K E N Y A W I L D L I F E S E R V I C E

POLICY FRAMEWORK AND DEVELOPMENT PROGRAMME, 1991-96

ANNEX 7A

RHINO CONSERVATION AND MANAGEMENT

November 1990

PREFACE

This report is one of eleven annexes to the report by Kenya Wildlife Service entitled "Policy Framework and Development Programme, 1991-1996", produced in November 1990. It analyses in greater detail some of the issues, policies and investment plans described in the Main Report.

The full list of annexes to the Main Report is:

1. Organisational structure and management.
2. Revenue sources.
3. Development and management of tourism in Parks.
4. National Park and Reserve planning.
5. Wildlife education and visitor services.
6. Community conservation and wildlife management outside Parks and Reserves.
7. Special issues: the conservation of elephants and rhinos.
8. Research programme.
9. Analysis of capital investment needs.
10. Land use planning and management in Kenya.
11. Programme impacts: three case studies.

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This is a report of the Kenya Wildlife Service. It was written by R. A. Brett and E. W. Wanjohi (KWS Staff). The report benefited from consultations with other members of KWS, KWS consultants and representatives from donor organisations and NGO's contributing to rhino conservation in Kenya.

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ANNEX 7A

RHINO CONSERVATION AND MANAGEMENT

1.1 INTRODUCTION

Since the turn of the century, the black rhinoceros has declined dramatically in both the extent of its range and its numbers in sub-Saharan Africa. In recent years the black rhino has become extinct, or is nearing extinction, in 12 African countries, and its numbers have dropped 90% across the continent in the last 17 years. The black rhino is now only found in reasonable numbers (i.e. at least 100) in Zimbabwe (2000), South Africa (600), Namibia (390), Kenya (400) and Zambia (100).

Poaching for the horn has been, and continues to be the major cause of the decline of the black rhino. Despite sustained efforts to control the trade in rhino products, particularly horn, there has been little reduction in the poaching pressure on the black rhino in Africa as a result. The substantial black rhino populations remaining in Zimbabwe have been under intense pressure from Zambian poachers since 1985. In general, the diminishing returns from fewer poachable rhinos have not stopped the trade, reduced the price of rhino horn on world markets, nor the incentive to poach. A poacher can sell a pair of rhino horns for more than a year's salary at the set minimum wage for his country; this will be on average less than 5% of the retail price of those same horns in Far Eastern markets (ca. $4000/kg).

The decline in the black rhino has been particularly severe in Eastern Africa, where the very large National Parks and Reserves such as Tsavo NP and the Selous GR each used to hold more black rhinos than currently survive on the whole continent. Tanzania's black rhinos may number less than 60 animals, and Uganda and Somalia probably have less than 10 animals between them. The black rhinoceros dropped in numbers in Kenya from an estimated 20,000 in 1970 to probably under 500 animals in the early 1980's. Throughout the 1970's and early 1980's, Kenya's black rhinos were poached in all areas, inside and outside of Parks and Reserves, with few restrictions and little law enforcement. In addition to the removal of most of the black rhinos in lowland areas (e.g. Tsavo NP, Meru NP) by well-organised Somali poachers, the most rhinos from highland rhino populations were slaughtered by corrupt elements within the former WCMD as much by local poachers.

In Kenya it was eventually recognised that the only hope for protecting the remaining black rhinos lay in concentrating within smaller areas the resources and anti-poaching security which had previously been spread to thinly to be effective. From 1984, the WCMD embarked on a policy of translocation of black rhinos into specially protected areas, which now come under the general heading of 'sanctuaries'. Within these relatively small areas, many of which are completely enclosed by specially designed

electric fences with alarms, most of the country's black rhinos have been protected from poaching and have bred up in numbers. Rhino sanctuaries have been stocked largely with unprotected rhinos, often isolated animals from outlying areas, or with surplus rhinos from two areas which were stocked with black rhinos in the late 1960's and early 1970's and have since neared their respective carrying capacities, namely Nairobi NP and Solio Ranch. The latter demonstrated the potential of protecting and breeding up black rhinos within a fenced sanctuary.

Kenya now holds the only substantial wild populations of the north eastern ecotype/subspecies of the black rhinoceros (Diceros bicornis michaeli), now numbering 380-400 animals. 300 of these are located in 11 well-protected areas, which include (or are contained within) 6 national parks or reserves (Nairobi NP, Lake Nakuru NP, Tsavo West NP (Ngulia rhino sanctuary), Aberdares NP Salient, Amboseli NP and Masai Mara GR) and 5 sanctuaries on private land (Solio, Lewa Downs, Ol Jogi, Ol Pejeta and Laikipia ranches). Six of these areas are ring-fenced (four on private land), three are partially fenced, and two are open parks or reserves. The status of these 11 populations at the end of 1989 is shown in Table 1. There are 80-100 additional rhinos located in outlying areas, most of which are outside the National Parks and Reserves, and are the less well protected remnants of larger poached-out rhino populations. None of these populations is larger that 20 animals, and most are inviable in the long term and would benefit from capture and translocation into sanctuaries.

In the last four years it has become clear that the 'sanctuary' policy has been a success, and in the short term holds the best hope for recovery of the black rhino in East Africa, particularly in view of the desperate position for this species in neighbouring countries. Apart from South Africa, Kenya is the only country where black rhino are known to be increasing in numbers. If the black rhino populations in Southern Africa, particularly in Zimbabwe, continue to suffer the reductions that Kenya suffered, they will probably also have to adopt the same policy and increase the number of small rhino populations specially protected as a backup to efforts to control poaching of the larger populations. In Kenya, black rhinos located in sanctuaries have suffered little poaching and have shown an annual increase in numbers of about 5%. This is about half the rate of increase that could be obtained once all the sanctuaries, particularly those which are fenced, have been stocked with a sufficient number of rhinos, particularly females, in order to ensure high calving rates.

All black rhinos in Kenya are owned by the Kenya Government. However, a large part of the limited success achieved can be attributed to the efforts and foresight of private landowners, particularly in the Laikipia and Meru Districts, who invested substantial resources in protecting black rhinos on their land while rhino populations in Parks and Reserves were being heavily poached. Since 1984 there has been an exceptional coalition between the private sector, NGO's and donor organisations which

realised, the potential of rhino sanctuaries, and the WCMD/KWS. Surplus rhinos bred up in privately owned sanctuaries have been used to stock new sanctuaries in National Parks, and surplus rhinos from both private land and Parks and Reserves will continue to be used to complete the stocking of new sanctuaries in both sectors. With continued cooperation all Kenya's relatively small black rhino populations can be managed interactively to enable the best breeding opportunities and potential for restocking Parks and Reserves within the KWS system.

In addition to Kenya's black rhinos there are approximately 60 white rhinos in Kenya, all of the southern race (Ceratotherium simum simum). Evidence from fossils and cave paintings in Kenya and Northern Tanzania suggests that the white rhino was widespread and a part of the East African savanna fauna until 2000 years ago, or less, when it was probably displaced by pastoralists who could easily kill such tame animals. The reintroduction of white rhinos into Kenya, all of which were imported from South Africa in the 1970's, cannot therefore be judged as a case of bringing in an 'exotic' species. All but one of the white rhinos are at present located on private land and are privately owned. KWS will be conserving this species along side the black rhino, and establishing small populations in enclosed Parks with appropriate ecotype, particularly those with good potential for tourist viewing. Once sufficient numbers of white rhinos have been bred up in such Parks, KWS may generate revenues from sale of animals to the private sector in Kenya, or to other Governments or parties outside Kenya.

The modest recovery of the black rhinoceros so far achieved in sanctuaries in Kenya is one significant success story which will be given the local and international publicity it deserves. The demonstration that an African wildlife department, with assistance from outside donors, has been able to turn around the decline of an endangered animal such as the black rhino is of great importance for generating the confidence of future donors in KWS being able to do the same for the elephant. Information on the steady increase in numbers, and successful management of the black rhino in Kenya will be used extensively in KWS's local education programmes, and in promotional material put out by KWS in the local and international media.

Rhino Area: Type & Name	----Males----- AD	SA	CF	ST	----Females--- AD	SA	CF	ST	--Unknown Sex-- AD	SA	CF	ST	TOT	-----Management------ A	D	CC	HL	S	---Breeding--- SR	%CC	%C	1986-9 +	-	1989 +	-	CR
RING-FENCED:																											
Nakuru NP	8	3		11	5	2		7			2	2	20	142	0.13	71	53		1.57	40	10.0	2		1		1
Ngulia RS	1			1	5	1		6			2	2	9	73	0.12	73	55		0.17	40	22.2	2	2	1	2	1
Solio R GR	16	2	8	26	19	5	6	30			2	2	58	56	1.04	56	42	16	0.87	84	27.6	17	5	1	0	1
Lewa Downs R RS	1	1	1	3	5	1	4	10					13	40	0.33	26	20		0.30	100	38.5	4				1
Ol Jogi R GR	1	3	1	5	3	1		4			1	1	10	73	0.14	20	15		1.25	67	20.0	3	1	1	1	1
Ol Pejeta R GR	2	2		4									4	93	0.04	93	70		-	-	0.0					1
Total	29	11	10	50	37	10	10	57	0	0	7	7	114	1135	0.10	337	253	16	0.88	73	24.7	28	8	4	3	
PART-FENCED:																											
Nairobi NP	15	9	3	27	18	8	5	29			1	1	57	117	0.49	60	45	12	0.93	50	15.8	12	2	5	1	1
Aberdare NP	7	1	2	10	9	3	3	15				12	37	70	0.53	50	(50)		0.67	56	28.0	5				2
Laikipia R	19	3	1	23	10	4	1	15	3		2	5	43	397	0.11	100	(100)		1.53	40	9.3	5	1	2	1	1
Total	41	13	6	60	39	13	9	59	3		3	18	137	584	0.23	210	195	12	1.02	46	13.1	22	3	7	2	
UNFENCED:																											
Masai Mara GR	5	1	3	9	11	1	2	14	1		1	2	25	1690	0.01	80	(80)		0.64	55	24.0	7		1		1
Amboseli NP	4	1		5	2	1		3			1	1	9	390	0.02	50	(50)		1.67	50	11.1	2	2	1		1
Total	9	2	3	14	13	2	2	17	1	0	2	3	34	2080	0.02	130	130		0.82	54	20.6	9	2	2	0	
TOTALS	79	26	19	124	89	25	21	133	4	0	12	29	285	3410	0.08	679	580	28	0.93	58	18.2	59	13	13	5	

Key:
AD=Adults(>6 y.o.)
SA=Subadults(4-6 y.o.)
CF=Calves (<4 y.o.)
ST=Subtotal (Sex)
TOT=Population total
A=Area of rhino reserve (sq km)
D=Density of rhino (per sq km)
CC=Carrying Capacity (Brett (1989) estimate)
ML=Management Level
S=Existing Surplus of Rhino (number of rhino exceeding ML, available for translocation
SR=Known Sex Ratio (No.Males/No.Females)
%CC=Percentage of Adult Cow Rhino with Calves
%C=Percentage of Calves in population
'+'=Total No. of Births for stated period
'-'=Total No. of Deaths for stated period
CR=Census Rating (Du Toit 1989)
NP=National Park
GR=Game Reserve
R=Private Ranch

Table 1 - Population Statistics for the black rhinoceros in Kenya (at the end of 1989), and overall breeding performance from 1986 to 1989

2.1 AIMS

2.2 Short term: 1991-1995

1. To protect the black rhinoceros (north east African ecotype: Diceros bicornis michaeli) and white rhinoceros (southern ecotype: Ceratotherium simum simum) in all areas of Kenya.

2. To protect all viable populations of black rhinoceros in sanctuaries: areas where there are special developments in place (e.g. electric fencing, intensive anti-poaching/surveillance) for this purpose.

3. To establish breeding populations in those areas with appropriate numbers and diversity of founders, in order to breed up 500 black rhinoceros by 1995.

4. To establish a breeding population of the white rhinoceros (Ceratotherium simum simum) in Lake Nakuru NP.

2.3 Medium term: 1996-2000

4. To maintain achievement of objectives 1., 2., 3. and 4.

5. To attain a target for 680 black rhinoceros by 2000, roughly the absolute ecological carrying capacity of the presently established sanctuaries in Kenya.

6. Given a surplus of black rhinoceros bred up in the sanctuary areas, to continue to 'harvest' surplus rhinoceros from sanctuaries on a basis of maximum sustained yield in order to reintroduce black rhinoceros to areas of their former range, particularly in areas where successful recolonisation and fast breeding are likely; also to recolonise the surrounding areas of sanctuaries by releasing animals from within enclosures, so that restocking results, and, if security is sufficient and breeding output high, so that fencing can eventually be removed.

2.4 Long term: 2000 onwards

7. To develop and conserve in the long term a genetically viable population of at least 2000 black rhinoceros of the northeast african ecotype (Diceros bicornis michaeli) in their natural habitat, this being the minimum number to ensure the survival of this species in Kenya in the long term.

8. To encourage the continued protection and breeding of white rhinoceros (Ceratotherium simum simum) on private land and enclosed National Parks.

3.1 RHINO CONSERVATION & MANAGEMENT PROGRAMME

3.2 Management of existing populations

The Kenya Wildlife Service will continue the programme of construction of the presently planned sanctuaries, and of stocking these areas with surplus rhinos from areas already at or approaching carrying capacity, or with unprotected rhinos from outlying areas.

The black rhinos in Kenya can be roughly divided into those which are found in hot, low altitude bushland which is infested with tsetse flies which infect the rhinos with trypanosomes (e.g. Tsavo NP, Meru NP), and rhinos those found in cooler, higher altitude areas (e.g. Aberdare NP), where the tsetse fly does not occur. 60% of the black rhinos in sanctuaries are part of 'hybrid' populations located in highland areas (e.g. Nairobi NP, Solio Ranch), but which were stocked with large numbers of animals from the Tsavo area in the 1960's.

Kenya's total rhino population is too low (380-400) to allow separate management of the upland and lowland rhino populations for genetic reasons, in particular the very small numbers of 'pure' lowland black rhino populations. For these reasons Kenya's black rhinos will be treated for management purposes as one population. Although the feasibility of routinely moving upland rhinos to lowland tsetse-infested areas has not yet been fully established (i.e. the ability of upland rhinos to become resistant to infection with trypanosomes after translocation: see section 5.5), the intention is to move large numbers of surplus rhinos from the sanctuaries, most of which are located in highland areas, to restock the large areas of unrestricted lowland rhino habitat that are still capable of supporting thousands of black rhino (e.g. Tsavo NP).

The following general management policy in rhino sanctuaries will be adopted:

1. All rhinos will be managed for maximum breeding output so that numbers of rhinos increase as fast as possible.

2. Maximum breeding rates will be maintained when numbers approach the carrying capacity of sanctuaries, particularly those which are totally enclosed, by translocating out a maximum sustained yield of rhinos to other rhino conservation areas which satisfy certain criteria (see Section 3.2.1).

3. Surplus rhinos moved out of existing sanctuaries will be used to complete the stocking of the remaining planned sanctuaries. Once all sanctuaries have reached or exceeded their management levels, surpluses will be used to restock larger areas of unrestricted rhino habitat in the National Parks and Reserves which used to hold large numbers of black rhino (e.g. Tsavo NP, Aberdares NP, Mt Kenya NP, Meru NP), depending on sufficient security in these recipient areas and all other criteria (see Section 3.2.1).

4. All rhino populations and their habitat requirements will be monitored in order to achieve 2.

Managing existing rhino populations for maximum sustained yield will be achieved by removing animals above 75% of the ecological carrying capacity (ECC) for each area, equivalent to a management level (ML) or optimum stocking rate. Numbers will be permitted to build up by 5-10 animals, depending on overall population size, before removals take place. These periodic removals would optimise the efficiency and cost-effectiveness of the removal operations, would minimise the disturbance to the animals and would allow time for annually repeated surveys to provide reliable population trends.

The ecological carrying capacities and hence the 75% management levels set for each area will be based on minimum rhino numbers required to reduce (a), breeding output, and (b), food resources, and will take into account the density and movements of rhino, the quality of the rhino habitat, and the numbers of other browsing herbivore species. These have been estimated for the 11 major rhino conservation areas in Kenya, and they are listed in Table 1. It can be seen that two areas of upland Kenya, Solio Ranch and Nairobi NP, already have surpluses of rhino exceeding management levels available for translocation to other rhino conservation areas.

It should be stressed that the policy of breeding up black rhinos in relatively small sanctuaries has been, and will continue to be a vital holding action in reversing the decline in rhino numbers, and that the ultimate objective is to use the sanctuary populations as a 'breeding bank' of actively managed rhinos for provision of a continuous supply of surplus rhinos to restock the much larger, unrestricted areas of rhino habitat. It is these areas which are capable of supporting the minimum viable populations of rhino (e.g. 2000 rhinos) which no longer require active management to maintain their genetic variation, and reduce the probability of demographic instability or the risk of minor catastrophes.

Monitoring data accumulated on the numbers and densities of rhinos in each area, their breeding output at these densities and the impact on these numbers on the browse availability, will be used to feed back to the formation of decision rules about management of rhino numbers within sanctuaries, and the setting of carrying capacities and hence the equilibrium offtake for different rhino sanctuaries, particularly those enclosed by fencing.

3.3 The establishment of new rhino populations

3.3.1 Criteria for selection of new rhino areas

When assessing the suitability for new sanctuaries or reserves for stocking with black rhinos, the following guidelines will be observed:

-- The habitat must be suitable for rhinos, preferably with a previous history of a high density of black rhinos in the same area.

-- The poaching threat should not be severe, or if it is, effective control must be demonstrated. If rhinos are being moved to unrestricted or unfenced areas, the security, surveillance and monitoring in combination must be sufficient to demonstrate population growth despite occasional poaching of rhino.

-- The potential rate of increase of the rhino population in the recipient area must exceed that of the donor area

-- The potential effective founder population should be at least 10 rhinos, i.e. total founder population should be at least 20-25 rhinos.

-- The ecological carrying capacity should be at least 20 rhinos.

-- The number of founders should not exceed 50% of the ecological carrying capacity.

-- The current population size should not exceed 60% of the ecological carrying capacity.

-- There should be no disease or other health risk to the rhinos.

-- Current or proposed land-use must be compatible with conserving the species.

-- Small areas stocked (e.g. less that 100 sq km) should be fenced or have boundaries to prevent rhinos dispersing.

3.3.2 Selection of rhinos for translocation

The criteria for the selection of outlier rhinos for translocation and removal to sanctuary populations will be:

1. The rhino is in imminent danger of being poached.

2. The rhino is isolated from other rhinos, or is part of a 'doomed', inviable and/or potentially inbred group, which through translocation would become part of a viable population.

3. The rhino is not breeding, because of 2.
Other factors influencing the priority of individuals for translocation into sanctuaries are:

4. The cost of capture and translocation. Two capture operations of individual rhinos in remote areas in late 1989 and early 1990 cost $8,000 and $13,000 per rhino respectively, largely due to the necessity of using a helicopter. The high cost of catching an individual rhino in particularly difficult conditions may in some cases outweigh the small benefit to a recipient population (in terms of its contribution to improved breeding output) of catching and moving it there in the first place, particularly if the rhino is a male (see point 6.).

5. The rhino is of large genetic value, because of its remoteness from other populations, the habitat type and possible local adaptation of the rhino or 'store' of genetic variation. This factor is hard to quantify, but may become clearer following on-going genetic studies (see Section 5.4).

6. The rhino is a female. Females are particularly valuable in increasing breeding output in a recipient population.

3.4 Maintenance of genetic diversity

The following guidelines will be observed as far as possible:

1. New rhino populations will be founded by 20-25 rhinos, preferably unrelated breeding animals.

2. Founder populations will be allowed to expand as fast as possible to numbers exceeding the management level set for the area, but not exceeding its carrying capacity.

3. 1-2 rhinos (unrelated breeding animals) will be moved into each population every generation (6-15 years). This will involve the movement of rhinos between small sanctuary populations, as well as the capture and translocation of outlying unprotected rhinos into sanctuaries.

3.5 Rhinos, tourist viewing and revenues

All rhinos, whether black or white, are important and valuable species for tourist viewing, and may well provide as much viewing satisfaction to visitors as does the elephant. However the best rhino habitat is essentially dense bushland or forest, where rhinos are unlikely to be spotted away from particular places where the animals are attracted to water or salt licks (e.g. The Ark, Treetops). In general, the more open the habitat and the higher the density of rhinos, the more rhinos are likely to be seen, and therefore the more valuable they are for tourist viewing. Rhinos are among the most sought after species for

viewing by all tourists visiting KWS Parks and Reserves. This factor has probably increased with the endangered status and general scarcity of rhinos.

Of the 380-400 black rhinos remaining in Kenya, only about 140 animals are regularly visible in the more open Parks and Reserves. These include (in approximate order of viewing probability):

Nairobi NP	62
Masai Mara GR	28
Aberdares NP (Ark & Treetops)	20
Lake Nakuru NP	23
Amboseli	8
Mt Kenya NP/Forest Reserve (Mountain Lodge)	4

It is difficult to assess how much tourism revenues from different parks such as the above are dependent on the presence, and more importantly, the visibility of black rhinos. But there must be a major contribution to gate revenues from these, particularly when the areas are known and publicised as rhino sanctuaries. Lake Nakuru NP gate receipts have climbed steadily since 1987 when rhinos were introduced from Solio Ranch.

Although there are only 7 black rhinos left in Amboseli NP, most of these are easy to find, and safari companies can almost 'guarantee' showing them to their clients. Each animal is enormously valuable as a result. Much the same situation exists in the Ngorongoro Crater Conservation Area in Tanzania. One can virtually guarantee to see rhino in Nairobi NP because of their high density and the particular 'tameness' of many well known rhinos to the proximity of vehicles. Because of the rhinos viewing value, the policy for managing rhinos and moving rhinos between populations will be adapted to maintain high rhino densities in the present and future 'showcase' rhino sanctuaries, such as Nairobi NP and Lake Nakuru NP.

In the several private land rhino sanctuaries, land owners are already making money out of tourism coupled to conservation of the black rhino. In KWS sanctuaries or protected areas where rhinos are less visible due to the dense vegetation or forest, tourists can be attracted to game viewing lodges where rhinos are attracted by salt or water (e.g. The Ark). Similar camps or lodges could benefit from the introduction of rhinos into protected areas in the future. Rhinos are more valuable in the more open 'showcase' rhino sanctuaries (e.g. Nairobi NP), especially at high numbers, but this value will have to be weighed against the need to breed up rhinos in areas of better rhino habitat where higher densities could be supported.

When assessing the pros and cons of moving particular rhinos out of areas which are near carrying capacity and which have good rhino viewing (e.g. Nairobi NP), in order to reduce the potential negative impact on tourist viewing, the intention is to select

those animals for translocation which are more secretive, or with home ranges located in dense bush, where they are largely inaccessible to tourist viewing. Many rhinos do become habituated to the presence of vehicles and general disturbance, and become in general much less aggressive, and many of these are well known by the drivers of tourist vehicles, and thus can almost be 'guaranteed' to their clients. These popular rhinos are clearly not good candidates for translocation.

In general rhino numbers in prime viewing areas would not be adversely affected by translocations of 'surplus' rhinos to other protected areas, as the densities at which rhinos are moved out should be large enough to ensure good viewing, especially in populations in open reserves nearing carrying capacity.

3.6 Rhinos on private land

All black rhino in Kenya, including those on private land, are the property of the Kenya Government, and the Kenya Wildlife Service will make and implement all decisions necessary to their survival in Kenya, in particular the maintenance of sufficient security. If the criteria for holding black rhino on private land are satisfied (Section 3.2.1), and the areas rank sufficiently high in priority over Parks and Reserves for receiving rhinos in the first place, private land owners will be encouraged to generate funds for their protection and management, particularly through tourism in these areas.

White rhinos in Kenya are the property of the landowner, they may be purchased and sold at mutually agreed prices, inside or outside of the Republic of Kenya. However all decisions over their sale, management and protection must be made with the approval of, and in consultation with KWS. KWS will enforce management decisions for the white rhino on private owners, particularly if they in any way compromise or conflict with measures to conserve the black rhino in Kenya.

4.1 RHINO CONSERVATION & MANAGEMENT REQUIREMENTS

In order to maintain the recovery of the small populations of black rhino in Kenya, total security for these is vital. Depending on the location and characteristics of different areas, security depends on different factors (e.g. anti-poaching, fencing and alarms) and the aspects to the poaching threat (e.g. distance to political (or National) boundary, security status of region, previous incidence of poaching).

The Kenya Wildlife Service will place the security of all rhino populations as a highest priority. However all populations will be regularly rated for poaching threat, in addition to biological and genetic status, and if in the future the security of any rhino population is judged to have deteriorated sufficiently, whole rhino populations may be captured and translocated to safer

areas (which do satisfy the criteria of Section 3.2.1), where feasible.

Existing rhino sanctuaries vary considerably in size and 'design' particularly in relation to security. For example, the Lake Nakuru Rhino Sanctuary is Lake Nakuru NP, where, apart from rhino monitoring patrols and other rhino-specific activities, there is a large overlap with the normal park management. The fence around Lake Nakuru NP is important as much for the Park, and surrounding human inhabitants, as for the rhino. In contrast, the Ngulia rhino sanctuary is a smaller fenced area deep within the Tsavo West National Park. The fence here is designed purely to contain rhino, and has no other purpose. The security, however, is dependent on anti-poaching by the Tsavo NP Field Force over a much wider area, which of course covers elephant and other wildlife, and is not rhino-specific. Thus in different sanctuaries, there are different areas of overlap with normal parks management.

Although KWS staff involved in the rhino conservation programme are in many cases employed in rhino-specific activities (e.g. fence maintenance, rhino monitoring), as rhino numbers do build up in sanctuaries, and more rhino are released in operations to restock unrestricted areas of Parks and Reserves, the security and management requirements for rhinos in different areas will steadily merge more fully with the normal requirements of Parks and Reserves, as they did in the past.

The requirements of the most important KWS-managed rhino conservation areas are listed in Appendix 7A.1, containing all items necessary for the maintenance of rhino surveillance and fencing in these areas. Also crucial to the maintenance of maximum breeding output of rhinos in all areas is an extensive programme of translocations of rhinos between sanctuaries and into sanctuaries from outlying areas. These translocation requirements are listed in Appendix 7A.2.

A KWS fencing unit is to be formed to oversee the maintenance all fence barriers in the KWS areas, and particularly of rhino fencing. The proposed establishment of this unit, and the stores of equipment and supplies necessary for this unit are listed in Appendix 7A.4.

5.1 RHINO RESEARCH PROGRAMME

5.2 Rhino monitoring

Successful management of the black rhino populations for maximum sustained breeding output and avoidance of overpopulations depends on detailed population monitoring. A system of monitoring of the rhino populations in sanctuaries is already in place, aimed primarily at obtaining the following information:

-- Absolute population sizes in each area.

-- Population performance indicators annually.

-- Recruitment rate to each population.

-- Personal history records of all rhinos.

-- Details of all matings, births and mortalities.

-- Identities of breeding animals.

-- Confirmation of the presence and health of individual rhinos.

Rhino surveillance personnel in the major rhino areas collect information from daily vehicle and foot patrols, and record this in record books drawn up for the purpose. Staff in private land rhino areas will be required to monitor their rhino populations in order to obtain the minimum information required to identify all individuals, regularly census and establish population trends. Most of the black rhino in the protected areas are identifiable from individual features (e.g. horn shape), and individual identification is the basis of all monitored information. All animals immobilised for translocation, tagging or treatment are ear-notched to assist future identification.

5.3 Vegetation monitoring and food resources

The most important components of the diet and browse preferences of black rhino in all major conservation areas will be identified. A long-term regime of monitoring the browse availability will be initiated, especially in confined ring-fenced areas. The impact of other browsing herbivores and their influence on the food resources available for rhino will be assessed in each area.

Vegetation monitoring in rhino sanctuaries will concentrate on the following:

-- Routine ground photography of enclosed areas from fixed points/cairns (N,S,E,W directions) in wet and dry seasons. Use of these points for long-term transects.

-- Rhino diet identification - key browse species.

-- Browse availability: Line transects, exclosure plots, Bush/tree heights, browse levels and stem diameters, crown diameters, woody vegetation cover.

Collaborating institutions:
National Museums of Kenya - East African Herbarium
University of Nairobi - Botany Department
Moi University, Eldoret
Wildlife Conservation International
University of Bayreuth - Germany

5.4 Ecological monitoring in rhino sanctuaries

The successful management of rhino sanctuaries and other small parks/reserves, particularly those enclosed by fencing, other confines, and/or surrounded by human settlement, will depend critically on detailed ecological monitoring. Particular attention should be paid to assessment vegetation status (see Section 5.2), and the numbers and population dynamics of several species of, perhaps competing, grazing and browsing herbivores.

Judging by the events that have taken place already in fenced rhino sanctuaries on private land in the last 10-15 years (e.g. Solio Ranch Game Reserve, Lewa Downs Rhino Sanctuary, Ol Jogi Ranch Game Reserve; Lake Nakuru NP, Nairobi NP), these systems are susceptible to major swings in the numbers of different species. For example: die-offs of eland, kudu, oryx & wart-hog in dry years; overpopulations of waterbuck and impala at low predator numbers; large increases in numbers of giraffe, zebra and buffalo in most areas; overbrowsing of favoured browse species by black rhino (made more acute by giraffe grazing at lower browse levels, after depleting reserves at their own level). These are all areas where elephant are absent.

In enclosed areas, there is a need for a monitoring system appropriate to the whole ecosystem. In rhino sanctuaries, priority is usually given to the requirements of the black rhino, i.e. complete protection for this species, maintaining the habitat conditions and population structure to promote maximum sustainable breeding output. This inevitably means that in many rhino sanctuaries, there are already major 'giraffe problems', which potentially or already are having negative effects on the food reserves available to the rhino. The management of numbers of predator species will be critical to controlling the degree of competition for numerous grazing or browsing species, which would compete less at lower numbers (e.g. separated browse levels).

Appropriate long-term vegetation monitoring will be carried out in all enclosed rhino sanctuary, and the numbers and inter-relationships of other major predator and herbivore species will be monitored, particularly number of potential competitors with the rhino. The susceptibility of enclosed areas to catastrophic events (e.g. disease, major fire) is potentially a big threat to the rhino populations they may contain.

Collaborating institutions:
Moi University, Eldoret
Wildlife Conservation International

5.5 Genetic studies

The Kenya Wildlife Service will continue to sample individual rhinos immobilised during translocation or treatment for blood and tissue. Each rhino requires assessment of levels of genetic variation or inbreeding, and more detailed analyses of genetic material can enable detection of degrees of relatedness between individual rhinos. These analyses can and will affect management decisions in the future, in particular those involving the choice of particular animals for translocations between sanctuaries in order to minimise inbreeding.

As data on the population dynamics, survivorship, individual life histories and breeding performance in well monitored rhino populations accumulate, the value of computer modelling and projections of the future performance and inbreeding levels in each will increase. Computer analyses of well known small rhino populations in Kenya are already providing indications of how soon action will have to be taken to avoid inbreeding. These will also allow Population Viability Analyses (PVA) to be undertaken.

Collaborating Institutions:
National Museums of Kenya - Institute of Primate Research
Centre for Reproduction of Endangered Species -
Zoological Society of San Diego
Institute of Zoology - Zoological Society of London

5.6 Disease resistance

Studies will continue on establishing the feasibility of routine translocations of black rhino from upland areas of Kenya, free of tsetse fly and trypanosomiasis, to lowland tsetse-infested sanctuaries or release areas. These involve the movement of a few selected 'guinea-pig' rhinos from upland sanctuaries (e.g. Solio Ranch, Nairobi NP) to lowland areas (e.g. Tsavo NP, Masai Mara GR), monitoring their infection by trypanosomes, and characterising the latter collected from rhino and from tsetse fly populations surveyed in the recipient area. Most of the successful rhino sanctuaries are located in non-fly areas, and most of the potential release areas for large numbers of rhino are located in tsetse fly/trypanosomiasis areas. As it is not yet confirmed that upland rhinos can easily adapt to translocation to tsetse fly areas, and large numbers of rhinos need to be moved, these studies are of particular importance to the future management.of the black rhino in Kenya.

Collaborating institutions:
ICIPE

5.7 Physiological monitoring

Recent advances in non-invasive methods of monitoring the levels of reproductive hormones in wild rhinos have enabled diagnosis of pregnancy in females, and the identification of breeding males. Hormones are measured in samples of urine, saliva and blood, when obtainable. It is difficult to detect pregnancy visually in female black rhino, and early diagnosis can be of considerable assistance is assessing breeding performance and planning translocations. The identification of breeding males is very useful in assessing the genetic contribution of individuals in small populations, and hence preventing single animals from over-representation in the gene-pool in future generations or inbreeding. Further development of monitoring methods and assays of suitable reproductive hormones will continue in laboratories in Kenya, and in the field.

Collaborating institutions:

National Museums of Kenya - Institute of Primate Research
Institute of Zoology - Zoological Society of London
German Primate Centre
Centre for Reproduction of Endangered Species - Zoological Society of San Diego

5.8 Nutrition

Particular conservation areas for the black rhino in Kenya are known to suffer from deficiencies of certain minerals in the soil and browse (e.g. Lake Nakuru NP). Mineral studies will continue in these areas in order to assess the potential impact of these deficiencies on the health and breeding of rhinos in these areas, and the need for mineral supplements.

Collaborating institutions:

Imperial College, London
National Museums of Kenya - East African Herbarium

6.0 RHINO RESEARCH REQUIREMENTS

Research on Kenya black rhino will concentrate on rhino population and vegetation monitoring. In most areas the monitoring work will be undertaken by the officers in charge of the rhino surveillance units, who are also in charge of management and security in each area. Thus there will be a direct link between the monitoring information and its use in rhino management.

At present the rhino surveillance officers in the three of the four major KWS rhino areas (Nairobi NP, Lake Nakuru NP, Tsavo Ngulia Rhino Sanctuary) are trained biology graduates, and their assistants are Park Assistants with experience of monitoring rhinos, plant identification and vegetation monitoring. Five more KWS surveillance officers, three of which are already posted to their respective rhino areas, will be trained in rhino population

and vegetation monitoring techniques, for application in areas not adequately covered at present (Aberdare NP, Amboseli NP, Masai Mara GR, Mt Kenya NP, Ngeng Valley). Three rhino monitoring officers will be trained in different aspects of research on black rhino biology and conservation in the next five years, one to PhD level, and two to MSc level.

The research requirements of the rhino conservation programme are listed in Appendix 7A.3

7.1 COLLABORATION WITH NEIGHBOURING COUNTRIES

7.2 Cross-border cooperation

In the Masai Mara GR and Amboseli NP, black rhinos from Kenya wander into Tanzania, and, particularly in the former case, their security is threatened as a result. Improved communication between KWS, TANAPA and the Tanzania Wildlife Division in these areas, and agreements of cross-border security and anti-poaching would improve the prospects of the survival of these international rhinos.

7.3 Provision of rhinos

As the status of the black rhino populations in neighbouring countries is so poor, if sufficient surplus rhino from sanctuaries become available, Kenya will be in a position to assist other countries with the donation, deposit or sale of individual black rhinos for breeding purposes, perhaps sponsored by donor agencies.

Tanzania has probably only about 50 black rhinos, the total population fragmented into very small sub-populations, none of which are viable in the long-term without input of unrelated animals. These could benefit from the inclusion of surplus males from Kenya, or eventually females if available, otherwise many of the small remnant populations are doomed. Somalia is reported to have 4-6 'doomed' rhinos near to the Kenya border. The black rhino in Uganda is probably extinct.

7.4 Other assistance

If Kenya cannot provide rhinos in the future, it could at least provide expertise to the wildlife departments of neighbouring countries wishing to conserve their black rhino populations, in the following areas:

-- Monitoring and census of rhino populations.

-- Capture expertise and assistance.

-- Population management.

-- Advice and assistance on construction of rhino sanctuaries.In the latter area, Kenya has had probably more experience and success than any other African country.

Although the policy has yet to be clearly defined to specific conservation areas, Tanzania in particular is planning to capture and translocate inviable 'pockets' of black rhinos remaining in the vast Selous GR to sanctuaries. Identification, monitoring and assessment of individual rhinos for capture, capture and transport of the rhinos, and planning and construction of rhino

sanctuary infrastructure in Tanzania could all benefit from input of expertise from Kenya.

Although there are as yet no established techniques of artificially enhancing breeding output, or artificial transfer of genetic material between rhino populations (e.g artificial insemination, embryo transfer), once these methods are feasible Kenya could assist neighbouring countries that have inviable or critically inbred rhino populations with provision of genetic material (semen, ova).

APPENDIX 7A.1

KENYA RHINO CONSERVATION PROGRAMME

(i) COSTS BY ZONE

All recurrent costs starting 1991, and continuing at same levels annually to 1996.
All capital demands immediate (1991), and probably non-recurring.

[Vehicle costs: Maintenance 25%, Depreciation 20%]

		JG	No	Kshs
KWS HQ	Staff	5	1	163 740
		6	1	140 640
	Total			304 380
	Transport			
	Capital			
	1 Suzuki LWB Pickup			300 000
	Recurrent			708 000
	Total			1 008 000
	Materials (Research)			
	Capital			90 540
	Recurrent			43 200
	Total			133 740
	TOTAL			**1 446 120**
NAIROBI ZONE	Staff	6	1	140 640
		11	2	126 240
		12	1	48 960
		13	1	42 720
		14	15	492 300
		15	12	274 320
	Total			1 125 180
	Transport			
	Recurrent			726 000
	Total			726 000
	Materials			
	Capital			241 180
	Recurrent			16 225
	Total			257 405
	TOTAL			**2 108 585**

COSTS BY ZONE (continued)

RIFT VALLEY ZONE	Staff	6	1	140 640
		9	1	90 660
		11	1	63 120
		12	2	97 920
		13	5	213 600
		14	26	853 320
		15	15	342 900
	Total			1 802 160
	Transport			
	Recurrent			987 600
	Total			987 600
	Materials			
	Capital			121 180
	Recurrent			16 225
	Total			137 405
	Casuals			120 000
	TOTAL			**3 077 165**
SOUTH KENYA ZONE	Staff	6	1	140 640
		9	1	90 660
		13	4	170 880
		14	21	689 220
		15	10	228 600
	Total			1 320 000
	Transport			
	Capital			
	1 Suzuki LWB Pickup			300 000
	Recurrent			1 434 000
	Total			1 734 000
	Materials			
	Capital			541 180
	Recurrent			16 225
	Total			557 405
	Casuals			120 000
	TOTAL			**3 731 405**

COSTS BY ZONE (continued)		JG	No	Kshs
MOUNTAINS ZONE	Staff	9	1	90 660
		12	1	48 960
		13	4	170 880
		14	19	623 580
		15	20	457 200
	Total			1 391 280
	Transport			
	Capital			
	1 Suzuki LWB Pickup			300 000
	3 Motorbikes			150 000
	Recurrent			828 000
	Total			1 278 000
	Materials			
	Capital			391 180
	Recurrent			16 225
	Total			407 405
	TOTAL			**3 125 645**
NORTH KENYA ZONE	Staff	11	1	63 120
		12	1	48 960
		13	1	42 720
		14	15	492 300
	Total			647 100
	Transport			
	Recurrent			519 000
	Total			519 000
	TOTAL			**1 166 100**
RHINO TRANSLOCATIONS (Annual recurrent)				**1 800 000**
FENCING UNIT	Staff	9	1	90 660
		13	2	85 440
		15	4	131 280
	Total			307 380
	Transport			
	Capital			
	1 L/Rover Petrol Pickup			900 000
	Recurrent			519 000
	Total			1 419 000
	Materials			
	Capital			73 160
	Total			73 160
	TOTAL			**1 799 540**

(ii) COSTS BY FUNCTION
(excludes KWS HQ Staff & Transport)

	JG	No	Kshs
RHINO SURVEILLANCE/MONITORING			
Staff	6	3	491 220
	9	2	181 320
	11	2	126 240
	12	5	244 800
	13	10	427 200
	14	95	3 117 900
Total		117	4 588 680
Transport			
Capital			300 000
Recurrent			3 117 600
Total			3 417 600
Materials			
Capital			900 540
Recurrent			43 200
Total			943 740
Casuals			120 000
TOTAL			**9 070 020**
RHINO FENCE MAINTENANCE (including Fence Unit) (Total length of fencing: 186 km (1990), increasing to 228 km (1991))			
Staff	9	1	90 660
	11	2	126 240
	13	6	256 320
	14	6	196 920
	15	57	1 303 020
Total		72	1 973 160
Transport			
Capital			1 350 000
Recurrent			1 083 000
Total			2 433 000
Materials			
Capital			484 720
Recurrent			64 900
Total			549 620
Casuals			120 000
TOTAL			**5 075 780**
RHINO TRANSLOCATIONS (Annual recurrent)			**1 800 000**

(iii) DETAILED COSTS BY AREA

KWS HQ

A. Staff

Title	JG	No
Project Coordinator (Senior Biologist)	5	1
Project Officer (Biologist I)	6	1
Personnel Total		2

B. Transport

Capital (Kshs '000):

Vehicle Type	Cost	No
Suzuki 4WD LWB Pickup	300	1

Recurrent (Kshs '000):	Fuel & Maint.	Deprn.	Total	No
Suzuki 4WD LWS Pickup	147	60	207	1
L/Rover Diesel S/Wagon	321	180	501	1
Total			1 008	

NAIROBI ZONE

NAIROBI NP

RHINO SURVEILLANCE

A. Staff

Title	JG	No
Warden/Biologist I	6	1
Asst Warden III	11	1
Sergeant	12	1
Rangers	14	12
Drivers	14	2

B. Transport

Recurrent (Kshs '000):	Fuel & Maint.	Deprn.	Total	No
L/Rover Petrol Pickup	339	180	519	1

C. Materials

Item	Unit cost	No	Total cost
Capital:			
VHF Radios	30 000	4	120 000

FENCE MAINTENANCE
(Length of Fence: 25 km (1990), increasing to 36 km (1991))

A. Staff

Title	JG	No
Asst Warden III	11	1
Fence Foreman	13	1
Driver	14	1
Subordinate Staff	15	12
Total		15

B. Transport

Recurrent (Kshs '000):	Fuel & Maint.	Deprn.	Total	No
Suzuki 4WD LWB Pickup	147	60	207	1

C. Materials

Item	Unit cost	No	Total cost
Capital:			
Voltmeters	3 520	3	10 560
Pliers	1 000	2	2 000
Rolls of Wire	2 280	4	9 120
Insulators	25	500	12 500
Posts	120	200	24 000
Jembes	100	5	500
Slashers	100	4	400
Hammers	100	2	200
Tents	9 000	6	54 000
Strainers	1 900	1	1 900
Rubber Gloves	100	3	1 200
Knapsack Sprayers	2 400	2	4 800
Recurrent:			
Herbicide: Hyvar-X	16 225/25kg	25 kg	16 225
Total			137 405

RIFT VALLEY ZONE

LAKE NAKURU NP

RHINO SURVEILLANCE

A. Staff

Title	JG	No
Warden/Ecologist I	6	1
Field Assistant	13	1
Sergeant	12	1
Corporals	13	2
Rangers	14	13
Drivers	14	2
Total		20

B. Transport

Recurrent (Kshs '000):	Fuel & Maint.	Deprn.	Total	No
Suzuki 4WD LWB Pickup	147	60	207	1

FENCE MAINTENANCE
(Length of fence: 74 km)

A. Staff

Title	JG	No
Assistant Warden III	11	1
Foreman	13	1
Driver	14	1
Subordinate Staff	15	15

B. Transport

Recurrent (Kshs '000):	Fuel & Maint.	Deprn.	Total	No
4WD LWB Pickup	147	60	207	1
Tractor	30	12	42	1
Gyromower	4	2	6	1
Total			255	

C. Materials

Item	Unit cost	No	Total cost
Capital:			
Voltmeters	3 520	3	10 560
Pliers	1 000	2	2 000
Rolls of Wire	2 280	4	9 120
Insulators	25	500	12 500
Posts	120	200	24 000
Jembes	100	5	500
Slashers	100	4	400
Hammers	100	2	200
Tents	9 000	6	54 000
Strainers	1 900	1	1 900
Rubber Gloves	100	3	1 200
Knapsack Sprayers	2 400	2	4 800
Recurrent:			
Herbicide: Hyvar-X	16 225/25kg	25 kg	16 225
Total			137 405

MASAI MARA GR

RHINO SURVEILLANCE

A. Staff

Title	JG	No
Assistant Warden I	9	1
Sergeant	12	1
Corporal	13	1
Rangers	14	10
Total		13

B. Transport

Recurrent (Kshs '000):	Fuel & Maint.	Deprn.	Total	No
1 L/Cruiser 4WD Pickup	339	180	519	1

LOITA HILLS

RHINO SURVEILLANCE

A. Staff (local Masai employed on casual basis)

Title	No	Salary
Supervisor	1	24 000
Scouts	10	96 000
Total	11	120 000

B. Transport (Supervision from Masai Mara GR)

Vehicle	Maint & Fuel/month	Annual cost
L/Cruiser 4WD	550	6 600

SOUTH KENYA ZONE

TSAVO WEST NP - NGULIA RHINO SANCTUARY

RHINO SURVEILLANCE

A. Staff

Title	JG	No
Warden/Biologist I	6	1
Field Assistant	13	1
Sergeant	12	1
Corporals	13	1
Rangers	14	16
Total		20

B. Transport

Recurrent (Kshs '000):	Fuel & Maint.	Deprn.	Total	No
Suzuki 4WD LWS Pickup	147	60	207	1
L/Rover Petrol Pickup	339	180	519	1
Total			726	

C. Materials: VHF Radios

Type	No	Unit cost	Total cost
Portable	5	30 000	150 000
Vehicle set	2	30 000	60 000
Base station	2	60 000	120 000
Total			330 000

FENCE MAINTENANCE
(Length of fence: 41 km)

A. Staff

Title	JG	No
Foreman	13	1
Subordinate Staff	15	10
Total		11

Title	Salary	No
Casual Labourers	120 000	10

B. Transport

Capital (Kshs '000):

Vehicle Type	Cost	No
Suzuki 4WD LWB Pickup	300	1

Recurrent (Kshs '000):	Fuel & Maint.	Deprn.	Total	No
Suzuki 4WD LWS Pickup	147	60	207	1
L/Cruiser Diesel Pickup	321	180	501	1
Total			1 008	

C. Materials

Item	Unit cost	No	Total cost
Capital:			
Voltmeters	3 520	3	10 560
Pliers	1 000	2	2 000
Rolls of Wire	2 280	4	9 120
Insulators	25	500	12 500
Posts	120	200	24 000
Jembes	100	5	500
Slashers	100	4	400
Hammers	100	2	200
Tents	9 000	6	54 000
Strainers	1 900	1	1 900
Rubber Gloves	100	3	1 200
Knapsack Sprayers	2 400	2	4 800
Recurrent:			
Herbicide: Hyvar-X	16 225/25kg	25 kg	16 225
Total			137 405

AMBOSELI NP

RHINO SURVEILLANCE

A. Staff

Title	JG	No
Assistant Warden I	9	1
Corporals	13	1
Rangers	14	4
Drivers	14	1
Total		7

B. Transport

Recurrent (Kshs '000):	Fuel & Maint.	Deprn.	Total	No
Suzuki 4WD LWB Pickup	147	60	207	1

C. Materials: VHF Radios

Type	No	Unit cost	Total cost
Portable	2	30 000	60 000
Vehicle set	1	30 000	30 000
Total		60 000	90 000

MOUNTAINS ZONE

ABERDARES NP

RHINO SURVEILLANCE

A. Staff

Title	JG	No
Assistant Warden I	9	1
Field Assistant	13	1
Sergeant	12	1
Corporals	13	1
Rangers	14	12
Drivers	14	2
Total		18

B. Transport

Capital (Kshs '000):

Vehicle Type	Cost	No
Suzuki 4WD LWB Pickup	300	1

Recurrent (Kshs '000):	Fuel & Maint.	Deprn.	Total	No
Suzuki 4WD LWS Pickup	147	60	207	1
L/Rover Petrol Pickup	339	180	519	1
Total			1 026	

C. Materials: VHF Radios

Type	No present	No required	Unit cost	Total cost
Portable	0	6	30 000	180 000
Vehicle set	0	1	30 000	30 000
Base station	0	1	60 000	60 000
Total				270 000

FENCE MAINTENANCE
(Length of fence: 37 km (1990), increasing to 68 km (1991))

A. Staff

Title	JG	No
Foreman	13	1
Subordinate Staff	15	20

B. Transport

Capital (Kshs '000):

Vehicle Type	Cost	No
Motorbike	150	3

Recurrent (Kshs '000):	Fuel & Maint.	Deprn.	Total	No
Motorbikes	72	30	102	3
Total			252	

C. Materials

Item	Unit cost	No	Total cost
Capital:			
Voltmeters	3 520	3	10 560
Pliers	1 000	2	2 000
Rolls of Wire	2 280	4	9 120
Insulators	25	500	12 500
Posts	120	200	24 000
Jembes	100	5	500
Slashers	100	4	400
Hammers	100	2	200
Tents	9 000	6	54 000
Strainers	1 900	1	1 900
Rubber Gloves	100	3	1 200
Knapsack Sprayers	2 400	2	4 800
Recurrent:			
Herbicide: Hyvar-X	16 225/25kg	25 kg	16 225
Total			137 405

MT KENYA NP

RHINO SURVEILLANCE

A. Staff

Title	JG	No
Field Assistant	13	1
Corporal	13	1
Rangers	14	5
Total		7

NORTH KENYA ZONE

MATTHEWS RANGE - NGENG VALLEY
(FOREST RESERVE)

RHINO SURVEILLANCE

A. Staff

Title	JG	No
Assistant Warden III	11	1
Sergeant	12	1
Corporal	13	1
Rangers	14	15
Total		18

B. Transport

Recurrent (Kshs '000):	Fuel & Maint.	Deprn.	Total	No
L/Cruiser Petrol Pickup	339	180	519	1

APPENDIX 7A.2

RHINO TRANSLOCATIONS
(65 Black rhino, 15 White rhino)

Numbers of translocations and Costs over 5 years 1991-1995
Administered through KWS HQ

Area	Number of rhino	Cost per rhino (Kshs)	Cost per year (Kshs)	Cost for 5 yrs (Kshs)
TO				
Lake Nakuru NP	20	70 000	280 000	1 400 000
Tsavo Ngulia	10	250 000	500 000	2 500 000
	20	70 000	280 000	1 400 000
Aberdares NP	5	70 000	70 000	350 000
	3	250 000	150 000	750 000
Amboseli NP	10	70 000	140 000	700 000
Ol Pejeta	15	70 000	140 000	700 000
	2	250 000	100 000	500 000
Lewa Downs	5	70 000	70 000	350 000
Total	90		1 800 000	9 000 000
FROM				
Nairobi NP	30	70 000	420 000	2 100 000
Unprotected Areas	15	250 000	750 000	3 750 000
Solio Ranch	45	70 000	630 000	3 150 000
Total	90		1 800 000	9 000 000

APPENDIX 7A.3

RESEARCH

Administered through KWS HQ

A. Staff
(Overlaps with Rhino surveillance/security)

A. RHINO SANCTUARIES:
Nairobi NP, Lake Nakuru NP, Aberdare NP, Tsavo West NP

1	Biologists (BSc level)	4
2	Technicians - Field Assistants (have a knowledge of vegetation identification & monitoring)	4

B. OTHER AREAS (to be trained)

1	Masai Mara GR - Biologist (BSc level), NCO	2
2	Amboseli NP - AW I, Park Assistant	2
3	Mt Kenya NP - NCO	1
4	Matthews Range/Ngeng Valley - AW III, 2 NCOs	3
TOTAL		16

B. Materials

Capital:

Item	Number	Unit cost(Kshs)	Total Cost(Kshs)
Binoculars	18	4600	82 800
Dictaphones	3	2580	7 740

Recurrent:

Film & processing:	Annual cost (Kshs)
4 x 5 x 12 x 180/-	43 200
Total	133 740

APPENDIX 7A.4

KWS FENCING UNIT

A. Staff

Title	JG	No
Assistant Warden I	9	1
Fence Technicians	13	2
Subordinate Staff	14	4
Total		7

B. Transport

Capital (Kshs '000):

Vehicle Type	Cost	No
L/Rover 4WD Petrol Pickup	900	1

Recurrent (Kshs '000):	Fuel & Maint.	Deprn.	Total	No
L/Rover Petrol Pickup	339	180	519	1
Total			1 419	

C. Materials

Capital:

Item	Unit cost	No	Total cost
Voltmeters	3 520	3	10 560
Tents	9 000	6	54 000
Strainers	1 900	2	3 800
Knapsack Sprayers	2 400	2	4 800
Total			73 160