez-Espeleta, E.F., 2001: Human Security and Vulnerability in a  
Scenario Context: Challenges for UNEP's Global Environmental Outlook, *Update*.  
Number 2 (2001).

Lee, K.N., 1993. Compass and Gyroscope: Integrating Science and Politics for the  
Environment. Island Press, Washington, DC.

Leichenko, R., O'Brien, K., 2002. The dynamics of rural vulnerability to global change:  
the case of southern Africa. *Mitigation and Adaptation Strategies for Global Change* 7,  
1–18.

Luers, A.L., 2005. The surface of vulnerability: An analytical framework for examining environmental change. *Global Environmental Change*. Part A. Volume 15, Issue 3, October 2005, Pages 214 – 223.

Mahony, K., van Zyl, J., 2002. The impacts of tourism development on rural communities: three case studies in South Africa. *Development Southern Africa* 19 83-104.

Mano, R., Isaacson, B., Dardel, P., 2003. Identifying policy determinants of food security response and recovery in the SADC Region: The case of the 2002 food emergency. FANRPAN Policy Paper, Keynote paper prepared for the FANRPAN Regional Dialogue on Agricultural Recovery, Food Security and Trade Policies in Southern Africa, Gaborone, Botswana, 26–27 March 2003.

Mathieu, P., & Trottier, J., 2001: Water Scarcity, Vulnerability, Livelihoods and Security: the Role of Institutions, *Update*. Number 2 (2001).

Midgley, G.F., Hannah, L., Millar, D., Thuiller, W., Booth, A., 2003. Developing regional and species-level assessments of climate change impacts on biodiversity in the Cape Floristic Region. *Biological Conservation*.

Natal Parks Board, 1985: Hluhluwe and Imfolozi Game Reserves Combined Management Plan. Natal Parks, Game and Fish Preservation Board, Pietermaritzburg.

Natal Parks Board, 1986: Notes from a Training course on early man, Zulu history and the Wilderness. Natal Parks, Game and Fish Preservation Board, Pietermaritzburg.

Natal Parks Board, 1988: Conservation Division Yearbook 1987 – 1988. Natal Parks Board, Pietermaritzburg.

Natal Parks Board, 1989: East Division Yearbook 1988 – 1989. Natal Parks Board, Pietermaritzburg.

Natal Parks Board, 1990: East Division Yearbook 1989 – 1990. Natal Parks Board, Pietermaritzburg.

Natal Parks Board, 1991: East Division Yearbook 1990 – 1991. Natal Parks Board, Pietermaritzburg.

Natal Parks Board, 1992: East Division Yearbook 1991 – 1992. Natal Parks Board, Pietermaritzburg.

Natal Parks Board, 1993: East Division Yearbook 1992 – 1993. Natal Parks Board, Pietermaritzburg.

Natal Parks Board, 1994: East Division Yearbook 1993 – 1994. Natal Parks Board, Pietermaritzburg.

Natal Parks Board, 1995: East Division Yearbook 1994 – 1995. Natal Parks Board, Pietermaritzburg.

Natal Parks Board, 1996: East Division Yearbook 1995 – 1996. Natal Parks Board, Pietermaritzburg.

Natal Parks Board, 1997: East Division Yearbook 1996 – 1997. Natal Parks Board, Pietermaritzburg.

Ndlovu, N., Rogerson, C.M., (2004). The local economic impacts of rural community-based tourism in the Eastern Cape. In Rogerson, C.M., Visser, G., (eds) *Tourism and Development Issues in Contemporary South Africa*, 436–51. Africa Institute, Pretoria.

Nel, E.I., 1999. Regional and local economic development in South Africa: the experience of the Eastern Cape. Ashgate, Aldershot.

- Nel, E., Binns, T., 2001. Initiating “developmental local government” in South Africa: evolving local economic development policy. *Regional Studies* 35 355-62.
- O'Brien, K., 2001: The Dynamics of Vulnerability to Global Change, *Update*. Number 2 (2001).
- O'Brien, K., Leichenko, R., 2000. “Double exposure”: assessing the impacts of climate change within the context of economic globalisation. *Global Environmental Change* 10, 221–232.
- O'Brien, K., Vogel, C. (Eds.), 2003. *Coping with Climate Variability: the Use of Seasonal Climate Forecasts in Southern Africa*, Ashgate Press, Aldershot.
- Pelling, M., High, C., 2005. Understanding adaptation: What can social capital offer assessments of adaptive capacity? *Global Environmental Change* 15, 308–319.
- Office of the MEC for Agriculture and Environmental Affairs, KwaZulu-Natal, 2002. Speech delivered by the KwaZulu-Natal MEC of Agriculture and Environmental Affairs, Mr. Narend Singh, at a dinner to officially launch Ezemvelo KZN Wildlife. <http://www.info.gov.za/speeches/2002/0203111046a1001.htm>
- Ogutu, J.O., Owen-Smith, N., 2003. ENSO, Rainfall and Temperature Influences on Extreme Population Declines among African Savanna Ungulates. *Ecology Letters*. Volume 6. Issue 5 (2003) 412.
- Ostrom, E., 2005. *Understanding Institutional Diversity*. Princeton University Press, Princeton, USA.
- Ostrom, E., Ahn, T.K., 2003. *Foundations of Social Capital*. Edward Elgar, Cheltenham, UK.



Owen-Smith, N., Mason, D.R., Ogutu, J.O., 2005: Correlates of Survival Rates for 10 African Ungulate Populations: Density, Rainfall and Predation. *Journal of Animal Ecology* (2005) 74, 774–788.

Peterson, G.D., Carpenter, S.R., Brock, W.A., 2003. Uncertainty and management of multi-state ecosystems: an apparently rational route to collapse. *Ecology* 84, 1403-1411.

Polsky, C., Schroter, D., Patt, A., Gaffin, S., Martello, M.L., Neff, R., Pulispher, A., Selin, H., 2003. Assessing Vulnerabilities to the Effect of Global Change: An Eight-Step Approach. Belfer Centre for Science & International Affairs, Harvard University.

Pielke Jr., R.A., 1998. Rethinking the role of adaptation in climate policy. *Global Environmental Change* 8, 159–170.

Pretty, J., 2003. Social capital and the collective management of resources. *Science* 302, 1912-1914

Pro-Poor Tourism 2002. How is PPT different from other forms of “alternative” tourism? ([http://www.propoortourism.org.uk/ppt vs alternative.html](http://www.propoortourism.org.uk/ppt%20vs%20alternative.html)) Accessed 30 June 2002.

Reid, P., Massey, R., Vogel, C., 2005. Climate and development: experiences of farmers in KwaZulu-Natal, South Africa. In: Schulze, R., (Ed), *Climate Change and Water Resources in Southern Africa*

Reid, P., and Vogel, C., 2006: Living and responding to multiple stressors in South Africa - Glimpses from KwaZulu-Natal. *Global Environmental Change* in press.

Resources in Southern Africa: Studies on Scenarios, Impacts, Vulnerabilities and adaptation, Water Research Commission, Pretoria, RSA, WRC, Report 1430/0/05, Chapter 25, pp. 395–414, [www.wrc.org.za](http://www.wrc.org.za)

- Ribot, J.C., 1995: The Causal Structure of Vulnerability: It's Application to Climate Impact Analysis., *Geojournal* 35.2 Kluwer Academic Publishers, 119-122.
- Roe, D., Urquhart, P., 2001. Pro-poor tourism: harnessing the world's largest industry for the world's poor. IIED (International Institute for Environment and Development), London.
- Rogerson, C.M., 1997. Local economic development and post-apartheid reconstruction in South Africa. *Singapore Journal of Tropical Geography* 18 175-95.
- Rogerson, C.M., 1999a. Place marketing for local economic development in South Africa. *The South African Geographical Journal* 81 32-43.
- Rogerson, C.M., 1999b. Local economic development and urban poverty alleviation: the experience of post-apartheid South Africa. *Habitat International* 23 511-34
- Rogerson, C.M., 2000. Local economic development in an era of globalisation: the case of South African cities. *Tijdschrift voor Economische en Sociale Geografie* 91 397-411.
- Rogerson, C.M., 2001. Tourism and uneven local economic development: Route tourism in South Africa. Paper presented at the International Conference of Tourism Development and Management in Developing Countries, Guilin, China, November 2001.
- RSA 1996a. The White Paper on tourism. Department of Environmental Affairs and Tourism, Republic of South Africa, Pretoria.
- RSA 1996b. The Constitution of the Republic of South Africa, Act No. 108 of 1996, Pretoria.
- RSA 1998. The White Paper on local government. Department of Constitutional Development, Pretoria.

RSA 2000. Draft local economic development policy. Department of Provincial and Local Government, Pretoria.

Rutherford, M.C., Midgley, G.F., Bond, W.J., Powrie, L.W., Roberts, R., Allsopp, J., 1999: South African Country Study on Climate Change. Plant Biodiversity: Vulnerability and Adaptation Assessment, University of Cape Town, Cape Town.

Sandwith, T., 1997. Community conservation programmes: towards the development of a new policy and strategic plan. Unpublished report. Pietermaritzburg: KwaZulu-Natal Nature Conservation Service.

Scheyvens, R., (2002). Tourism for Development: Empowering Communities. Prentice Hall, Harlow.

Scoones, I., 2000. Sustainable Rural Livelihoods. A Framework for Analysis, *IDS Working Paper 72*, IDS, Brighton.

Scoones, I., 2004. Climatic change and the challenge of non-equilibrium thinking. *IDS Bulletin 3*, 114–119.

Sharpley, R., 2002. Tourism management: rural tourism and the challenge of tourism diversification: the case of Cyprus. *Tourism Management 23* 233-44.

Smit, B., Burton, I., Klein, R.J.T., Wandel, J., 2000: An anatomy of adaptation to climate change and variability, *Clim. Change* 45 (2000) 223-251.

Smit, B., Wandel, J., 2006. Adaptation, adaptive capacity and vulnerability. *Global Environmental Change* 16 (3), 282-292.

South Africa, 1999. Programme of action 1999/2000. Pretoria: Department of Environmental Affairs and Tourism.

South Africa, 2000. Integrated Sustainable Rural Development Strategy. Pretoria: Deputy President's Office.

South African Reserve Bank (SARB), 2001. Quarterly Bulletin, No. 220. Pretoria: SARB.

Streek, B., 2000. Plans to increase blacks' stake in tourism. Weekly Mail and Guardian, 9 June.

Stern, N., 2006. Stern Review on the Economics of Climate Change.

Tourism Concern 2002. Briefing on ecotourism.

(<http://www.tourismconcern.org.uk/indepth%20ecotourism%20briefing.htm>) Accessed 1 July 2002.

Turner, S., (2001). Tourism, the environment and rural development. In Coetzee JK, Graaf J, Hendricks F *et al.*, (eds). *Development: Theory, Policy and Practice*. Oxford University Press, Cape Town.

UNEP, 1998. Handbook on Methods for Climate Impact Assessment and Adaptation Strategies. In: Feenstra, J., Burton, I., Smith, J., Tols, R., (Eds.), United Nations Environment Program, Institute for Environmental Studies, Amsterdam.

UNEP, 2001. Assessing Human Vulnerability to Environmental Change: Concepts, Issues, Methods and Case Studies. A report on work in progress, United Nations Environment Program, Nairobi.

UNDP, 2004. Reducing disaster risk, a challenge for development. Global Report, Bureau for crisis Prevention and Recovery, New York.

van der Leeuw, S.F., 2001: Vulnerability and the Integrated Study of Socio - Natural Phenomena. In *Update* number 2 of 2001.

van Jaarsveld, A.S., Chown, S.L., Erasmus, B.F.N., Kshatriya, M., Wessels, K.J., 1999: Vulnerability and Adaptation Assessment of South African Animal Taxa to Climate Change, University of Pretoria, Pretoria.

Watts, M.J., Bohle, H.G., 1993. The space of vulnerability: the causal structure of hunger and famine. *Progress in Human Geography* 17 (1), 43–67.

Walker, B.H., Emslie, R.H., Owen-Smith, R.N., Scholes, R.J., 1987: To Cull or Not to Cull: Lessons from a Southern African Drought. *Journal of Applied Ecology*, Volume 24, Number 2 (1987), 381-401.

Walker, B.H., Meyer, J.A., 2004. Thresholds in ecological and social-ecological systems: a developing database. *Ecology and Society* 9 (2), 3 [online] URL <http://www.ecologyandsociety.org/vol9/iss2/art3/>.

Warburton, M., Schulze, R., 2005. Detection of Climate Change: A review of Literature on Changes in Temperature, Precipitation and Streamflow, on Detection Methods and Data Problems. In: Schulze, R., (Ed), *Climate Change and Water Resources in Southern Africa*.

Watson, H.K., 1990. A Comparative Study of Soil Erosion in the Umfolozi Game Reserve and adjacent KwaZulu Area from 1937 to 1983. Unpublished Ph. D. Thesis, University of Durban-Westville

Watson, H.K., MacDonald, 1983. Vegetation changes in the Hluhluwe-Umfolozi Game Reserve Complex from 1937 to 1975. *Bothalia*. Vol. 14, no. 2, pp. 265-269.

Weaver, D.B., 1998. Ecotourism in the less developed world. CAB International, Wallingford.

Wells, M., 1996. The economic and social role of protected areas in the new South Africa. Johannesburg: Land and Agricultural Policy Centre; and London: Overseas Development Institute.

Wells, M., Brandon, K., 1992. People and parks: linking protected area management with local communities. International Bank for Reconstruction and development. (IBRD)/World Bank Report. Washington, DC: World Bank.

Williams, S., 1998. Tourism geography. Routledge, London.

Wilson, K., Pressey R.L., Newton A., Burgman, M., Possingham, H., Weston C., 2005: Measuring and Incorporating Vulnerability into Conservation Planning, In *Environmental Management* Volume 35 (2005), Number 5, Springer, New York, 527-543.

Wisner, B., 1993. Disaster vulnerability: scale, power and daily life. *GeoJournal* 30 (2), 127–140.

Wisner, B., 1995. Bridging expert and local knowledge for counter-disaster planning in urban South Africa. *GeoJournal* 37 (3), 335–348.

Wisner, B., 2004. Assessment of capability and vulnerability. In: Bankoff, G., Frerks, G., Holhorst, T. (Eds.), *Vulnerability, Disasters, Development and People. Earthscan*, London, pp. 183–194.

World Wildlife Fund (WWF), 1993. Sustainable use of natural resources: concepts, issues and criteria. Positional paper. Gland, Switzerland: WWF.

Zungu,V., 2003. From Fortress Conservation to Community Conservation: An Assessment of Environmental Partnership at Hluhluwe-Umfolozi Game Reserve. (Unpublished Masters thesis, University of Natal).