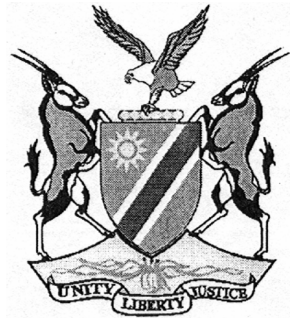


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Ministry of Environment and Tourism  
Republic of Namibia

## SPECIES MANAGEMENT PLAN

### **Southern Savanna Buffalo**

*Syncerus caffer caffer*

December 2002

SPECIES MANAGEMENT PLAN

**Southern Savanna Buffalo**

*Syncerus caffer caffer*

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## GLOSSARY AND DEFINITION OF TERMS

### Acronyms

DPW	- Directorate of Parks and Wildlife
DSS	- Directorate of Scientific Services
DWNP	- Department of Wildlife and National Parks, Botswana
MET	- Ministry of Environment and Tourism
NNF	- Namibia Nature Foundation
WWF LIFE	- World Wide Fund for Nature: Living In a Finite Environment programme

### Definition of Terms

“Caprivi” and “Caprivi Strip”: The word ‘Caprivi’ is used throughout the Plan to refer to the ‘peninsular’ of land extending eastwards from the north-eastern corner of Namibia as far as its junction point with Botswana, Zambia and Zimbabwe at the confluence of the Chobe and Zambezi Rivers. The phrase ‘Caprivi Strip’ is reserved for the narrow ‘isthmus’ connecting the broader part of the peninsular to the main body of Namibia.

The “Project”: A number of situations have occurred in the Plan, particularly in the development of budgets, where it has been necessary to refer to the expected process of implementation of the Plan. Although no formal project proposal has yet been developed for this purpose, the term “project’ is used to refer to the activities which would follow adoption of the Plan.

“Project Area”: The term ‘Project Area’ is that area which includes the buffalo population of northern Namibia and northern Botswana together with the relevant parts of south-eastern Angola, south-western Zambia and north-western Zimbabwe.

“Kasane Workshop”: A workshop was held in Kasane, Botswana on 30th November and 1st December 2002 in which representatives of the Namibian Ministry of Environment and Tourism and the Botswana Department of Wildlife and National Parks participated with the aim of collaboration on joint management issues affecting the buffalo population shared between the two countries. The background study to this Plan (**Species Report for Southern Savanna Buffalo**) was presented at the workshop.

## ACKNOWLEDGMENTS

This draft plan has benefitted from the inputs of all those persons who attended the Kasane Workshop including, in particular, Isaac Theophilus (Deputy Director), Jan Broekhuis (Assistant Director) and Mark Vandewalle (Research Biologist) of the DWNP in Botswana. People from Namibia who contributed their time and valuable experience towards preparation of the Plan include Ben Beytell (Director, DPW), Pauline Lindeque (Director, DSS), Chris Brown (Namibia Nature Foundation), Chris Weaver (WWF LIFE programme), Barbara Paterson (Transboundary Mammal Project of the Ministry of Environment and Tourism), Jonathan Barnes (Directorate of Environmental Affairs), Mike Griffin (DSS), Lu Scheepers (DSS) and a large number of others.

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## ***EXECUTIVE SUMMARY***

Namibia has a population of some 3,000 buffalo in the Caprivi which is contiguous with the larger northern Botswana population of about 90,000 buffalo. Although buffalo once existed in abundance north of the Caprivi in Angola and Zambia, the present state of these populations is parlous due to a high degree of illegal hunting. Two small populations of disease-free buffalo are held within the main body of the country: there are some 200 buffalo in the Waterberg Plateau Park and another 70 buffalo at Tsumkwe in the Nyae Nyae Conservancy in Bushmanland.

Although not threatened at present, the Namibian buffalo population is well below the level at which it should exist. There is a potential range of some 10,000km<sup>2</sup> available for buffalo in the Caprivi and this should carry at least 15,000 buffalo. Because of the high value of buffalo in the international safari hunting industry, the potential net income from wildlife in the Caprivi could be raised from its present level of US\$2.5 million to US\$7.5 million if the buffalo population was at carrying capacity. This would result in the maximum possible land use values in the Caprivi and the income would benefit the State and Conservancies. Even before the buffalo population reached its ceiling value, the revenue would be sufficient to meet the full budgetary requirements of the Directorate of Parks and Wildlife in the Caprivi.

To achieve the full potential for buffalo in the Caprivi, a number of limiting factors need to be addressed.

- The buffalo range needs to be secured: at present veterinary control fencing and *ad hoc* patterns of settlement are fragmenting the buffalo population and reducing the available range. Linkages with the Botswana buffalo population are crucial in this respect.
- Having secured the range, the habitats need to be improved. More than half of the entire grazing is destroyed by fire each year; parts of the range are inaccessible due to lack of surface water and competition with the large elephant population may be further limiting the buffalo.
- To achieve the growth rate of which the buffalo are capable, illegal hunting must be contained. This requires a level of field staff and operating budgets which must be above the minimum threshold. The buffalo population also needs to be protected against diseases borne by domestic livestock which may affect population health.

If all of the above issues are addressed successfully, the buffalo population should increase at a growth rate of at least 5% per annum and would achieve a level of 15,000 animals in slightly over 30 years. If population numbers are augmented by immigration from the large Botswana population, the time to reach carrying capacity would be reduced.

The management steps needed to achieve the objectives are integrated into a process-based planning structure in this document. Included in the structure is the full set of monitoring requirements for an adaptive management approach which will allow objectives, hypotheses and management activities to be modified in light of information gathered during implementation.

The most important of the management interventions required – particularly those involving veterinary controls and land use planning – require the Ministry of Environment and Tourism to enter into dialogue with other Ministries in Namibia and to collaborate with the corresponding authorities in neighbouring countries, especially in Botswana.

Conservancies in the Caprivi have a key rôle to play in the development of the buffalo population. To maintain the integrity of the buffalo range, vital corridors are needed through the Conservancies to link the main State Protected Areas and to give buffalo access to riverine habitats. Any investment by Conservancies in increasing buffalo numbers will pay handsome dividends: their present returns from wildlife management as a form of land use will be more than doubled if buffalo populations reach the numbers expected.

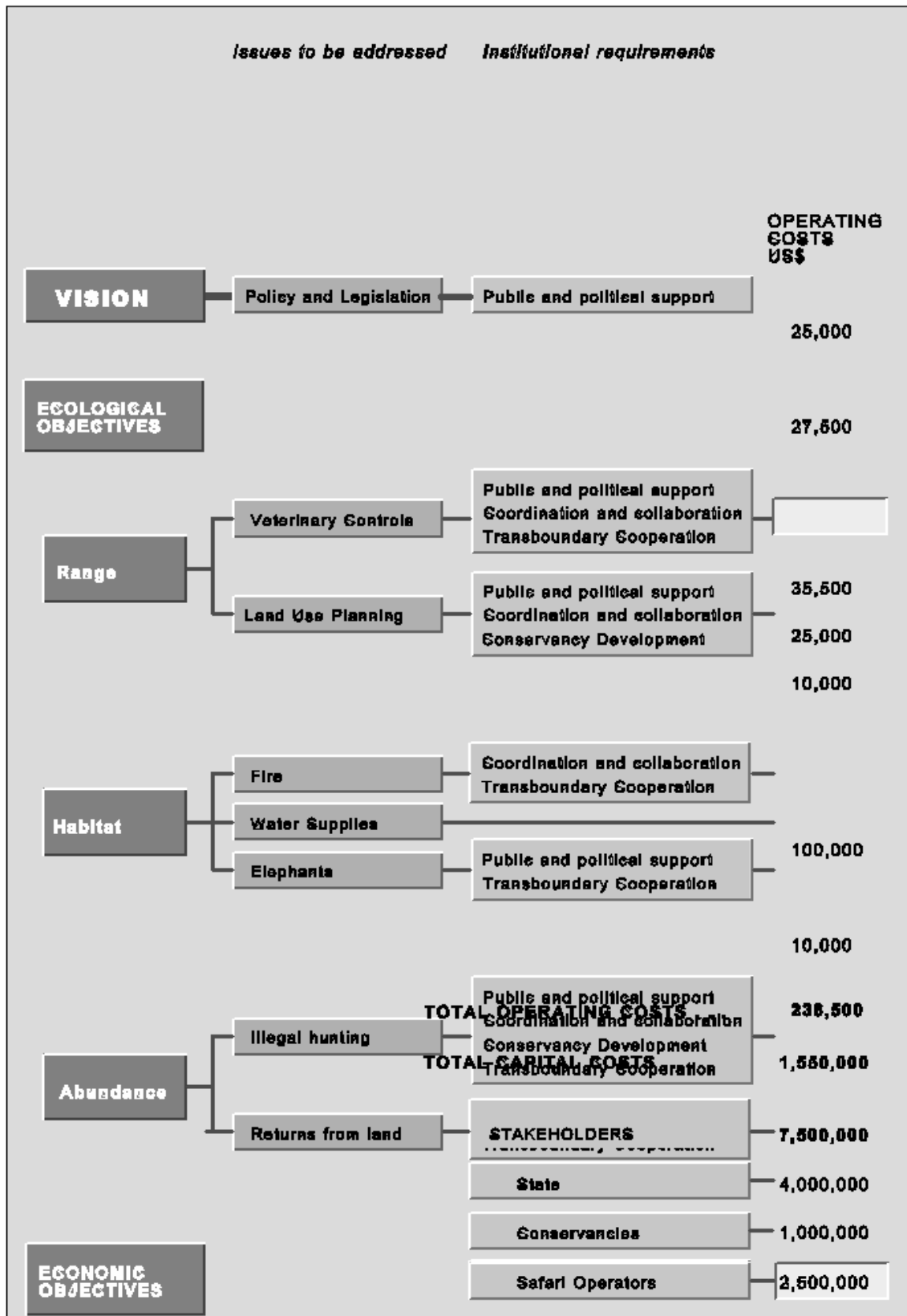
Whilst a few of the management measures demanded by this species management plan are designed exclusively to benefit buffalo (particularly those involving veterinary controls), the majority of the required actions will benefit all wildlife species in the Caprivi.

The capital and recurrent expenditure budgets required to achieve the objectives of the Plan are developed fully in ANNEX 2 and shown in the Plan Structure on the next page. Central in the assumptions surrounding the financial calculations are the present annual allocations from the Treasury to the Directorate of Parks and Wildlife. If these allocations enable the wildlife agency to perform effectively, the objectives are likely to be achieved. If, however, adequate funds are not available, there are alternatives. Within a few years of its inception, the buffalo ‘project’ ought to provide sufficient revenue to meet the entire running costs of Caprivi Parks.

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The future management of the two small disease-free buffalo populations in northern Namibia is addressed in separate self-contained plan in ANNEX 1 of this document. The Directorate of Park and Wildlife should initiate an aggressive management plan for these buffalo which includes a combination of –

- de-stocking the present areas where the buffalo are held because carrying capacity is being exceeded, and managing the populations for maximum production of offspring;
  - introducing buffalo to areas in northern Namibia where they formerly occurred, including State Protected Areas, Conservancies and, subject to veterinary control solutions being found, commercial farms in northern Namibia where wildlife management is becoming the main form of land use;
  - using the high value of the disease-free buffalo in the southern African regional markets to fund the management programme by selling animals as and when needed to meet requirements (each buffalo is worth some N\$200,000).
-



## ***INTRODUCTION & BACKGROUND***

This Species Management Plan should be read in conjunction with the **Species Report for Southern Savanna Buffalo** prepared under the **Transboundary Mammal Project** of the Ministry of Environment and Tourism in November 2002.

### **Conservation Status and Significance**

In Namibia, the only 'wild' population of Southern Savanna Buffalo, *Syncerus caffer caffer* (Sparrman 1779),<sup>1</sup> occurs in the Caprivi where its numbers are well below carrying capacity and it runs the risk of becoming fragmented into several isolated subpopulations through the combined effects of veterinary control fences and the unplanned spread of human settlement. Although the population cannot yet be regarded as threatened in any formal conservation sense, it is highly desirable that its numbers increase and it is not subdivided.

The primary importance of buffalo in land under wildlife management is their pivotal rôle in the international safari hunting industry. If buffalo numbers in the Caprivi could be increased to the levels at which they should naturally occur, this would more than double the present economic returns from land and benefit both conservancies and State Protected Areas.

To achieve this requires a coordinated effort within Namibia and with its neighbour, Botswana. Whilst there are several immediate management steps which are within the powers of the Directorate of Parks and Wildlife to implement, the larger factors which are determining the status of the buffalo population will only be addressed through dialogue with the veterinary departments in Namibia and Botswana and with land use planning authorities in the Caprivi. The maintenance of spatial links with the large Botswana buffalo population and the successful development of conservancies in the Caprivi are the key to avoiding population fragmentation and increasing buffalo numbers.

In the main body of the country, buffalo went extinct during the great rinderpest epidemic at the end of the nineteenth century and, although there was a limited recovery up until the middle of the twentieth century, veterinary control measures implemented in the latter half of the century resulted in a second wave of extinction. Today two small disease-free buffalo populations exist in northern Namibia, one north of the veterinary cordon fence in a paddock at Tsumkwe in the Nyae Nyae Conservancy and the other in the Waterberg Plateau Park south of the veterinary fence. Both of these populations are in urgent need of management interventions as they are approaching or have exceeded carrying capacity.

If these disease-free buffalo were re-introduced to commercial farms or conservancies in northern Namibia, they have the potential (when numbers are fully developed) to alter the present land use values on marginal farming land from present break-even levels to a healthy profitability.

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1. The common name "Southern Savanna Buffalo" is that used by the Antelope Specialist Group of the IUCN Species Survival Commission (ASG 1998).

## Populations

Namibia has three separate buffalo populations which cannot, in the true sense of the word, be regarded as a 'metapopulation'. They are maintained as distinct separate entities and, at present, there are no intentions to mix them.

**(1) Caprivi** ..... 1,000 - 3,000

The present accuracy of survey methods does not allow a more precise estimate than the above. The estimate refers to the resident population. Numbers may be increased temporarily when buffalo move into the Caprivi from neighbouring countries (mainly in the wet season).

**(2) The Waterberg** ..... ~ 200

This population was established by the introduction of 48 animals between 1981 and 1991. Most of the animals originated from the Addo National Park in South Africa.

**(3) Tsumkwe** ..... ~ 70

In 1996 thirty buffalo were penned in a quarantine camp in Bushmanland (within the Nyae Nyae conservancy) north of the main veterinary cordon fence. One animal was destroyed soon after penning because it was found to be carrying the Foot and Mouth disease virus.

Both the Waterberg and Tsumkwe buffalo are free of all diseases to which buffalo are known to be hosts including Foot and Mouth disease, Bovine Tuberculosis and Theileriosis.

## Limiting Factors and Threats

**Human interventions**, both direct and indirect, have the greatest influence on buffalo abundance in Namibia.

- (1) Veterinary Control Measures:** Both in Namibia and northern Botswana veterinary fences are the most important determinant of buffalo distribution and numbers. Large parts of the potential range are not available to buffalo and, within the allowed range in Caprivi, the population in the extreme west of the Caprivi Strip is becoming totally isolated as a result of the placement of fences. The present location of veterinary fences is shown in **Map 1** and the past, available and actual range of buffalo is shown in **Map 2**.
- (2) Land Use Planning:** Within the Caprivi, the *de facto* location of human communities and their cattle not only dictates the application of veterinary measures but also results in direct competition with buffalo for land and grazing resources. This is a competition which buffalo are unlikely to win. The present available range for buffalo is determined by patterns of human settlement, the amount of land cleared for agriculture and the grazing requirements of cattle. The effects are particularly severe in the vicinity of Mamili and Mudumu National Parks (see **Map 3**) where wedges of settlement are being driven into the areas separating the parks and, if continued, this will result in several isolated subpopulations of buffalo whose only contact will be through unsettled land in Botswana.



- (3) **Illegal hunting:** Buffalo are subject to a high level of illegal hunting in the Caprivi and the areas to the north of it (in Angola and Zambia this hunting may be unsustainable). The population can tolerate a harvest of about 5% (or 150 animals) per year – beyond this it will decline rapidly.

Illegal hunting may be less important than the first two factors. A matter of concern is the fact that the Directorate of Parks and Wildlife does not have sufficient manpower and financial allocations to carry out effective law enforcement.

- (4) **Fire** is responsible for destroying a large proportion of the food which should be available to buffalo in the Caprivi during the critical dry season period of every year. Burns commence as early as April each year in Caprivi and continue until December when over 60% of the vegetation has been burnt and the total count of individual fires may exceed 3,000 (Mendelsohn and Roberts 1997).

If human influences could be removed, the ultimate ceiling for buffalo populations in Namibia is set by **abiotic factors**. Buffalo populations are regulated by their food supply – which is ultimately determined by rainfall and soil fertility.

- (5) **Rainfall** is the driving vector which sets the overall carrying capacity of land through food production; affects the growth rates of buffalo populations through the direct relationship between the fecundity of female buffalo and nutrition; and, notwithstanding any food production as a result of good rainfall, determines the range available to buffalo by the amount of surface water during the dry season.

**Biological factors** exert a relatively minor influence on buffalo populations. Most savanna habitats are suitable for buffalo providing rainfall is adequate. The effects of predation, social behaviour and most diseases are swamped by other factors.

- (6) **Rinderpest** is an exception – it is capable of eliminating entire buffalo populations.
- (7) **Inter-specific competition** for grazing arising from the large elephant population in northern Botswana and Caprivi may be a biological factor significantly affecting buffalo abundance. Competition for food is the ultimate determinant of carrying capacities (Sinclair 1974).
-

## Background and Rationale for the Management Plan

Under the present Namibian environmental legislation, management plans are required for species which are rare or valuable and which share boundaries with neighbouring countries. Buffalo are not at present “rare” but could become so if present factors acting to fragment and reduce the species range continue to operate. Buffalo are valuable. In international safari hunting, every buffalo placed on quota is worth some US\$10,000. In the Caprivi, the net income from land under a sport hunting regime with buffalo and other wildlife populations at carrying capacity would be about US\$7.5/hectare which greatly exceeds the returns from alternative land uses. Buffalo could perform a similar rôle in elevating land use values in conservancies and commercial farms in northern Namibia.

The implications of this management plan for the annual financial planning of the Directorate of Parks and Wildlife are that it should strive by all means possible to obtain a budgetary allocation sufficient to contain illegal hunting and carry out effective fire control. A capital allocation is needed to develop permanent game water supplies in the Caprivi Strip which would maintain continuity between the buffalo subpopulations at the eastern and western ends of the Caprivi Game Park. Beyond this, achievement of the goals of the management plan lie well beyond the conventional mandate of the Ministry of Environment and Tourism and will require dialogue amongst ministries in Namibia and with the authorities in neighbouring countries.

The time scale attached to this management plan has no relationship to standard government five-year budgeting plans – except insofar as the required operational expenditure for State Protected Areas needs to be maintained continuously above the minimum threshold needed for effective management and law enforcement. Given that Parks budgets are adequate, the present core areas for buffalo (about 5,000km<sup>2</sup> - see Map 3) should reach the ceiling population level in about 25 years, assuming that there is no permanent immigration of buffalo from Botswana – which would shorten the time. The achievement of buffalo carrying capacity over the larger possible range (“medium” and “maximum” ranges on Map 3) is subject to many more factors being favourable – including success in conservancy development, a reversal of the present spread of unplanned settlement and land clearance, and positive re-alignment of veterinary fences both in the Caprivi. and northern Botswana.

No schedule can be attached to the introduction of buffalo to commercial farms and conservancies in northern Namibia because the decisions on this involve other ministries beyond the Ministry of Environment and Tourism.

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## MANAGEMENT PLAN

### Vision

**Noting the valuable economic and ecological contribution which buffalo make in arid and semi-arid lands, Namibia seeks to realise the full potential of buffalo as a component of wildlife-based land use both in the areas where the species presently occurs and in areas where it used to occur. In keeping with the provisions for sustainable use in the Namibian Constitution, the high values buffalo can add to production from land should benefit landholders and enhance development.**

### Risks and Assumptions

Elsewhere it has been pointed out that the key factors which will determine whether buffalo populations reach their full potential in the Caprivi and are re-established in the main body of the country lie largely outside the purview of the Ministry of Environment and Tourism (MET). However, MET has a key promotional rôle to play in realising the above vision.

#### Assumptions

- (1) The Ministry of Environment and Tourism will, through advocacy and persuasion both within Namibia and in dialogue with neighbouring countries, mitigate the future application of veterinary control measures which presently affect buffalo detrimentally.
- (2) MET and its supporting agencies will be able to establish successful conservancies and influence land use planning in the Caprivi in a manner which maintains the potential range for buffalo and allows the maximum population growth rates within that range.
- (3) Adequate funding will be available to the Directorate of Parks and Wildlife through the fiscus to maintain its essential functions in the Caprivi and undertake those specific items of capital development which would enhance the buffalo population.

*In the event that such funding is not available through government there are alternative solutions – including donor funding and/or partnerships with conservancies and the private sector. **The key point is that buffalo are a bankable asset: an injection of funds which will result in buffalo achieving their full potential in the Caprivi (or elsewhere) will produce known returns from land which more than justify the investment.***

- (4) Buffalo can be integrated into land use in the main body of the country in a manner which does not pose an unreasonable threat to domestic livestock through diseases.

*This has been achieved elsewhere in the southern African region through introductions of disease-free buffalo, through modifications to veterinary cordon fences and through specific fencing to enclose those buffalo populations which are not disease-free.*

### Risks

- (1) That higher valued uses for land than those conferred by buffalo will be discovered which will result in major changes in land use, so nullifying the conservation effort which has been out into enhancing buffalo populations.

*This does not appear likely at present – the reverse is true. Land which has for most of the twentieth century been managed under domestic livestock in southern Africa is now being converted to wildlife management because of the higher returns possible.*

- (2) That an outbreak of any disease for which buffalo are a carrier amongst cattle either in Namibia or in Botswana will result in the application of more stringent veterinary controls which further depress buffalo populations.

### **Timing and Duration of Plan**

Implementation of this plan should commence as soon as possible and remain in operation until buffalo populations have reached the carrying capacities expected of them in Caprivi (see penultimate paragraph on page 4) and in those areas where they may be re-introduced in the main body of the country.

At the outset, an adaptive management monitoring programme should be initiated which tests the underlying hypotheses regarding buffalo population growth rates and carrying capacities. The objectives, hypotheses and management activities in the plan should be modified as needed to take into account externalities which may arise (and almost certainly will arise) during implementation.

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The Species Management Plan which follows addresses the existing buffalo population in the Caprivi. Management of the disease-free buffalo populations in the Waterberg Plateau Park and Tsumkwe and the contentious issue of the possible re-introduction of buffalo into commercial farms and conservancies are dealt with in **Annex 1** to this plan.

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## Plan Structure

The findings from the background study on buffalo dictate a process-based structure for the management plan. The reasoning which goes into the structure is described below –

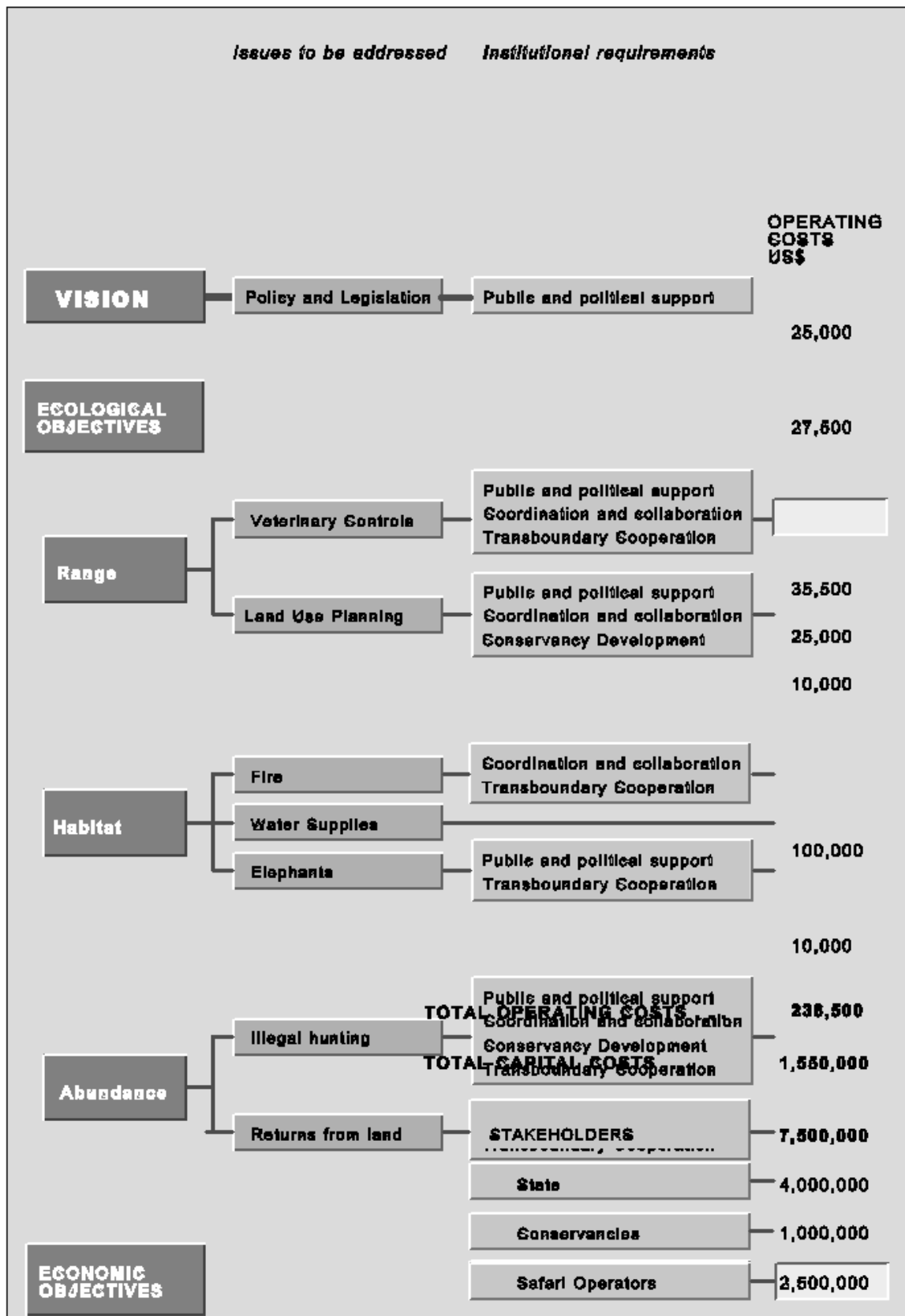
- In order to realise the **VISION**, a number of **ECOLOGICAL OBJECTIVES** have to be addressed. The VISION itself must be consistent with Namibian policy and legislation and the Species Management Plan must enjoy public and political support.
- The highest priority amongst the Ecological Objectives is to secure the potential Range for buffalo in the Caprivi. If this is not done there is little point in proceeding with the remaining objectives and management activities. Two main issues have to be addressed to secure the range: present and future veterinary control measures and land use planning in the Caprivi.
- Having secured the buffalo range, three Habitat issues need to be addressed. At present fire is consuming more than half of the dry season grazing for buffalo every year; a large part of the range is unavailable to buffalo because of a lack of surface water; and the elephant population is competing with buffalo for grazing in certain places and at certain times of the year. In order to achieve the desired increase in buffalo numbers, it is essential that the maximum amount of food within the range is available to buffalo.
- If the range is secure and habitats have been enhanced as far as possible, the buffalo population should increase at the maximum growth rate until it reaches carrying capacity for the available range. Two factors might prevent this happening: illegal hunting and disease. The other factors which control buffalo growth rates are largely dependent on rainfall and therefore fall outside the scope of issues which can be addressed by management.
- The **ECONOMIC OBJECTIVES** will only be achieved when the above ecological objectives have been satisfactorily addressed.

In a process-based approach to management, the objectives are addressed serially (see **Fig.1** on the next page). The economic objectives will be achieved with little effort if the ecological objectives are properly addressed. Certain of the measures to improve habitats and increase buffalo abundance can be undertaken at the inception of the Plan but it must be recognised that, unless the process of securing the range is put underway first, these secondary measures could well be a waste of time.

There is no basis for treating the social and institutional requirements or budgetary requirements as separate objectives. They are inextricably linked to achievement of the ecological objectives and need to be integrated appropriately into each management issue. In the true ecological sense, “humans are an integral component of ecosystems” – the ‘Ecosystem Approach’ of the Convention on Biological Diversity (CBD 1998).

The required budgets for the management activities shown in Fig.1 are developed in **Annex 2**.

Figure 1. A Process-based Species Management Plan Structure



## ***OBJECTIVES***

### **1. Ecological Objectives**

#### **1.1. Range**

##### **Ecological Objectives – RANGE**

- **The range available to buffalo in the Caprivi will not fall below 10,000km<sup>2</sup>;**
- **The range will be maintained as an intact area without fragmentation resulting in isolated subpopulations;**
- **To the maximum extent possible, key riparian habitats along the Kavango, Kwando, Linyanti, Chobe, and Zambezi River frontages will be secured; and**
- **Linkages with the Botswana buffalo population will be maintained and enhanced.**

#### **Rationale**

The total area of the Caprivi is some 20,000km<sup>2</sup> all of which is potentially suitable habitat for buffalo in the biological sense. However, existing human settlement and clearance of land for agriculture has already removed about 3,000km<sup>2</sup> from the available range and it is likely, given present demography, that this process will continue. The presence of cattle and the disturbance factors arising from the present configuration of human occupation make it unlikely that buffalo will ever occupy a further 7,000km<sup>2</sup> of the Caprivi – mainly in the eastern extremity.

It is eminently feasible, however, that the core range of some 5,000km<sup>2</sup> comprising the existing State Protected Areas and parts of established conservancies can be secured for buffalo and, with further management measures, most of the Caprivi Game Reserve and the Forest Reserve could be added to the potential range bringing the total area up to some 10,000km<sup>2</sup> (see Map 3).

The veterinary control fence along the international border with Botswana is resulting in the buffalo population in the western core area of Caprivi Game Reserve becoming isolated from the remainder of the Caprivi buffalo population. This fence is also acting against the establishment of buffalo populations in Khaudom where buffalo used to occur.

The trends towards fragmentation of the existing range and the exclusion of buffalo from key riverine habitats are starkly apparent in Map 3. The human propensity to colonise river frontages could not produce a worse situation for buffalo. In the extreme western Caprivi a large part of the potential range is denied to buffalo by the settlement on both banks of the Kavango River north of the main road; in the area east of the Kwando River ‘ribbon’

subsistence cropping restricts buffalo access to water and creates a barrier to the Forest Reserve; and the potential buffalo range along the Chobe and Linyanti Rivers is severely threatened by an almost continuous belt of settlement. There are two other areas of concern. Settlement between Mudumu National Park and the conservancies to the north and along the southern boundary of the Forest Reserve is creating a barrier which will separate 'southern' buffalo from 'northern' buffalo. Settlement along the northern boundary of Mamili National Park will soon isolate this buffalo population completely.

It is becoming apparent that the main corridors of contact between the above areas are through Botswana. Thus, linkages with the Botswana buffalo population are needed more for the avoidance of isolated subpopulations within Namibia than for the augmentation of numbers of buffalo in the Caprivi.

### **Expected Results**

The desired situation is self-evident from the objectives but it can be broken down into a set of specific targets –

- (1) The range available to buffalo will consist of the "Core" and "Medium Range" areas shown on Map 3 together with certain key river frontages in the eastern Caprivi.<sup>2</sup>
- (2) The following areas will be secured where human settlement and land clearance is threatening the integrity of the buffalo range –
  - (a) The interstitial areas between Mamili National Park, Mudumu National Park, the Forest Reserve, the eastern core area of West Caprivi Game Reserve and the 'Golden Triangle'; and
  - (b) In the extreme west of the Caprivi, the buffalo range will be extended north of the main road along the Kavango River in order to maintain future linkages with Angolan buffalo populations. This requires addressing the 'ribbon' settlement along the east bank of the Kavango River.
- (3) A more or less continuous zone without settlement will be created along the Linyanti and Chobe Rivers inland for a distance of about 15km from the rivers in order to give buffalo access to key riverine habitats.

All of the above results should be achieved in the short-term. It will become progressively more difficult to deal with the problems as they intensify and, whilst the buffalo range is not yet irreversibly fragmented, failure to act rapidly could result in the worst-case scenario.

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2. As a priority, the river frontage along the Chobe within Salambala Conservancy needs to be secured.



### Management Activities

The actions required to secure the overall buffalo range are as follows –

- (1) Veterinary controls: Discussions are needed with the veterinary authorities in Namibia and Botswana with the aim of mitigating present veterinary control fences and avoiding the future development of any fences which will further curtail the buffalo range.
- (2) Land Use Planning: Immediate dialogue is needed with land use planning authorities and local communities in the Caprivi. Many of the threats of fragmentation posed in the interstitial areas (see (2) on the previous page) can be addressed by internal land use planning within the existing conservancies.<sup>3</sup> The development of additional conservancies in key areas in the Caprivi would also enhance the potential buffalo range.

The possibility of radical land use reform in the affected areas should also be considered: if government were to initiate a joint land use planning exercise between the Ministry of Environment and Tourism, Conservancies and local communities under a revised institutional arrangement for joint management of the entire area, it might be possible to produce a larger and more suitable buffalo range to the mutual benefit of all parties.

To achieve the above steps will require **public and political support, co-ordination and collaboration** amongst government ministries and departments and **transboundary co-operation**. The continued development of existing **Conservancies** and the establishment of new conservancies is likely to contribute significantly to the process.

### Impacts

Achievement of the objectives for the buffalo range in Caprivi is the first step towards securing the key habitats for buffalo. However, to obtain the full value from these habitats will require additional management steps.

If a range of some 10,000km<sup>2</sup> can be secured for buffalo, it will also benefit a number of other large mammal species in the Caprivi.

### Monitoring

The status of the buffalo range can be simply assessed by the amount of land settled and cleared for agriculture. This can be measured using air photography or satellite imagery.

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3. Established Conservancies: Kwandu, Mayuni, Mashi, Wuparo.  
Proposed Conservancies: Lianshulu, Malengalenga, Impalila

## 1.2. Habitat

### Ecological Objectives – HABITAT

- **The impact of fire will be reduced from its present level so that no more than 25% of the buffalo range is burnt each year;**
- **Those parts of the range which are at present inaccessible to buffalo due to lack of surface water will be made available through development of water supplies;**
- **Research will be undertaken to assess the degree of inter-specific competition between buffalo and other species, particularly the large population of elephants.**

### Rationale

At present more than 50% of the available buffalo range is burnt each year (Mendelsohn and Roberts 1997). This effectively halves the carrying capacity which would normally be predicted for the Caprivi based on rainfall (approximately 2 buffalo/km<sup>2</sup>).

A large part of the potential range in Western Caprivi is actually unavailable to buffalo because of a lack of surface water during the dry season.

Both inter-specific and intra-specific competition for food are the ultimate factors regulating buffalo populations. Sinclair (1974) made the definitive statement that buffalo populations are regulated by adult mortality caused by undernutrition as a result of food shortage. Food shortage, in turn, is caused by intra- and inter-specific competition. Any species is effectively competing with another species if it eats any of the food required by that species. If the population of one species is large it can have a marked impact on the smaller population of the other species – in the Serengeti, wildebeest were in large numbers and were responsible for depleting the resources of buffalo. It may well be that the very large elephant population in northern Botswana and the Caprivi is competing with buffalo – both are wet season grazers.<sup>4</sup>

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4. The wildlife population on which the financial calculations of the contribution which sport hunting of buffalo could make to land use values in the Caprivi (*Species Report for Southern Savanna Buffalo*, Appendix 2, page 79) includes 3,500 LSUs of elephant and 1,500 LSUs of buffalo in an area of 1,000km<sup>2</sup>. Recognising that Livestock Units are usually calculated in relation to grazing and that a large proportion of elephants' diet consists of browse, nevertheless the above proportions suggest that elephants are consuming a large proportion of the potential grazing which could be available to buffalo.

### Expected Results

- (1) Fire will be limited within the buffalo range to an annually burnt area of less than 25% of the range and all efforts will be made to avoid the same areas being burnt each year.
- (2) The Caprivi Game Reserve (the main part of the Caprivi Strip) will become a functional part of the buffalo range through the development of permanent water supplies.
- (3) Research into the impact of elephants on buffalo populations is likely to show that a significant quantity of the available grazing is consumed by elephants, so reducing the carrying capacity of the available range for buffalo.

All of the above results should be achieved in the short term (within two years).

### Management Activities

The actions required to maximise the food potential of the buffalo range and to enable buffalo to utilise the range fully are as follows –

- (1) To limit the ravages of fire, a network of firebreaks and adequate manpower and equipment for controlling fires is required.

**Coordination and collaboration** with neighbouring communities in the Caprivi and **transboundary co-operation** with Botswana are needed to achieve this objective fully.

- (2) A minimum of about five permanent game watering points need to be developed in the Caprivi Game Reserve. These water supplies should be positioned evenly across the Caprivi Strip to enable buffalo not only to get access to additional grazing but also to traverse the distance between the core wildlife areas at each end of the Strip. Additional water points may also be needed in the Forest Reserve.

This development can be undertaken within the authority of the Directorate of Parks and Wildlife.

- (3) Intervention in the balance between elephants and buffalo will depend upon the outcome of the research undertaken. It is important to understand that any decision to intervene (e.g. a decision to reduce numbers of elephant) will be based entirely on subjective and aesthetic criteria – there are no technical absolutes which enable a manager to know what the “natural” proportions of elephants and buffalo should be.

The best approach to this problem may be to undertake an adaptive management research experiment. In a defined area, where both elephants and buffalo are present and their numbers are known, the elephant population would be reduced significantly. At the same time there should be a scientific ‘control’ area where there is no intervention and the effect of the management in the first area should be compared with that in the control area. The numbers of elephant removed should be large enough to be able to detect any differences, the duration of the experiment should be long enough to enable the buffalo population to respond to the treatment, and the monitoring of numbers should be accurate enough to detect the changes.

Any decision to reduce elephant populations, even if it is limited and experimental, will require **public and political support** and **transboundary cooperation** with Botswana.

**Impacts**

Given that the buffalo range has been secured, the achievement of these objectives will maximise the value from the habitats within the range and set the stage for the buffalo population to increase to carrying capacity in the shortest time possible.

As with the range objectives, these management activities will benefit other species in addition to buffalo.<sup>5</sup>

**Monitoring**

- (1) Satellite imagery can be used for detailed fire mapping (Mendelsohn & Roberts 1997, p 24-25). However, this monitoring technique is expensive if the progressive incidence of fires over the dry season is to be mapped. A single image of the final result of fires by the end of November each year may be adequate.
- (2) The effect of establishing water points in the Caprivi Strip needs to be monitored by assessing the extent to which buffalo use the water and occupy areas of the range from which they were previously absent. Elephants are also likely to use these water points and the monitoring programme should place an equal emphasis on quantifying this outcome. Aerial surveys (see next section) may detect this if carried out in the late dry season. Simple qualitative checks using spoor and buffalo sightings in the vicinity of waterholes would provide an immediate answer to the question and radio-tracking studies might establish whether contact is taking place between buffalo from the eastern and western ends of the Caprivi Strip.
- (3) The proposal in the previous subsection for an adaptive management experiment involving elephants and buffalo also specifies the monitoring requirements for such an experiment.

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5. In the Kasane workshop, it was hypothesized that elephant might make more use than buffalo of any new waterpoints in the Caprivi but that this would, in any event, have a beneficial effect on buffalo because it would free up grazing in the riverine habitats.

### 1.3. Abundance

#### Ecological Objectives – ABUNDANCE

- **The buffalo population in Caprivi will increase to 15,000 animals within 30 years;**
- **Numbers of buffalo illegally killed will not exceed 1% of the population per year;**
- **All practical measures will be taken to minimise the likelihood of buffalo contracting diseases from domestic livestock which threaten their well-being.**

#### Rationale

In the absence of human influences, buffalo populations are regulated by their food supply – which is controlled largely by **abiotic factors** – rainfall and soil fertility. Achievement of the previous objectives should allow the development of a population of some 15,000 buffalo within about 30 years. Two factors might prevent this from happening – illegal hunting and disease.

- (1) Illegal hunting: Given normal rainfall in the Caprivi (500mm +), the typical growth rate expected of the buffalo population is slightly above 5% per annum. Whilst the population could tolerate an illegal offtake up to 5%, such a level would preclude its increase. If it is assumed that the present resident population of buffalo in the Caprivi is about 3,000 animals, an illegal offtake of 1% or 30 animals per year is a reasonable target since it allows a sport hunting quota of 2.5% of the population to be sustained in addition to the illegal hunting. At this level of exploitation the buffalo population would continue to increase at 2.5%.
- (2) Disease: The various diseases which affect buffalo adversely are discussed fully by Morkel (1988) and summarised in the background study to this plan. Rinderpest is fatal to buffalo and there have been several occasions during the last 100 years when cattle originating from east Africa carrying the disease have come close the boundaries of southern African countries. Contagious Bovine Pleuropneumonia (CBPP) is also potentially fatal for buffalo and is known to occur in the Caprivi.

#### Expected Results

- (1) If illegal hunting of buffalo is limited to 1% per annum, the population will maintain at least half of its maximum growth rate and be able to sustain a reasonable sport hunting quota.
- (2) If contact between buffalo and domestic livestock can be minimised the threats of potentially fatal diseases for buffalo will be reduced.

The first result could be obtained in the short term if adequate budgets are provided. Reducing contact between buffalo and cattle will depend on land use planning and may take several years.

### Management Activities

- (1) The requirements to contain illegal hunting are –
  - Adequate manpower and operational budgets in the State Protected Areas;
  - Commitment within the conservancies towards increasing their wildlife populations;
  - Cooperation with police and other authorities in Caprivi and with neighbouring countries.
- (2) The primary measure needed to protect buffalo from livestock diseases is the avoidance of contact. This poses problems in the Caprivi because land use allocations are still in a state of flux and, as yet, veterinary fencing to separate buffalo and cattle is not in place. There are obvious concerns on the part of the wildlife authorities that implementation of fencing could result in further reductions in the buffalo range. This matter needs to be addressed in conjunction with the land use planning issues raised amongst the priority objectives on page 9.

Both of the above entail **public and political support, co-ordination and collaboration** amongst local authorities and **transboundary co-operation**. The continued development of **Conservancies** is likely to contribute significantly to the process.

### Impacts

If these objectives can be achieved, the Caprivi buffalo population should reach some 15,000 animals within thirty years. Any permanent immigration of buffalo from Botswana would be a bonus and would shorten the time to reach the objective. The economic implications of this population are discussed under the Economic Objectives (2.)

The side effects of developing a large buffalo population are likely to lie in –

- Increased conflict with agriculture and humans; and
- A higher probability of disease incidence affecting domestic livestock.

The former can be dealt with as the buffalo population increases by using electric fencing to protect crops and people. The latter is by no means certain and, given the diversity of diseases which can be transmitted by buffalo to cattle and *vice versa*, it is pointless to speculate in advance what remedial measures might be required.

If the land use planning initiatives referred to under **Objective 1.1** are successful, a large amount of conflict will be avoided through good planning and this may entail separation of buffalo and cattle through fences in the eastern Caprivi. Ultimately, as has happened in several community-based wildlife management programmes elsewhere in the southern African region, domestic livestock may disappear altogether to be replaced by wildlife.

**Monitoring**

A system of monitoring law enforcement effort and illegal activity needs to be put into place to ensure that the objective for illegal hunting is being achieved. This aspect of monitoring is of a sufficiently high priority that it is discussed separately in **ANNEX 3**.

The difficulties of estimating buffalo population numbers was highlighted in the Background Study to this plan. A knowledge of buffalo population numbers is not necessary for setting hunting quotas (page 19) but, if considerable effort is to be put into increasing buffalo numbers in the Caprivi, then it would be desirable to measure the effects of this investment.

The subject was discussed at the recent Kasane workshop and it was agreed that –

- Current aerial monitoring techniques for buffalo are expensive and inaccurate;
  - Accuracy needs to be high enough to monitor trends;
  - There is sufficient justification to merit experimenting with survey techniques, including the development of local community monitoring systems;
  - Having settled upon a monitoring system, it should be consistently implemented so that results from year to year are comparable; and
  - There is a need for collaboration between Botswana and Namibia on this activity.
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## 2. Economic Objectives

The economic potential of a buffalo population of 15,000 animals is sufficiently high that this might be regarded as the primary objective for the buffalo plan. However, as it will not be achieved until the ecological objectives are met, it follows logically after the ecological requirements.

### ECONOMIC OBJECTIVES

- **With the Caprivi buffalo population at carrying capacity, the net annual income from international safari hunting will be increased from its present potential level of some US\$2.5 million by an additional US\$5 million, making wildlife-based land use the highest valued production system for the Caprivi.**
- **This income should equitably benefit both the State and Conservancies as the primary stakeholders, and safari operators as secondary stakeholders.**

#### Rationale

With the present population of 3,000 buffalo in the Caprivi, the potential net earnings from safari hunting (of the full wildlife complement) are about US\$2.5 million (see *Appendix 2* of the Background Study to this plan). The addition of a further 12,000 buffalo would raise the net income to about US\$7.5 million<sup>6</sup> (with no changes to densities of the other species). This is an average return of US\$ 7.5/hectare, which is considerably higher than the earnings possible from both cattle and subsistence agricultural systems.

Assuming that the safari operator takes US\$2.5/hectare of the net earnings,<sup>7</sup> the balance available to the State and Conservancies at full development would be about US\$5/hectare. The required operating costs for the entire Buffalo Management Plan, which include the full operating costs for all State Protected Areas in Caprivi (Annex 2), are slightly over one million US\$ per annum. At full development this could be obtained from safari hunting on 2,000km<sup>2</sup> out of the total of 8,000 km<sup>2</sup> of State Protected Areas. The total area of established Conservancies in the Caprivi is approximately 2,000 km<sup>2</sup> and, assuming buffalo

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6. This figure is based on 5,000 km<sup>2</sup> with buffalo at a density of 2/km<sup>2</sup> earning a net US\$10/hectare and a further 5,000 km<sup>2</sup> with buffalo at a density of 1/km<sup>2</sup> earning US\$5/hectare.
  7. The operator's costs are US\$4.37/ha and a return of US\$2.5/ha would yield more than a 50% profit on operations. With the intense competition in safari hunting, few operators achieve this profit level in the southern African region.



achieve the required numbers in these conservancies, their combined annual earnings would amount to about US\$1 million.

### **Expected Results**

The high potential income which buffalo can add to present wildlife earnings will maximise the income from land in the Caprivi and provide the incentive for additional land to be managed under wildlife. The income would be adequate not only to meet the State's operating costs but also to earn significant additional revenue.

Under normal population growth rates (5%), it would take about 33 years to achieve the desired numbers – but this might be accelerated if favourable conditions in the Caprivi buffalo range attract animals from the Botswana buffalo population which is close to carrying capacity.

### **Management Activities**

Given that all ecological objectives are met and the Caprivi buffalo population increases at the expected rate towards carrying capacity, the conditions needed to maximise the income for the primary stakeholders during the period while buffalo populations are growing and when they have reached carrying capacity are as follows –

- (1) Sustainable hunting quotas need to be set. This should be done through adaptive management using the criterion that at all times there should be a significant number of trophies from bulls 10 years of age and older. Quotas can be increased when this is the case, but as soon as the average age of the trophies falls below 10 years, quotas should be reduced (see Background Study, pages 60-61).
- (2) All safari hunting concessions should be sold to maximum advantage. The best system is one of public auction of concessions because it is difficult for any corrupt practices to affect the competitive outcome and prices are usually far higher than those obtained through a tender system. Tenders are the next best option but, unless the system for award of tenders is transparent, corruption is frequently encountered.
- (3) Because no distinct resident subpopulations of buffalo have yet been identified in the Caprivi, there is a problem in setting quotas for individual areas as opposed to the entire range. This requires institutions to be developed amongst the State and Conservancies which will enable the overall proceeds from buffalo hunting to be shared while the hunting is taking place from a common population.
- (4) There is a transboundary aspect to this same problem. In several instances it is clear that buffalo trophies are coming from a population shared between Botswana and Namibia.

This is a test case for developing workable transboundary institutions which, in the first instance, result in cooperation on quota setting and, ultimately, lead to income sharing.<sup>8</sup>

The above activities highlight the need for **coordination and collaboration** both at the **national** and **transboundary** levels.

### **Impacts**

The impact of achieving the highest valued land use is likely to be considerable. It will provide the revenue for effective State conservation, elevate the standard of living for the existing people of the Caprivi and create the incentives for more land to put under wildlife. Ultimately, it could revolutionise land use planning in the Caprivi and pave the way for transfrontier conservation areas.

### **Monitoring**

The record of ages of buffalo trophies taken on sport hunting will indicate the sustainability of the operation and give a reasonable assessment of the trends in the buffalo population. It is possible from the population modelling undertaken in the Background Study to estimate the size of the buffalo population from the age structure of the trophies. The Conservancies should take responsibility for this monitoring in their areas at an early stage.

The annual record of revenues and incomes earned from safari hunting in State Protected Areas and Conservancies will provide the data needed to assess the overall progress towards achieving the economic objectives.

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8. In the Kasane workshop, the opportunity to develop such an institution involving Salambala Conservancy in Namibia and the Chobe Enclave community in Botswana was identified. These communities are directly opposite one another on the Chobe River and are almost certainly hunting from the same buffalo population.

## ***FINANCE AND CAPACITY***

A detailed budget for the operating costs and capital costs associated with this plan has been developed in **ANNEX 2** and a summary of the budget figures relating to each objective is shown in **Fig.1** (page 8). The viability of the project is also analysed in ANNEX 2.

The key points arising from this budget are –

- (1) It contains a contribution to the operating and capital costs required for effective performance of the Directorate of Parks and Wildlife in the Caprivi. It does not seem reasonable that the entire set of running costs and capital costs for the State Protected Areas in Caprivi are ‘debited’ against the buffalo project. However, two points need to be made.
  - Firstly, the objectives of the Species Management Plan will not be realised if the Caprivi Parks are underfunded; and
  - Secondly, the returns from buffalo management when the population is at carrying capacity are capable of funding the entire set of government costs in the Caprivi.

However, to include the entire set of Parks’ costs as part of the Species Management Plan produces an extremely unbalanced budget. It is the prerogative of the State to re-invest the revenues earned from the buffalo project in its running costs and capital costs.

- (2) The project is very viable. The entire set of capital costs and the initial deficits in running costs could be borrowed from a bank at 10% interest and the loan would be acquitted before the buffalo population had reached one-half of carrying capacity.
- (3) The required manpower for effective protection of the Caprivi buffalo from illegal hunting in each of the protected areas is given in ANNEX 2 and the operating cost budget includes a full provision of all equipment needed for effective performance. The budget also includes a provision for training Conservancies in law enforcement and monitoring.

## ***TRANSBOUNDARY COOPERATION***

At the Kasane Workshop, the following areas of potential co-operation and collaboration between Botswana and Namibia were identified –

1. Maintaining linkages between buffalo populations and compatible land use;
2. Expanding range and veterinary implications;
3. Illegal hunting;
4. Interaction between buffalo and other species;
5. Fire control;
6. Buffalo population estimates and monitoring;
7. Hunting quotas;
8. Institutional collaboration.

## ***IMPLEMENTATION PROCESS & UPDATE PROCEDURES***

The first draft of the Species Management Plan was completed in December 2002.

Review of the draft plan should take place during January and February 2003 and, following comments and decisions from the Directorate of Parks and Wildlife and the Directorate of Scientific Services in the Ministry of Environment and Tourism, a second draft should be prepared for submission to the Ministry at the end of February 2003. Subject to any further revisions which might arise from inter-ministerial discussions or transboundary liaison with Botswana, a Final Plan should be ready for adoption before June 2003.

This should be followed by a meeting between the Ministry of Environment and Tourism and supporting agencies to discuss implementation and, in particular, the approach to funding the project. The Plan itself contains the full set of management steps which need to be undertaken in a sequence of priorities.

The implementation of the Plan will be underpinned by an adaptive management approach which enables management actions, the underlying hypotheses about the performance of the buffalo population and the objectives to be revised as needed during implementation. This approach also caters for unexpected events and episodic factors which may alter management strategies.

Notwithstanding any modifications made as and when necessary during implementation, there should be a mandatory review of the plan every two years – preferably synchronised with the results from the biennial air surveys provided for in the schedule of activities. In the course of such reviews, if any major changes are needed in the plan, the document should be modified, updated and re-approved.

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***ANNEXES***

**ANNEX 1**

Management of Disease-free Buffalo Populations  
and  
Re-introduction of Buffalo to Northern Namibia

**ANNEX 2**

Capital and Operating Costs Required to Fulfil the Objectives of the Management Plan

**ANNEX 3**

Monitoring of Law Enforcement Effort and Illegal Activity

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**ANNEX 1**  
**Management of the Disease-Free Buffalo in Namibia**  
and  
**Introduction of Buffalo to Commercial Farms and Conservancies**

**BACKGROUND****Conservation Status and Significance**

Namibia possesses some 300 disease-free buffalo held in two separate localities in the main body of the country. The population in the Waterberg Plateau Park (over 200 animals) lies south of the main veterinary cordon fence and the population at Tsumkwe (about 70 animals) is north of the veterinary fence in Bushmanland.

The achievements to date with these buffalo herds should be viewed as a conservation success. Both populations are approaching or have exceeded carrying capacity for the areas where they are being held and there is some urgency to decide on their future. Being disease-free, the animals are extremely valuable – current prices in the regional live sales market for buffalo are around N\$200,000 each – and the sale of some or all of these buffalo is one management option. The animals could also be used to begin new buffalo populations in the main body of the country (subject to the agreement of the veterinary authorities) in areas where buffalo used to occur.

**Populations**Waterberg Plateau Park

The introduction of 48 buffalo took place between 1981 and 1991 at an average rate of 5 animals per year over this period (Erb 1992). Most of the animals came directly from Addo National Park in South Africa although 11 came from from Willem Pretorius Game Reserve in the Free State in 1985-86 (presumably these animals originated from Addo stock) and 4 were buffalo of East African origin imported from a Czechoslovakian Zoo in 1986. The last estimate for the present population was 184 in the year 2000 and it is now thought to be in excess of 200 animals.

Tsumkwe

The Tsumkwe buffalo herd has its origins in some 200 buffalo in the Bushmanland area which were isolated from Botswana by the international boundary veterinary fence in the early 1960s. Most of this group died of thirst and starvation and, by 1996, only 30 survived. These animals were penned in a quarantine camp in the Nyae Nyae conservancy north of the main veterinary cordon fence in 1996. It is significant that, up until the time of their quarantine, this herd had been in regular contact with cattle without transmitting Foot and Mouth disease. Shortly after penning, one animal which tested FMD positive was destroyed. The present herd of about 70

animals is free of the various diseases to which buffalo are hosts and is commercially very valuable.

### **Limiting Factors and Threats**

The population in the Waterberg will soon exceed the carrying capacity of the Park. With an annual rainfall of under 500mm, the sustainable density of buffalo is about 1/km<sup>2</sup>, i.e. some 400 animals for the Park. This ceiling will soon be reached and it can be expected that both habitats and buffalo will deteriorate in the future if remedial measures are not taken.

In the low rainfall conditions of Tsumkwe where the carrying capacity is less than one buffalo per square kilometre, the present population of 70 animals in 2,400ha is grossly overstocked (i.e. 3/km<sup>2</sup>) and is having to receive supplementary feeding.

Given the value of disease-free buffalo, it is financially irresponsible not to manage these particular herds under a regime where they are breeding at the maximum rate – which will only be achieved if their numbers are kept well below carrying capacity.

Because of their origins, the Waterberg buffalo are viewed by some as a threat to the genetic integrity of Namibian buffalo. This topic is explored fully under **Risks and Assumptions** in the next main section.

### **Rationale for a Management Plan**

The Namibian scientific and management authorities have a conservation and economic opportunity presented by these buffalo and, because both groups are beginning to exceed carrying capacity, management decisions are needed urgently. A number of options are available –

- (a) Introductions to commercial farms (recommended by Morkel 1988);
- (b) Establish a buffalo population at Mangetti Game Camp (and use this as an opportunity to initiate a Conservancy of Chief Kahenge's people);
- (c) Re-establish buffalo in Etosha National Park and Khaudum Game Reserve;
- (d) Sell buffalo to South African buyers.

All of these aims would seem desirable and none of them are mutually exclusive.

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The Plan which follows is based entirely on the recommendations of the consultant using the arguments presented in the **Species Report for Southern Savanna Buffalo**.<sup>9</sup> The subject was

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9. This background study was carried out by R.B. Martin in November 2002 under a consultancy jointly organised by the Namibia Nature Foundation and the WWF LIFE Programme to support the **Transboundary Mammal Project** of the Directorates of Parks and Wildlife and Scientific Services in the MET.

not discussed at the Kasane Workshop at the end of November and no written comments have been received on the topic either for or against the recommendations. The consultant recognises that the final decisions will be made by the Namibian authorities (including the veterinary authorities) in consultation with the various stakeholders.

## **MANAGEMENT PLAN**

### **Vision**

**Noting the valuable economic and ecological contribution which buffalo make in arid and semi-arid lands, Namibia seeks to realise the full potential of buffalo as a component of wildlife-based land use both in the areas where the species presently occurs and in areas where it used to occur. In keeping with the provisions for sustainable use in the Namibian Constitution, the high values buffalo can add to production from land should benefit landholders and enhance development.**

There is no change to the Vision Statement in the main document. The statement could be modified to make it refer specifically to the disease-free buffalo herds at Waterberg and Tsumkwe but this does not seem necessary.

### **Risks and Assumptions**

- (1) It is assumed that, despite their origins, the Waterberg buffalo will be treated no differently from the Tsumkwe buffalo for management purposes.

In allowing the Waterberg animals to breed with other buffalo of Namibian origin, there is a risk of 'outbreeding depression'. If the Waterberg buffalo possess genetic characteristics which differ from Namibian buffalo, the resulting hybrid could demonstrate a reduced fitness – which might be shown by impaired breeding performance. The arguments supporting a precautionary approach in this case are far weaker than those which advocate an inclusionary approach.

- Both the Namibian and the Addo genotype are the same subspecies;
- No external features of the Waterberg buffalo lead to the conclusion that phenotype is morphologically different;
- The genetic characters which lead to outbreeding depression are seldom integrated into the gene complex of an organism as a whole: usually they are restricted to a few gene sites on a particular chromosome 'arm';
- The Waterberg stock have been present in Namibia for over 20 years and will already have undergone genetic modification in response to their particular environment;
- The risk of inbreeding depression may be higher than that of outbreeding depression;
- Outbreeding depression, if it were to occur, is usually a temporary phenomenon which is rectified by natural selection within a few generations;



- Very often the resultant product of hybridisation, or their offspring, may possess superior characteristics to the original founder stock.

Templeton (1986) questions the philosophical approach of those who seek to preserve the unique physical characters represented by a particular ‘species’ (in the subject under discussion it seems that there are not even any of these which can be identified – rather there is a vague foreboding that there may be some hidden characteristics in the Addo buffalo) because this static approach tends to deny the dynamic nature of evolution.

In an articulate discourse, Templeton asks whether we should be saving ‘species’ as defined by a currently existing constellation of traits, or ‘species’ which represent a unique evolutionary lineage. The species definition one accepts has a profound impact on management decisions in a case such as this. Under the static approach, it is assumed automatically that the existing population (i.e. the Namibian buffalo) must be preserved as is, and any genetic changes which might arise through crossing with Addo buffalo must necessarily be “bad”. Under the evolutionary lineage concept, allowing a new superior gene complex to evolve is not at all “bad”.

*“The conservation biologist should not try to suppress evolutionary change in all circumstances – rather the conservation biologist should use evolutionary change as a beneficial and powerful management tool for preservation of endangered evolving lineages — species.”*

The ultimate irony is that buffalo went extinct long ago in north-central Namibia and whatever buffalo are used to repopulate the area, they will not be identical to the ones which disappeared.

*In order to avoid an immediate decision on this issue, it is proposed in the Objectives that an experiment is undertaken which involves mixing of the Tsumkwe and Waterberg buffalo in a new locality whilst still maintaining the integrity of the original founder stock.*

*Should it be decided that the Waterberg Buffalo will not be allowed to interbreed with the Tsumkwe buffalo, either in a controlled experiment or in any other situation, it does not affect the other objectives which follow – it simply means that there is a smaller starting nucleus of buffalo to undertake the various management activities and, of necessity, the time schedule will be considerably longer.*

- (2) It is assumed that a veterinary solution will be found to accommodating Foot-and-Mouth disease-free buffalo on commercial farms and conservancies in northern Namibia.

The perceived risk involved in the introduction of buffalo to commercial farms in Namibia is that, even if the animals are initially disease-free, an escapee from any commercial farm could prejudice Namibia’s beef export status in international markets. Arguments are presented in the Background Study (pages 47-48) to this management plan to suggest that the risk is not as high as portrayed. Foggin and Taylor (1996) give instances of satisfactory veterinary control measures which have been implemented elsewhere in the southern African region to enable farmers not only to introduce disease-free buffalo but even to introduce buffalo which are carrying Foot-and-Mouth disease into commercial farming areas which enjoy a similar beef export status to that of Namibia.

*The only issue at stake in the objectives which follow is the matter of timing. It is not expected that commercial farmers in northern Namibia will be successful in the near future at securing buffalo as part of their wildlife-based land use systems. However, if the examples from the rest of region are indicative, sooner or later they will.*

The issue does not greatly affect conservancies in northern Namibia at present as there appear to be none in the area immediately south of the veterinary cordon fence which could support buffalo due the aridity of the terrain. North of the fence, only the Nyae Nae Conservancy appears suitable for buffalo and it is assumed that there would little difficulty, when the moment is ripe, for this conservancy to support a population of free-ranging disease-free buffalo.

## Objectives

The structure which follows is the same as that used in the main report. However, no attempt has been made in the list below to categorise the objectives.

### **Disease-free Buffalo – Objectives**

- (1) To test whether any deleterious effects result from interbreeding between the Waterberg buffalo and the Tsumkwe buffalo;**
- (2) To relieve the pressure on the Waterberg and the Tsumkwe buffalo caused by overstocking and to manage both herds for maximum production at a level below carrying capacity;**
- (3) To re-introduce buffalo to suitable State Protected Areas, commercial farms and conservancies in the main body of the country;**
- (4) To raise funds for the State and Conservancies through the sale and export of buffalo at maximum financial values.**

## Rationale

- (1) Some controversy exists as to whether interbreeding between the Waterberg and Tsumkwe buffalo will produce any deleterious effects in the hybrid offspring. To resolve this, a new population should be started in a third locality with a breeding nucleus of animals drawn from both the Waterberg and Tsumkwe populations. This would be treated as a research experiment to test for outbreeding depression: if reproductive performance or offspring viability differed from that in either of the founder populations, it would answer a question.
- (2) The Tsumkwe buffalo herd is overstocked. Under the rainfall conditions in Bushmanland, the long term carrying capacity is unlikely to exceed 0.5 buffalo/km<sup>2</sup> and the present population of 70 animals held in a paddock of 24 km<sup>2</sup> is at density of nearly 3/km<sup>2</sup>. The carrying capacity for the Waterberg Plateau population is about 1/km<sup>2</sup> and with some 200 animals in 400 km<sup>2</sup>, the population is below carrying capacity at the moment but could be expected to reach its ceiling in a few years. However, in both areas the objective should be

to maximise production of disease-free animals because of their high financial value and this will only be achieved by holding the populations well below carrying capacity.

- (3) Buffalo occurred widely in Namibia prior to the great rinderpest epidemic at end of the nineteenth century but were eliminated virtually throughout the country by the disease. In the first half of the 20th century, they had successfully re-colonised a number of areas in the north of the country but were destroyed directly and indirectly as a result of veterinary control measures. It is seen as a desirable conservation initiative to re-establish the species in some of the areas where it formerly survived.

Buffalo are also a pivotal species in the safari hunting industry and have the potential to raise land use values in northern Namibia from their present 'break-even' level to a significant profitability (see Background Study, Appendix 2).

- (4) The high financial value of disease-free buffalo within the southern African live sales market provides an opportunity to fund buffalo conservation efforts in Namibia through the sale of some animals from the two buffalo populations.

*All of the objectives are seen as compatible and capable of being pursued simultaneously.*

### **Expected Results**

- (1) The experiment to hybridise some buffalo from the Waterberg and Tsumkwe herds should provide a scientific basis for future decisions as to whether a general mixing of the populations is advisable. The experiment should last for several generations (i.e. at least 3-4 years) in order to detect any signs of impaired breeding performance.
- (2) The destocking of both the Waterberg and Tsumkwe areas will relieve pressure on the range and maintain both populations in a state of maximum growth.
- (3) Introductions of buffalo to protected areas where they formerly occurred will enhance the biological diversity of the parks and may result in a marginal increase of tourism revenues.

Introductions of buffalo to commercial farms and conservancies will enhance their economic viability. In the typical habitats and rainfall regime of the westerly farms in northern Namibia, the presence of buffalo in a safari hunting regime should increase the net income from land by about US\$2/hectare (Background Study, Appendix 3). Given the low profitability of all farming systems in this semi-arid environment, this represents a substantial boost and could make the difference between profit and loss in the land use system.

It could take several years before veterinary authorities are prepared to permit these introductions.

- (4) The sale of a number of disease-free buffalo would provide the funds needed for carrying out the management programme for these buffalo. For example, the costs of fencing a new 10,000ha paddock for the Tsumkwe buffalo might be N\$500,000 (40km @ N\$12.5/metre): this can be paid for by the sale of 2 buffalo. The returns are immediate.

The value of the animals provides a unique opportunity to strengthen conservancies. Nyae Nyae conservancy should be recognised as the 'co-owners' of the Tsumkwe herd, be fully

consulted on its management and should benefit to the maximum extent from all sales. The wildlife department might choose to use some of the animals from the Waterberg herd to begin new buffalo populations which will ultimately benefit conservancies.

### Management Activities

- (1) Two founder groups of about 10 animals each should be used to test the outcome of interbreeding between the Tsumkwe and Waterberg populations. It is probably wise to include only one dominant bull in this cohort and, if this bull is taken from (say) the Waterberg herd, there should be a subdominant bull from Tsumkwe also present in the group. A suitable locality might be in the Mangetti Game Camp since this is north of the veterinary cordon fence and is unlikely to raise difficulties with the veterinary authorities. Other possibilities might be in the vicinity of Khaudom or in the Nyae Nyae conservancy. The experimental area will need to be fenced and the sale of a few buffalo from the founder populations would meet the costs. Some DNA typing should be done prior to mixing the animals and the progeny should also be tested soon after birth. A small stipend should be provided to a researcher to ensure that all necessary monitoring is carried out.

Some **collaboration** is advisable with a suitable research facility and the experiment should be **coordinated** with the national veterinary authorities.

- (2) To manage the Waterberg buffalo herd at about half of carrying capacity, an aggressive programme of sales should be instigated immediately and all animals surplus to a population of 200 should be sold on the regional market, with the funds being re-invested in management of the disease-free buffalo herds, including re-introductions to new areas.

The range available to the Tsumkwe buffalo needs to be substantially increased and, at the same time, plans for ongoing destocking should be implemented. A population of 50 buffalo at a stocking rate of 0.5 buffalo/km<sup>2</sup> would require a 100 km<sup>2</sup> paddock. All buffalo in excess of 50 animals (and preferably an even lower ceiling, since this is close to the estimated carrying capacity) should be removed under the provisions of the next objective.

Close **collaboration and coordination** with the Nyae Nyae conservancy should take place on all management decisions affecting the Tsumkwe buffalo and, particularly if a larger area within the conservancy is to be used to hold the buffalo, the conservancy should be recognised as a major **stakeholder** in the future of the herd.

- (3) Re-establishment of buffalo populations

Buffalo generally do not survive in areas with an annual rainfall lower than 250mm (Stewart and Stewart 1963). This limits the potential areas for re-introduction to the western parts of northern Namibia.

(a) *State Protected Areas*: Buffalo occurred in Etosha National Park in recent times (De la Bat 1963 in: Gaerdes 1967) and in Khaudom National Park (Gaerdes 1967, Griffin 1983). Both of these parks are north of the veterinary cordon fence and the re-introduction should not raise veterinary difficulties.

(b) *Commercial farms*: Buffalo occurred in the mid-20th century in the Grootfontein, Otjiwarongo, Okahandja and Gobabis farming districts (Gaerdes 1967). All of these are south of the veterinary cordon fence and it will require a consensus of Namibian

commercial farmers before the Directorate of Veterinary Services is likely to allow the re-introduction of buffalo into any of these areas. A possible strategy may be to focus on commercial farm conservancies bordering onto Etosha National Park where a realignment of the veterinary cordon fence could accommodate buffalo.

- (c) *Conservancies*: There are few conservancies suitable to receive buffalo in northern Namibia. Rainfall in the western conservancies is too low to support buffalo and in the eastern parts the only established conservancy is that of Nyae Nyae which already supports the Tsumkwe buffalo herd. However, it could also support a free-ranging buffalo population. The establishment of a conservancy in the Mangetti Area based on disease-free buffalo could be a pro-active intervention by the Ministry of Environment and Tourism.

These re-introductions will require **public and political support, coordination and collaboration** with other government ministries and other **stakeholders** including **conservancies**.

- (4) Sale of buffalo requires no complicated management. Veterinary authorities in the importing country will require various tests to be done and may require a quarantine period on import. Where buffalo are being used to start new populations, the founder group should be large enough to give a high probability of success (at least 5 but preferably 10 or more animals).

## Impacts

The overall impact of successful buffalo introductions to areas in northern Namibia should be one of an increasing land use value and, in the protected areas, increasing biological diversity.

The possible but unlikely negative impact of disease transmission to domestic livestock has to be considered. The best strategy here is full involvement of the veterinary authorities at all stages of buffalo re-introductions. There are more than adequate economic arguments for the inclusion of buffalo in wildlife based land use systems: the technical problem of achieving this needs to become a problem shared with the veterinarians.

## Monitoring

Progress in establishing buffalo populations in northern Namibia requires detailed record-keeping beginning with the age and sex of all animals in each founder cohort and the subsequent natality and mortality in the new population.

## Funding

It is not possible at this early stage when key management decision for the disease-free animals have not been taken, to build up a detailed budget corresponding to the objectives. However, as a general principle, it would be highly desirable for the entire management programme to be funded from strategic sales of disease free buffalo as and when funds are required for particular management actions. Examples have been given in the preceding text where the sale of a few buffalo could meet the costs of fencing to increase paddock sizes or to meet veterinary requirements. The research and management costs of the proposed interbreeding experiment between Tsumkwe and Waterberg buffalo could also be met in this way.

**ANNEX 2**  
**Buffalo Management Plan**  
**FINANCE**

Costs are developed below for each of the prescribed management interventions which appear in the main body of the plan. It is assumed that the budget would devolve upon the Ministry of Environment and Tourism, mainly for the activities of the Directorate of Parks and Wildlife but also for the Directorate of Scientific Services. Any portion of this budget could be taken up by another government department or by an NGO, if it is considered that the particular management activity might best be carried out by a supporting agency. All costs are in United States dollars.

**1. ECOLOGICAL OBJECTIVES**

**1.1 Range**

(1) Veterinary controls

The requirement here is for liaison, coordination and collaboration both with the Namibian Directorate of Veterinary Services and the Botswana Department of Animal Health and Production. A small annual budget to cover costs of travel, holding meetings, undertaking site visits and map preparation is provided.

Recurrent expenditure ..... US\$25,000

Arising out of the joint planning process with the veterinary authorities may come a requirement for removal of fences, modification of existing fences or construction of new fences. Usually, it is assumed that these costs will be borne by the veterinary authorities. However, the achievement of the objectives may be more likely if there is a capital amount provided within the wildlife budget to contribute to the developmental costs. It is difficult in advance to predict what the requirements may be so that the lump sum below is a notional amount which, if used for the construction of new buffalo proof fencing at a cost of US\$1/metre, would provide for 500km of fencing.

*Capital provision* ..... US\$500,000

(2) Land Use Planning

As with the previous item, a small budget is needed for liaison, coordination and collaboration with land use planning authorities in the Caprivi.

Recurrent expenditure ..... US\$25,000

Associated with the land use planning component is a requirement to monitor the available buffalo range, the extent of human settlement and land cleared for agriculture. This can be done with the acquisition of 2 satellite images annually at an approximate cost of US\$750 each. A further provision for data capture entailing one person's time for two weeks/year (US\$1,000) has been added.

Recurrent expenditure ..... US\$2,500

Should it arise out of the planning process that there is a need for relocation of existing settlements, compensation for affected families or development of new infrastructure to facilitate land reorganisation, it would be as well to have a capital provision available to meet such costs. As with the provision for veterinary controls, the amount provided is notional.

*Capital provision* ..... US\$500,000

## 1.2 Habitat

### (1) Fire control

Maintenance of 500km of firebreaks using a grader capable of clearing 2km/hour at an operating cost of US\$100/hour ..... US\$25,000

Casual labour for fire-fighting, transport and firebeaters ..... US\$10,000

Recurrent expenditure ..... US\$35,000

Monitoring the annual incidence of fire can be done using the same satellite images acquired for land use monitoring. A provision is needed for data capture entailing one person's time for one week/year (US\$500)

Recurrent expenditure ..... US\$500

Initial preparation of 500km firebreaks using a bulldozer capable of clearing 1km/hour at an operating cost of US\$200/hour

*Capital provision* ..... US\$100,000

### (2) Water Supplies

Annual maintenance costs on 5 solar-driven pumps in the Western Caprivi including transport and spares.

Recurrent expenditure ..... US\$15,000

Monitoring the use of the water points by buffalo and other species may be best done by a specific research project carried out over 5 years. The project should contain provisions for radio-tracking equipment, transport, a contribution towards air surveys and a research stipend.

Recurrent expenditure (annual) ..... US\$10,000

Capital costs of drilling (or re-drilling) 5 boreholes, purchase of 5 solar panels and pumps, and construction of drinking pans @ US\$30,000 per installation –

*Capital provision* ..... US\$150,000

### (3) Elephants

In the management plan, it proposed that a research experiment is carried out in a limited locality where the competition between buffalo and elephant is reduced by removing elephant. The performance of the buffalo would be compared with other buffalo in a 'control' area where there is no elephant management. This project proposal would require detailed development and the provision here is of a contingency nature assuming that some active or passive research will be carried out to investigate the competition hypothesis.

Recurrent expenditure (annual) ..... US\$10,000

### 1.3 Abundance

#### (1) Illegal hunting

The required manpower and budgets for the State Protected Areas in the Caprivi were developed in the Background Study (page 58 and Appendix 4) and the relevant table is reproduced here. In order to achieve protection for all State protected areas included in the buffalo range, it is assumed that operating costs must include the State Forest Reserve. These budgets set a critical threshold – if less than the stated amounts, the objective to contain illegal hunting is unlikely to be achieved.

#### Required Budgets for State Protected Conservation Areas in Caprivi

State Conservation Areas	Total Area km <sup>2</sup>	Required Number of Guards	Required Annual Operating Budgets US\$	Cumulative Cost - US\$
Popa Game Reserve	20	5	122,000	122,000
Mahango Game Park	200	15	177,000	299,000
Mamili National Park	280	17	193,000	492,000
Mudumu National Park	1,000	32	300,000	792,000
State Forest	1,500	39	359,000	1,151,000
Caprivi Game Park	5,500	75	727,000	1,878,000
<i>All Protected Areas managed as a single unit</i>	<i>8,500</i>	<i>93</i>	<i>963,000</i>	<i>963,000</i>

Under the present system where each protected area is managed as an independent, self-contained entity the required annual budget for all areas is about US\$1.9 million. Considerable savings result from managing the entire block of State protected areas as one large area – the operating costs are almost halved to US\$963,000 per annum. Similarly the required manpower is reduced from 183 game guards to 93.

For the purposes of this Plan, it will be assumed that the State protected conservation areas are one large area and, accordingly, the required annual budget should be about US\$963,000. Reducing the total area to about 8,000 km<sup>2</sup>, to take into account the fact that parts of the Forest Reserve and the Caprivi Game Park are already encroached upon and would not form part of the buffalo range, the required budget becomes about **US\$900,000**.

There is a capital component associated with this budget which provides for staff housing, office facilities etc. The required capital for developing a park of 8,000km<sup>2</sup> is about US\$6 million. Assuming that about 50% of the required infrastructure is already in place, some **US\$3 million** would be needed to complete infrastructural development.

It does not seem reasonable that the entire set of running costs and capital costs for the State Protected Areas in Caprivi are ‘debited’ against the buffalo project. However, two points need to be made. Firstly, the objectives of the Species Management Plan will not be realised if the Caprivi Parks are underfunded. Secondly, the returns from buffalo management when the population is at carrying capacity are capable of funding the entire set of government wildlife activities in the Caprivi.



To avoid the situation where the entire budget is swamped with a single line item which dwarfs all other financial requirements, the approach taken here is to specify a contribution which the returns from buffalo hunting will make to Parks operating and capital costs in the Caprivi and to recognise that, unless funding is secured from other sources to meet the full Parks requirements, the entire Buffalo Management Plan is in jeopardy. Alternatively, it is the prerogative of the State to take the revenues earned from the buffalo project and use them to meet running costs and capital costs. The contributions are set at 10% of the full requirements

Recurrent expenditure ..... US\$90,000

*Capital provision* ..... US\$300,000

A further 2,000km<sup>2</sup> of the potential buffalo range lies within conservancies. A small provision is made to assist Conservancies with training in combatting illegal hunting and development of monitoring systems for illegal activity.

Recurrent expenditure ..... US\$10,000

#### Monitoring

The costs of monitoring illegal activity are included in the operating costs for State Protected Areas.

There is an overall requirement for monitoring the buffalo population size. The limitations of air survey methods have been pointed out and there is a need to develop improved techniques in order to produce any meaningful estimates. A provision is made here for a standard air survey coupled with the use of a second aircraft with the specific task of spotting and photographing large buffalo herds. This experimental survey would be carried out at the inception of the programme and repeated every two years thereafter if the technique proves adequate. At a sampling intensity of 15%, 1,500km<sup>2</sup> would require to be surveyed out of the total range of 10,000km<sup>2</sup>. At a cost of US\$7.75/km<sup>2</sup> actually surveyed, the total cost would be US\$11,625. Doubling this to provide for the second aircraft gives a survey cost of US\$23,250 and halving the cost because the surveys are only to be done every two years brings the annual cost back to US\$11,625. The cost includes the analysis of data and reporting.

Recurrent expenditure (rounded) ..... US\$11,625

#### (2) Disease

This objective aims primarily at preventing buffalo from contracting diseases which might impair the desired population growth. As was done for the first objective, a small provision is made here for any management measures which contribute to this objective (e.g. cattle fencing) and any clinical tests which might be necessary for diagnostic purposes.

Recurrent expenditure (rounded) ..... US\$10,000

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The full set of costs is summarised in the table on the next page.

### Summary of Budget Requirements for the Buffalo Species Management Plan

OBJECTIVE	Management Activity	Operating Costs	Capital Costs
1.1. Range	(1) Veterinary controls	25,000	500,000
	(2) Land use planning	25,000	500,000
	Monitoring	2,500	
1.2. Habitat	(1) Fire control	35,000	100,000
	Monitoring	500	
	(2) Game Water Supplies	15,000	150,000
	Monitoring	10,000	
	(3) Elephants	10,000	
1.3. Abundance	(1) Illegal hunting - State protected areas ( <b>NOTE</b> )	90,000	300,000
	Illegal hunting - Conservancies	10,000	
	Monitoring (air surveys)	11,625	
	(2) Disease prevention	10,000	
	<b>TOTALS . . . . . US\$</b>	<b>244,625</b>	<b>1,550,000</b>
<i>If the full costs for State Protected Areas are included in the budget, the additional amounts required are . . . US\$</i>		<i>810,000</i>	<i>2,700,000</i>
<b>TOTALS . . . . . US\$</b>		<b>1,054,625</b>	<b>4,250,000</b>

#### NOTE

The amounts allocated to containing illegal hunting in State Protected Areas are a contribution only – which has arbitrarily been set at 10% of the full amount required. The full requirement is US\$900,000 for annual operating costs and US\$3 million in capital investment (see discussion on page 34).

#### PROJECT VIABILITY

In the final part of this annex, the projected earnings from the buffalo population are examined in relation to costs. The assumptions involved in the ‘cash flow’ exercise are as follows --

1. The buffalo population grows at 5% per annum. At this rate it will increase from 3,000 animals to 15,000 animals in 33 years<sup>10</sup> in an area of 10,000km<sup>2</sup>. For the purposes of these financial calculations, the effects of illegal hunting on the growth rate are assumed to be zero.

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10. In practice, population growth to carrying capacity would be more likely to follow a logistic growth curve than a geometric series.

2. The theoretical income which could be derived from the present safari hunting operations in the Caprivi Strip is assumed to be US\$2.5 million. This is likely to be higher than the true figure because most of the secondary species on which the calculations are based are probably not present at the assumed densities.<sup>11</sup> Under the Economic Objectives, it is assumed that, at full development of the safari hunting, safari operators will make a net profit of US\$2.5/hectare. For the purposes of the cash flow exercise which follows it is assumed that this is the baseline and that there is zero income for the State and Conservancies from the present net earnings of US\$2.5 million from 10,000km<sup>2</sup> – all of the present profit is taken by safari operators. Although this is not true, it simplifies the analysis.
3. As the buffalo population increases from 3,000 animals to 15,000 animals, the surplus income from safari hunting rises from zero to US\$5 million. On a simple proportion of areas, 80% of this income will accrue as revenue to the State (8,000 km<sup>2</sup>) and 20% will accrue to Conservancies (2,000 km<sup>2</sup>).
4. Annual operating costs are assumed to remain the same for the full period until the buffalo population reaches carrying capacity. No allowance is made for inflation of operating costs in the table because it is assumed that this inflation would be balanced by a similar inflation in the values of buffalo in the safari hunting industry.
5. The budget includes a contribution of 10% of the running costs and capital costs required for management of the State Protected Areas. It is assumed that the State is meeting the balance. As the revenues from safari hunting increase it becomes possible for the full operating costs to be met from the revenue.
6. The capital costs are assumed to be a bank loan at an interest rate of 10% per annum. It is further assumed that the annual deficit in operating costs in the early stages of the project are met by the bank and added to the loan.
7. Repayments of the loan begin when the State revenues exceed operating costs and all revenue goes into repaying the loan until it is acquitted.

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In the table which follows, all cell values are determined by formulae and it is possible to explore a wide range of scenarios. The project contribution to the State operating and capital costs can be varied in the Costs Summary table on page 36 and this will be reflected in the Cash Flow table on the next page. If the State contributes nothing to the costs, the project can meet the entire set of operating and capital costs for the State from the outset and, provided the interest rate on the bank loan does not exceed 2.5% per annum, the loan will still be acquitted before the buffalo population reaches carrying capacity. If the State meets 50% of its operating costs, the project makes a healthy profit after 22 years. Any donor grants would increase the project viability.

Under the scenario shown in the table, the total loan debt rises to a peak of some US\$3.5 million about 8 years after the start of the project and is acquitted in the 16th year of the project, after which all revenue is profit and the annual operating costs can be met internally.

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11. The elephant population has, however, not been underestimated and, as this is the most valuable species after buffalo, the theoretical figures are not likely to be gross overestimates.

### Analysis of income development in relation to capital and operating cost investment

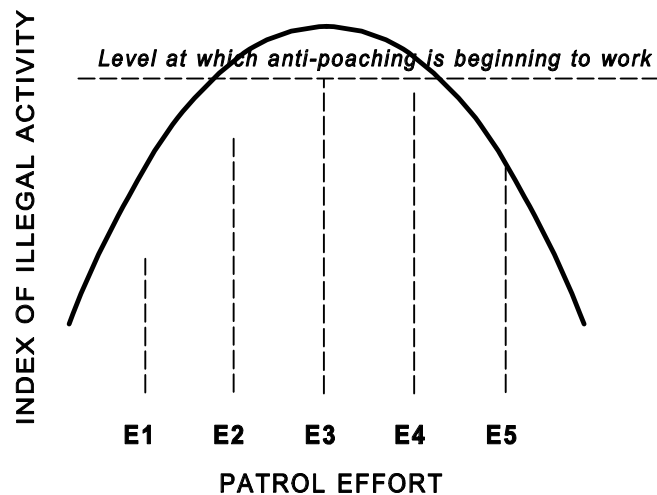
Required initial capital . . . US\$	1,550,000
Required annual operating costs . . . US\$	244,625
Annual interest on balance of loan (%)	10.0

YEAR	INCOME	REVENUE	OPERATING COSTS	Deficit/credit	Loan Balance
	Conservancies	State			
2003	12,500	50,000	244,625	-194,625	1,899,625
2004	25,625	102,500	244,625	-142,125	2,231,713
2005	39,406	157,625	244,625	-87,000	2,541,884
2006	53,877	215,506	244,625	-29,119	2,825,191
2007	69,070	276,282	244,625	31,657	3,076,053
2008	85,024	340,096	244,625	95,471	3,288,188
2009	101,775	407,100	244,625	162,475	3,454,531
2010	119,364	477,455	244,625	232,830	3,567,154
2011	137,832	551,328	244,625	306,703	3,617,166
2012	157,224	628,895	244,625	384,270	3,594,613
2013	177,585	710,339	244,625	465,714	3,488,360
2014	198,964	795,856	244,625	551,231	3,285,965
2015	221,412	885,649	244,625	641,024	2,973,537
2016	244,983	979,932	244,625	735,307	2,535,585
2017	269,732	1,078,928	244,625	834,303	1,954,840
2018	295,719	1,182,875	244,625	938,250	1,212,074
2019	323,005	1,292,018	244,625	1,047,393	285,888
2020	351,655	1,406,619	244,625	1,161,994	0
2021	381,738	1,526,950	244,625	1,282,325	0
2022	413,324	1,653,298	244,625	1,408,673	0
2023	446,491	1,785,963	244,625	1,541,338	0
2024	481,315	1,925,261	244,625	1,680,636	0
2025	517,881	2,071,524	244,625	1,826,899	0
2026	556,275	2,225,100	244,625	1,980,475	0
2027	596,589	2,386,355	244,625	2,141,730	0
2028	638,918	2,555,673	244,625	2,311,048	0
2029	683,364	2,733,456	244,625	2,488,831	0
2030	730,032	2,920,129	244,625	2,675,504	0
2031	779,034	3,116,136	244,625	2,871,511	0
2032	830,486	3,321,942	244,625	3,077,317	0
2033	884,510	3,538,039	244,625	3,293,414	0
2034	941,235	3,764,941	244,625	3,520,316	0
2035	1,000,797	4,003,189	244,625	3,758,564	0

ANNEX 3

Monitoring of Law Enforcement Effort and Illegal Activity

Bell (1986) and Jachmann (1998) give excellent systems for monitoring law enforcement and illegal activity. The rationale underpinning the systems (see figure) is that when no effort is applied to anti-poaching no illegal activity is detected and, as effort is increased in the early stages, an increasing amount of illegal activity is detected. At some point as effort continues to be increased, the amount of illegal activity actually decreases and, with further effort, it can be reduced to a level which is acceptable to wildlife managers and sustainable by wildlife populations. It should be noted that illegal activity can seldom, if ever, be eliminated completely and increasing expenditure on this aspect of park management produces diminishing returns.



The objective of this monitoring is to detect whether the situation is deteriorating or improving over time and whether additional funds and effort have to be allocated to anti-poaching. However, there are other secondary spin-offs from such a system: it provides a comparative analysis amongst scouts of performance on patrols (which can be valuable for promotion purposes or for dismissal of malingers), it can provide the basis for an incentive system and it can be combined with a basic field system for monitoring wildlife population numbers.

Law enforcement effort can be measured in several ways. The number of times a particular grid square (e.g. 5 x 5 km) is visited provides one type of index and measuring the total distances walked in the course of patrols provides another. These are fairly crude measures which can be considerably improved by using a GPS to record actual distances travelled and locations visited.

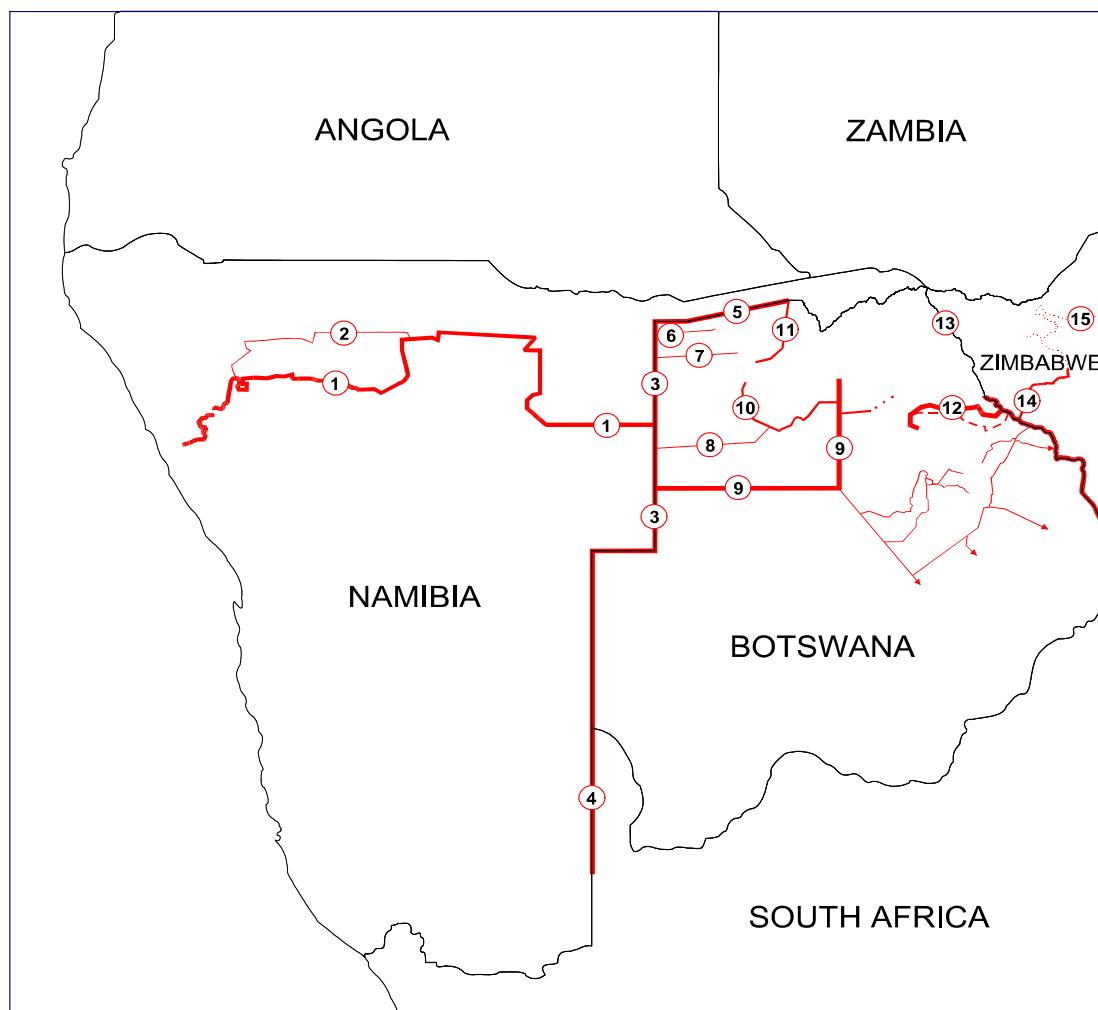
Illegal activity requires to be quantified by developing an index which is appropriate for the park concerned and which weights various activities according to the severity with which they are viewed. Bell (1986, pages 326-329) gives a points system by which illegal activity can be scored and this could very easily be adapted to the needs of the different parks in the Caprivi. Reports of arrests, weapon confiscations and snares recovered are valueless unless organised into an index which can be plotted against patrol effort.

Both Bell and Jachmann emphasize the importance of sound patrol reporting systems and the time which must be spent on debriefing after patrols have been completed if the data collected are to have any validity. Jachmann also details the important rôle which carriers (labourers) play in improving the law enforcement performance and, in an analysis of illegal hunting in the Luangwa Valley, Zambia, it was found that the employment of carriers significantly reduced the illegal offtake of elephants.

## REFERENCES

- ASG (1998). **African Antelope Data Base 1998**. IUCN/SSC Antelope Specialist Group, Compiler R. East, IUCN, Gland, Switzerland. 350pp
- Bell R.H.V (1986). **Monitoring of illegal activity and law enforcement in African conservation areas**. In: *Conservation and Wildlife Management in Africa*. Eds. R.H.V. Bell and E. McShane-Caluzi. US Peace Corps, Washington D.C., pp 317-351.
- CBD (1998). **The Ecosystem Approach**. Decision IV/1.B. of the Conference of the Parties to the Convention on Biological Diversity at its Fourth Meeting held in Bratislava, Slovak Republic, 4-15 May 1998.
- Erb, Peter (1992). **The Buffalo Population of the Waterberg Park**. Unpublished Background Document, Directorate of Scientific Services, Ministry of Environment and Tourism, Republic of Namibia. 4pp
- Foggin, C.M. and R.D. Taylor (1996). **Management and Utilization of the African Buffalo in Zimbabwe**. Proceedings of a Symposium on *The African Buffalo as a Game Ranch Animal*, Onderstepoort, 26 October 1996: 144-161
- Gaerdes, J. (1967). **Bueffel in Suedwestafrika**. Supplement to Mitteilungen, S.W.A. Wissenschaftliche Gesellschaft VIII (1), April 1967. 8pp
- Griffin, M. (1983). **A Preliminary Survey of Amphibians, Reptiles and Mammals in the Bushmanland, Eastern Kavango and Mahango Areas, with some Notes on Historical Distributions**. Compiled 1978-1983 by the Small Animal Biologist, Windhoek, Directorate of Nature Conservation and Recreation Resorts, South West Africa/Namibia
- Jachmann H. (1998). **Illegal Wildlife Use and Law Enforcement in African Savanna Rangelands**. Published by the Wildlife Resource Monitoring Unit, ECZ, Lusaka, Zambia. 124pp.
- Mendelsohn, John and Carole Roberts (1997). **An Environmental Profile and Atlas of Caprivi**. Directorate of Environmental Affairs, Ministry of Environment and Tourism, Republic of Namibia. 45pp
- Morkel, Piet (1988). **Introduction of Disease Free African Buffalo (*Syncerus caffer*) to Game Farms in Namibia**. Report to the Ministry of Environment and Tourism, Republic of Namibia. 41pp
- Sinclair, A.R.E. (1974). **The Natural regulation of Buffalo Populations in East Africa. IV. The Food Supply as a Regulating Factor , and Competition**. East African Wildlife Journal 12(4): 291-311
- Stewart, D.R.M. and J. Stewart (1963). **The Distribution of some Large Mammals in Kenya**. Journal of the East African Natural History Society, 24: 107pp
- Templeton, Alan R. (1986). **Coadaptation and Outbreeding Depression**. In: *Conservation Biology*, M. Soulé [Ed.], Sunderland, Massachusetts, Sinauer: 105-116.
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MAP 1: LOCATION OF THE MAJOR VETERINARY CONTROL FENCES



**KEY TO VETERINARY CONTROL FENCES**

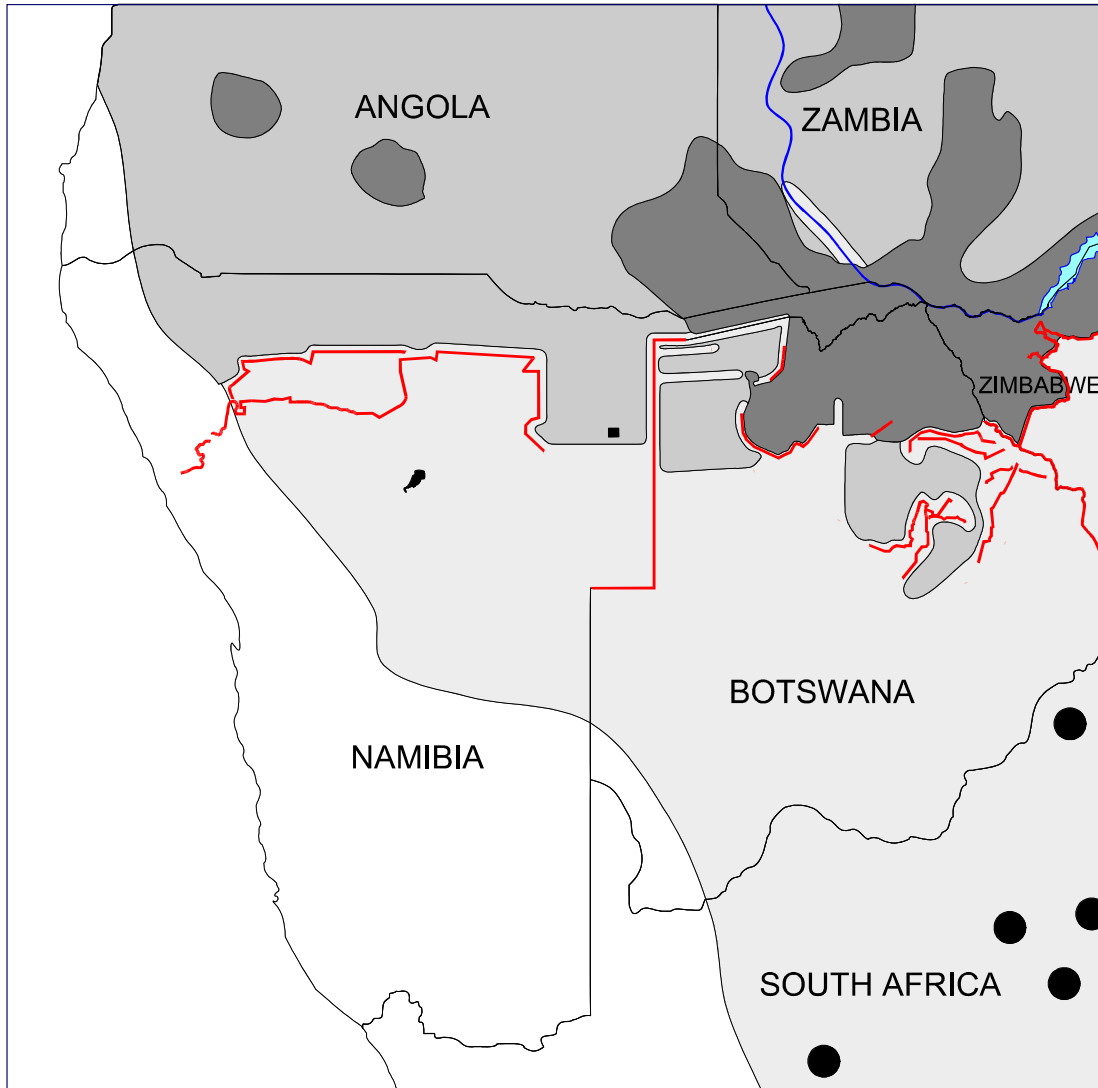
- ① Veterinary Cordon Fence: mid-1960s...
- ② Etosha Northern Boundary. Fence: 1980s
- ③ Namibia/Botswana International Boundary: mid 1960s
- ④ Namibia/South Africa International Boundary: mid 1960s
- ⑤ Caprivi Border 1995 (Early fences 1970-80)
- ⑥ Samuchima 1995
- ⑦ Ikoga 1995
- ⑧ Setata 1996
- ⑨ Kuke 1958
- ⑩ Southern Buffalo Fence 1982
- ⑪ Northern Buffalo Fence 1991-96
- ⑫ Ngwatsha Fence 2000 (original Makalamabedi Fence 1968 shown as dotted line below)
- ⑬ Botswana/Zimbabwe International Boundary 1984
- ⑭ Hwange National Park 1984
- ⑮ Sebungwe 1972






**LEGEND**

- Major Cordon Sanitaire
- Major buffalo-proof fence
- Secondary buffalo-proof fence
- ..... Fence in disrepair
- - - - - Former fence location
- > Fence continues



MAP 2: PAST, AVAILABLE AND ACTUAL BUFFALO RANGES



-  Potential range for buffalo (suitable habitats)
-  Currently available range (determined by veterinary control fences)
-  Actual range
-  Local isolated Foot and Mouth disease-free buffalo subpopulations
-  Veterinary fence

**MAP 3: POTENTIAL BUFFALO RANGE IN THE CAPRIVI**

