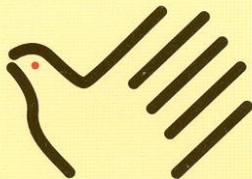


SADC REGIONAL PROGRAMME FOR RHINO CONSERVATION

FEASIBILITY STUDY FOR THE ESTABLISHMENT OF A RHINO SANCTUARY FOR BLACK AND WHITE RHINOS AT ZIWA RANCH, BURUULI, UGANDA

Rob Brett

*Coordination with National and Continental Rhino Conservation
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Author: Rob Brett

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The Programme is contracted to CESVI and implemented through a regional consortium which comprises:

- The Secretariat of the Southern Africa Development Community (SADC)
- IUCN-ROSA (The World Conservation Union - Regional Office for Southern Africa)
- The IUCN African Rhino Specialist Group
- WWF-SARPO - (World Wide Fund for Nature - Southern Africa Regional Programme Office)
- CESVI (Cooperazione e Sviluppo)

The **Programme goal** is to contribute to maintain viable and well distributed metapopulations of Southern African rhino taxa as flagship species for biodiversity conservation within the SADC region.

The **Programme objective** is to implement a pragmatic regional rhino strategy within the SADC region following the acquisition of sound information on, firstly, the constraints and opportunities for rhino conservation within each range state and secondly, the constraints and opportunities for rhino metapopulation management at the regional level.

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CONTACT DETAILS FOR THE PROGRAMME:

Dr. Rob Brett SADC Regional Rhino Programme Coordinator IUCN-ROSA 6 Lanark Road Belgravia PO Box 745 Harare, Zimbabwe Tel: 263-4-728266 Fax: 263-4-720738 Email: robb@iucnrosa.org.zw	SADC Secretariat Directorate of Food, Agriculture and Natural Resources P O Box 0095 Gaborone Botswana
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CESVI Zimbabwe Office 9 Northwood Rise, Mt Pleasant, Harare, Zimbabwe TEL/ FAX: 263-4-882243, 884492, 850898 EMAIL: cesvi@africaonline.co.zw	Ministero degli Affari Esteri Direzione Generale per la Cooperazione allo Sviluppo, Unità Tecnica Centrale Viale Contarini (angolo Viale Farnesina) 00194 ROMA ITALY
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BACKGROUND & RATIONALE

In recent years there has been a strong motivation from within Uganda to reintroduce the species of rhinoceros (eastern black - *Diceros bicornis michaeli*, and the northern white - *Ceratotherium simum cottoni*) that became extinct in the country by the early 1980's. Since 1997, Rhino Fund Uganda (RFU), with the support of the Uganda Wildlife Authority (UWA) has been the focus of efforts to achieve this. A feasibility study for the reintroduction of white and black rhinos to Uganda (Brett 1998) identified the most suitable areas for reintroduction in the medium-long term (Murchison Falls NP) and short term (Nshara Ranch/Lake Mburo NP), based on agreed reintroduction guidelines and relative rating of candidate areas, and recommended that southern white rhinos (*Ceratotherium simum simum*) be considered for introduction as an alternative to northern whites. Subsequently, the Nshara area could not be secured for rhino conservation and after a dormant period a revitalised RFU began work on a phased approach for reintroduction, commencing with the import of pair of southern white rhinos to a new captive facility at UWEC in Entebbe. Following the successful establishment of these white rhinos at the UWEC exhibit in 2001, the second phase in the RFU's efforts to reintroduce rhinos to Uganda has been the identification of a private ranch in Nakasongola district. Private ranches in the Buruuli area were examined in brief within the 1998 study, and had promise in the short term as potential rhino sanctuaries, particularly given their relatively secure central location within Uganda, well away from international borders. The long-term objective remains to establish a large viable population of black and/or white rhinos within Murchison Falls NP, which has the largest area of suitable habitat for both species within former range, once adequate protection and management capacity in this area can be assured.

The sanctuary establishment phase has now been strongly bolstered by the offer of the use of one ranch (Ziwa Ranchers Ltd) in Buruuli for the purpose of breeding eastern black rhinos, southern white rhinos and/or northern white rhinos (should a breeding group of the latter become available from captive populations and the (only) *in situ* population). With this land becoming available, a more detailed evaluation of its suitability and feasibility for rhino conservation was required, and this report presents the findings of this assessment, including recommendations for development and management of the area and neighbouring land units with rhino conservation as a focus for wildlife-based land use. The evaluation and this report resulted from a five-day mission to Uganda by the author in January 2002, including 3 days spent at Ziwa ranch and 2 days in Kampala, the work based on preliminary terms of reference drawn up by RFU (Annex I).

PROCEDURE AND SOURCES OF DATA

Ziwa ranch and some surrounding areas were visited from 29th to 31st January 2002. This visit included a ground survey of all areas of the ranch accessible by vehicle, and a GPS survey of all tracks, fence lines and cut lines on the ranch, with point positions recorded at habitat areas inspected, where digital photographs were taken. The length of riverine grassland along the Lugogo River was also covered on foot. All tracks and routes driven or walked, and all point locations recorded, were logged as tracks and waypoints on a Garmin GPS receiver, and downloaded to PC. The visit was made

during the dry season (see Rainfall, below); at this time there were few forbs/herbaceous plants visible, and several areas of grassland were being burnt.

GIS data compiled for the production of maps and spatial analysis were derived from five sources (below):

- (i) GPS survey of Ziwa ranch, described above, comprising mainly boundaries and tracks
- (ii) Point, line and polygon features digitised into GIS from a raster scan of the north-eastern corner of the 1:50,000 topographic map sheet KITONGOLO 50/1
- (iii) Ranch boundaries entered into GIS by triangulation from bearing and distance data taken from title deeds of two portions of Ziwa ranch (the south eastern and south western corners of the ranch adjacent to the Lugogo river)
- (iv) GIS data for the KITONGOLO 1:50,000 sheet acquired by RFU from the National Biomass Study (NBS) of the Uganda Forest Department (FD), specifically data on administrative boundaries, infrastructure, rivers, land cover (use, including broad classes of vegetation and land use, stocking levels, wet/dry land, and % bush/vegetation cover), and elevation (500 ft contours). The NBS 1:50,000 dataset is derived from satellite imagery from the early 1990s.
- (v) Areas of land adjacent to Ziwa ranch drawn as free-hand polygons by the Ziwa ranch manager, including information on the approximate size of areas and current ownership.

GIS data layers from these sources (including NBS *ArcView* .shp files) were imported into *MapMaker Pro*, and projected in UTM for the production of a land cover map (Figure 1), a sanctuary area/boundary planning map (Figure 3), and spatial analysis.

Interviews and meetings with ranch employees, RFU representatives and board members, and senior staff of UWA in Kampala took up the remaining time of the five-day mission.

OVERVIEW OF THE BURUULI AREA FOR RHINO CONSERVATION

The rationale for possible selection of private land in the central part of Uganda for rhino conservation was given in the 1998 feasibility study, and can be summarised as follows:

- A central area is likely to have reduced risk and vulnerability to poaching due to its location away from international borders, and not suffer from consequences of any residual instability or rebel activity within or bordering Uganda.
- A private land area may offer a higher degree of control over development and management in partnership with a donor/NGO compared with a government land or a UWA-managed protected area
- As part of a sanctuary or protection zone for rhinos, other important wildlife concentrations in the area could also be protected (e.g. including some of the important remaining populations of ungulates found along the lower (north) end of the Kafu river basin (Lamprey and Michelmore 1996b))

- There is potential for integration of existing cattle ranching operations with game ranching, in addition to the benefits of using rhinos as a catalyst for developing a wildlife-based economy in the area.
- There are useful and important precedents elsewhere in African rhino range states where private sector rhino conservation initiatives (e.g. Kenya sanctuaries, Zimbabwe conservancies) have provided vital additional or alternative areas for conserving rhinos, particularly when remnant populations in government protected areas have been vulnerable or seriously depleted by poaching.
- The development and successful breeding of rhino populations in private sanctuaries offers an opportunity for future provision of a supply of rhinos for developing new populations of rhinos on state land, and subsequent management of these as a country metapopulation.
- Some of the private/government ranches in the Buruuli area have already been developed and have infrastructure (track network, communications, water development, some fencing, etc) that would facilitate further development as game ranches or sanctuaries.
- The area falls neatly within an existing tourist circuit, primarily as a stopover between Kampala and visitor attractions or protected areas in the north (e.g. Murchison Falls NP), but also as a day-trip or one-night stop destination from Kampala.

However, there are also a number of disadvantages, constraints or negative aspects attached to developing rhino population on private land, and specifically in the Buruuli area:

- The Buruuli area is not known historical range of any rhino species (see Brett (1998): Figure 1), and theoretically translocation of rhinos to this area would constitute a local introduction. However, it is more than likely that the distribution of black and rhinos did extend south from the present Murchison Falls NP South in prehistoric times (see Brett 1998, page 4 for discussion of former range of rhinos in Uganda)
- The general habitat of the Buruuli area (broad-leaved woodland) is of low suitability compared with the known former range areas for black rhino in northern Uganda (see Brett 1998: Figure 1).
- The area has no history or track record of wildlife management or protection. There is no general law enforcement of security dedicated to wildlife protection in the general area at the moment, and the wildlife populations of the area have been progressively removed by poaching in the last five years, since aerial surveys identified the important concentrations of wildlife in the north Kafu basin (Lamprey and Michelmore 1996). This poaching of wildlife, predominantly using dogs, nets and spears, has been accompanied by or associated with the immigration and/or occupation of much of the Luweero-Masindi ranching area by Bahima pastoralists and their cattle moving in from the south east of Uganda.
- The development of a rhino sanctuary or conservancy for wildlife conservation in the area would depend on the motivation of the individual landowners, and economic benefits associated with a change in land-use. There would be continued vulnerability to illegal hunting of wildlife, particularly subsistence hunting, for any fenced are, and due to the mix of settlement and migratory pastoralists there would

be a major demand and requirement for effective law enforcement and positive involvement of surrounding communities.

- From a national perspective, although supported by UWA, a private land rhino sanctuary would have no initial connection with UWA/MTTI protected areas or role in the improvement and security of Uganda's wildlife estate.

However, with the formal support by UWA/MTTI of (and within) RFU and the apparent consensus within Uganda that the best initial approach to successfully reintroducing wild populations of rhinos is to establish a fenced sanctuary, a private ranch in the Buruuli area offers considerable potential. This would apply not only to establishing a founder population of rhinos, but also to the use of rhinos as a catalyst for securing and conserving viable populations of other species outside protected areas in central Uganda, with the aim of establishing a wildlife industry on private or communal land. The private ranch offered to RFU by Ziwa ranchers Ltd for use as a rhino conservation area or sanctuary is now described in more detail.

DESCRIPTION OF ZIWA RANCH

Land Area and Topography

Ziwa is a fenced cattle ranch located south of the main Kampala-Gulu road between Nakasongola and the Kafu river bridge, under current ownership (Capt Joe Roy/Ziwa Ranchers Ltd) since 1986. The Lugogo River, a tributary of the Kafu, makes up approximately 9 km of its southern boundary and is fringed with extensive papyrus swamp and seasonally inundated swamp grassland. Although the ranch management supplied a figure of 80 km² as the total size of the ranch, GIS mapping of the ranch confirmed the area as 61 km² within the rather complex boundary lines (Figure 1). The latter, particularly in the western, eastern and south-eastern sectors, result from acquisition of land units and their addition to the original area of the ranch. The ranch terrain gently undulates between 3,400 and 3,500 ft amsl, and drains southwards into the Lugogo. The only major promontory in the immediate area, Kasozi Hill (located just outside the ranch boundary) reaches 3,700 ft and has good views over the Lugogo and Ziwa ranch itself.

The area is managed as a cattle ranch, specifically for beef production from Boran stock, and the ranch has a well-developed network of graded motorable tracks, cut lines, dams, cattle paddocks and outposts within the boundary, currently enclosed by a 1 metre high 5 strand barbed wire perimeter fence (excepting the Lugogo river frontage). Apart from the network of graded tracks, there are two public dirt roads that pass through the ranch. The first road runs from the ranch main gate on the northern boundary to the south through the ranch towards Kasozi Hill. The other public road cuts through the New Wangorira sector on the west side of the ranch, allowing access to the Mukasa area. The ranch is managed from a centrally located headquarters and manager's house, and 1400 m airstrip has recently been cleared close by. Although primarily a cattle ranch, a small bush lodge consisting of thatched rondavels has been built close to the Lugogo with good views of the attractive woodland fringe and grassland zones along the river.

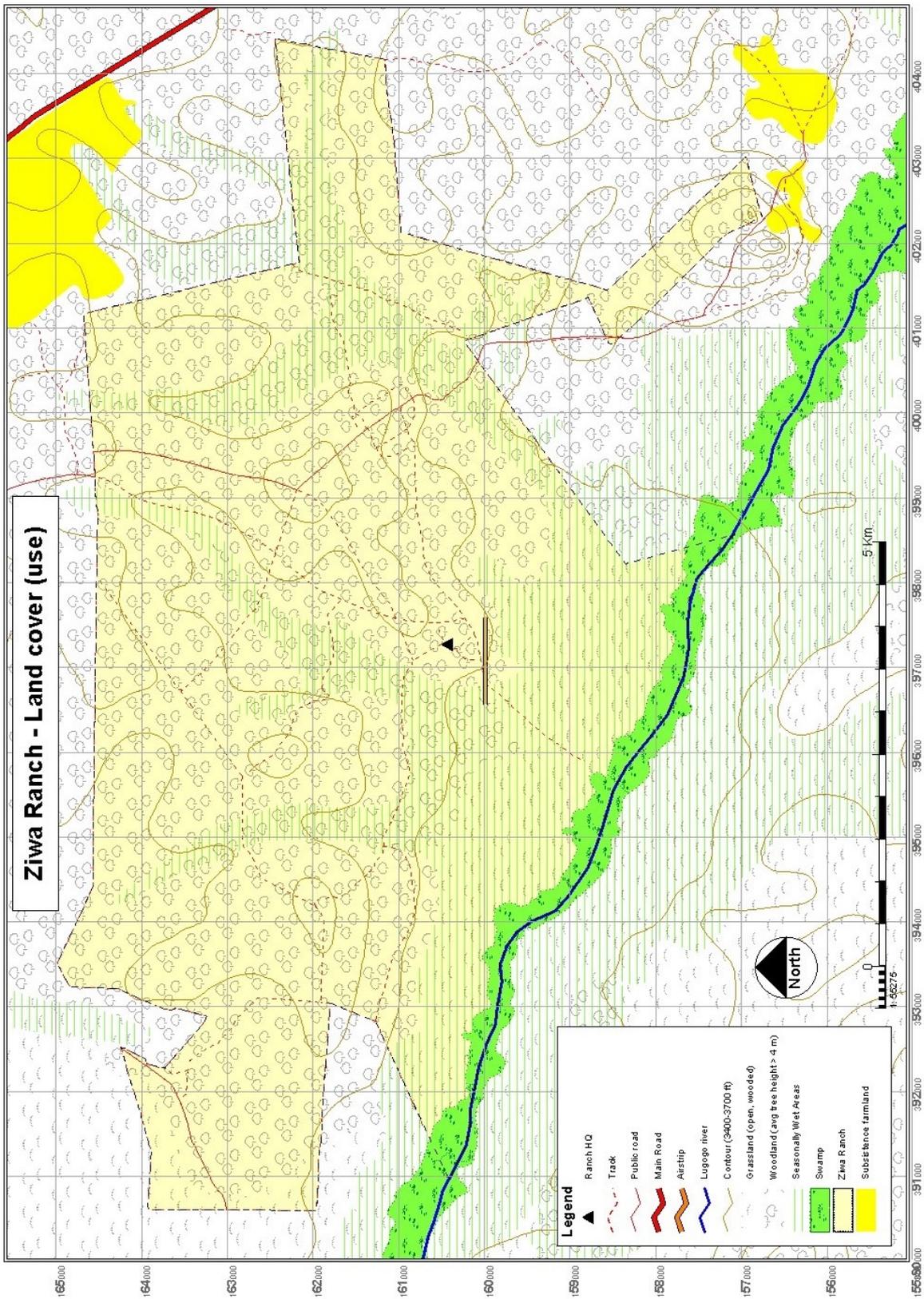


Figure 1 - Land cover (use) map of Ziwa Ranch and surrounds, Buruuli

Rainfall

Ziwa rainfall is bimodal in distribution with peaks in April and October, and well spread through the year. Only three months receive typically less than 50 mm, the longest dry period being January to February (Figure 3). The mean annual rainfall for the five years data collected at the ranch headquarters (1997-2001) was 1100 mm.

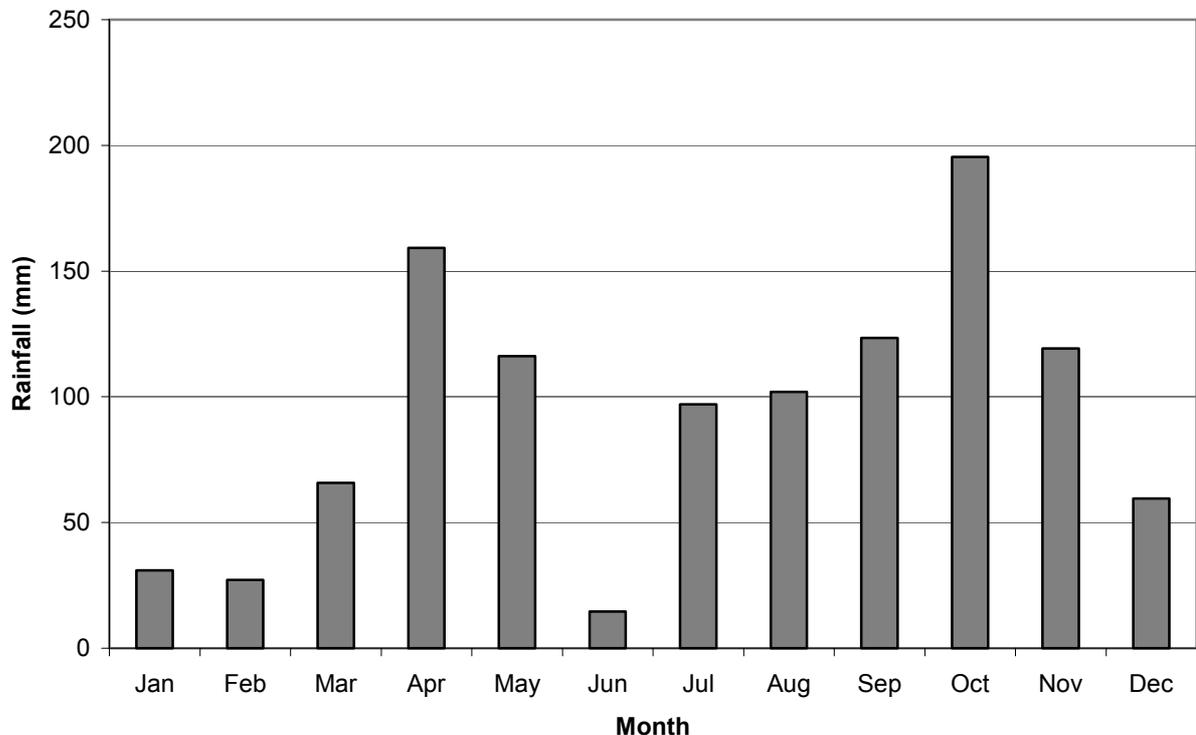


Figure 2 - Mean monthly rainfall for Ziwa Ranch, Buruuli: 1997-2001

Soils and Vegetation

The ranch area is divided between raised areas, ridges or interfluvies with alluvial sandy soils and shallow drainage lines with clay loams or 'black cotton'. Details on the underlying geology was not available during the visit, but the soils of the area are classified as ferralsols and fluvisols, probably most related to alluvium derived from a variety of basement and volcanic rocks originating from the Victoria Nile basin. The dominant broad vegetation types are *Combretum* woodland mosaic (covering ca. 75% of the ranch area, and on the higher ground), wooded grassland and open/swamp grassland (15-20%, over the clay soils), and riverine swamp along the Lugogo river. There are only small areas of dense bushland or thicket. Approximately 30% of the ranch area becomes seasonally inundated or waterlogged, including much of the grassland on the drainage lines and adjoining the swamp. Figure 1 shows the land cover of Ziwa ranch and surrounding areas, including the areas of the ranch that are seasonally wet.

The dense to medium density woodland areas are dominated by *Combretum molle* and frequent mature *Acacia siberiana*, with other common woody species of *Bauhinia*, *Euclea*, *Scutia*, *Rhus* and *Grewia*, and occasional *Borassus* palm trees. Within the more

open woodland, woodland margins and disturbed areas *Acacia hockii*, *Solanum* and *Asparagus* spp were frequent. *Euphorbia candelabrum* trees were also widespread, particularly associated with *Termitaria*. The trees of the wooded grassland areas are *Combretum* spp, with coarse perennial grass species (*Imperata*, *Hyparrhenia*) that are waterlogged during rains and frequently burnt during dry seasons, probably on an annual basis. Apart for the obvious effects of fire on the structure of the vegetation, some small areas of woodland on the ranch have been physically cleared for charcoal production and improvement as pasture for grazing, and these areas also have new regrowth of woody plants, particularly *Acacia hockii* and some of the broad-leaved trees and shrubs (e.g. *Euclea*, *Rhus* spp).

Although much of the woodland does have some understory of shrubs and some forbs, generally there is relatively low availability of palatable browse plants and forbs over the ranch except in the disturbed areas and woodland margins along drainage lines (e.g. along cut lines, tracks) where dense growth of small *Acacia hockii* is evident. These more open areas, including some of the wooded grassland offer the best availability of palatable browse for black rhinos. Throughout the ranch, both within the woodland and grassland areas, there is a high density of large *Termitaria* (estimate of 5-15 per hectare), which are colonised by a much higher diversity of woody and herbaceous species, with little or no sign of impact by browsers (or grazers).

Other herbivores

The lower Kafu basin has significant populations of kob, buffalo, waterbuck, reedbuck, bushbuck, hartebeest, sitatunga and oribi, although these have been steadily depleted by poaching in recent years. There are still concentrations of some of these species in the Ziwa area, particularly to the south of the Lugogo river (Lamprey, 1999/2001 aerial surveys) and on Ziwa ranch itself (kob, reedbuck bushbuck, oribi). Elephant are now absent from the area (although occasional movements of some individuals from the remnant Luweero population were recorded in the Ziwa area within the last 2-3 years).

HABITAT SUITABILITY AND STOCKING DENSITIES FOR RHINOS

Using the proportionate coverage of broad vegetation types, and primarily the availability/accessibility and proportion of palatable species, approximate 'ball-park' estimates of carrying capacity were made for the Ziwa ranch area in terms of maximum production stocking densities for the two rhino species.

Black rhinos

The habitat of the Ziwa area has low carrying capacity for black rhinos. The rainfall of the area is high, and the soils likely to be leached of important minerals and have increased acidity. With increasing rainfall in east Africa, maximum soil fertility is found to occur at approximately 750 mm of annual rainfall (Adcock 2001). Generally the availability and palatability of the rhino browse is low in both woodland and grassland areas, although in areas covered by both vegetation types the overall carrying capacity is improved considerably by the diversity of vegetation found on frequent *Termitaria* (in all areas, though particularly rich in the grassland areas bordering the Lugogo) and the high density of small *Acacia hockii* (along woodland margins, disturbed/cleared areas

and some areas of wooded grassland). There is good availability of water throughout the year, both from the permanent Lugogo river and artificial dams. Although tsetse and trypanosomiasis is present in the Ziwa area, experience in translocating black rhinos to lowland trypanosomiasis areas has demonstrated that the disease challenge can be tolerated by introduced rhinos with good nutrition and husbandry during the holding and release phase, which may be supported by some artificial reduction of fly densities using baited traps.

The estimate of the maximum production stocking density of the *Combretum* woodland with little or no understory (low browse availability) is 0.1 rhinos km⁻² (1 rhino per 10 km²). This estimate also applies to the areas of wooded grassland with limited coverage of low browse plants (< 1 m in height). Other areas with higher availability, diversity and palatability of browse (e.g. river grassland with *Termitaria*, wooded grassland and woodland margins with high frequency of small *Acacia hockii*) had an estimated maximum production stocking density of 0.25 rhinos km⁻² (or 1 rhino per 4 km²). Taking the proportion of the general area covered by lower (60%) and higher (40%) rhino density strata as a guide, we estimate a overall maximum production stocking density for black rhinos as 0.16 rhinos km⁻² (or 1 rhino per 6.25 km²). This estimate does not take into account social carrying capacity for male black rhinos, which is estimated as a minimum of 25 km² per animal.

White rhinos

With a high proportion of both open and wooded grassland, and woodland cover, the Ziwa habitat appears very suitable for white rhinos, with some nice areas of short grassland in open and wooded areas on clay soils. The areas of grassland along the swamp margin and in drainage lines had most cover of coarse unpalatable grass species (e.g. *Imperata* sp), but there is potential for conversion of some of better drained of these tall grassland areas to short grass lawns by white rhinos. Although little or no competition with wild grazers is likely at present, estimated carrying densities of white rhinos may have to be revised downwards in future, and the density of cattle held on the ranch would potentially have a major effect on grass biomass, particularly of short palatable species. Tsetse and trypanosomiasis infection do present potentially serious veterinary health risks to white rhinos, but these can be controlled and immunity developed by rhinos through a combination of reduction of challenge (artificial reduction in fly densities by trapping) and regular treatment.

The maximum production stocking density estimated for white rhinos in this area is 0.65 rhinos km⁻² (or ca. 1 rhino per 1.5 km²). The maximum stocking level given here should be regarded as indicative, which should be revised or fine-tuned on the basis of adaptive management informed by continuous monitoring of the growth rate and behaviour of the population. Limitations of male social carrying capacity in relation to key resources (e.g. favoured grazing areas/lawns, water points) are likely to have a strong influence on overall capacity as number increase. Using these estimates of background maximum stocking densities for rhinos as a guide, we can now examine possible areas for rhino management and fencing as a rhino sanctuary, including that of the current ranch, and evaluate possible options in the light of ecological constraints and other key criteria for selection of new rhino reserves (see Brett 1998, page 11).

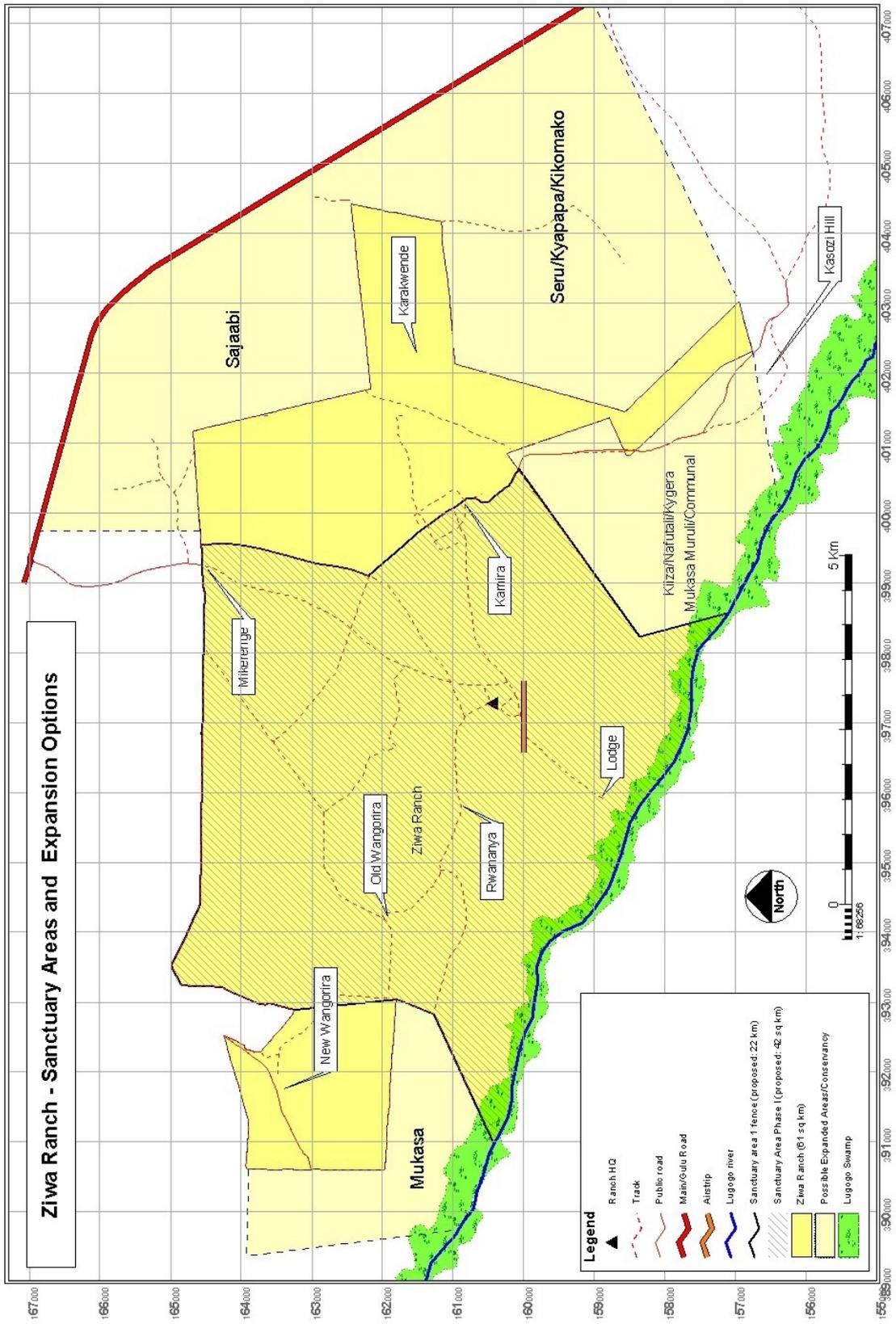


Figure 3 - Options and Areas for rhino sanctuaries and management at Ziwa Ranch, Buruuli

OPTIONS FOR RHINO CONSERVATION AREAS EXAMINED

One key consideration is that a suitable area for rhino conservation should be able to accommodate a founder population of at least 20 rhinos, and have an Ecological Carrying Capacity (ECC) of at least 100 rhinos. Although many existing rhino populations fail to reach these guidelines, they should still be used as key standards in any new population, also assuming that some genetic interchange is also practised through introduction of 1-2 unrelated animals every 8-10 years in order to minimise loss of genetic variability and/or inbreeding. There are numerous small populations of black and white rhinos in existence which do not have sufficiently large areas to reach these founder/population minima, but they are typically managed as part of a national or privately managed rhino metapopulation that reduce or minimise the negative effects of small population size through genetic and demographic management.

Smaller rhino conservation areas (e.g. less than 200 km² in total area) should be ring-fenced or have other barriers to prevent dispersal of rhinos. The most suitable initial approach for rhino protection and management in the Buruuli area is clearly that of a fenced sanctuary, particularly given the need to confine rhinos and provide effective protection – for which a well-maintained electric fence, even if low (e.g. 1 m high), has been shown to be the most cost-effective solution. Although a higher (e.g. 2 m high) fence may provide more of a physical barrier to deter intruders, no electric fence can prevent incursions by itself, and most of the security function has to be provided by routine anti-poaching patrols of the fence line and surrounding area, usually in combination with an outreach/intelligence network.

An electric perimeter fence of a rhino sanctuary is often the most expensive component of a new development, and the size and shape of the area to be fenced both have a major influence of this cost. Theoretically the most cost-effective shape of a fenced area is a circle, where the highest return will be provided in terms of km² enclosed per km of perimeter fencing. The more complex the shape of sanctuary and of boundary, the less cost effective in terms of fence line costs. For a sanctuary of 50-100 km² in total area, the most cost-effective shape will enclose between 2-3 km² per km of fencing, and this rate will increase proportionately for larger areas.

Apart from habitat suitability, other important selection criteria to be applied (and which were applied in the 1998 feasibility study) include low poaching threat and effective protection and management control, low risks from disease and natural hazards (cliffs, swamps, fire, predators) and land-use compatibility with rhino conservation. Given adequate capacity, options can be considered for management of three rhino taxa at Ziwa, including the two indigenous rhino subspecies (*D.b.michaeli* or *C.s.cottoni*, although Ziwa is out of historical range) and introduced *C.s.simum*. This could include the management of the two white rhino subspecies in separately fenced areas. However the availability of northern white rhinos is hard to predict and may be precluded; little progress has been made on improved conservation of this taxon with *ex situ* groups in zoos, and the present status is as described in the 1998 feasibility study.

The first option is that of the current total area of Ziwa ranch (Option A). However, the current shape and boundary of Ziwa (Figure 3) is clearly not cost-effective in terms of

fencing requirement relative to area enclosed, and thus two other options are presented and considered here. The second option is a smaller sanctuary within Ziwa, which does not enclose its extremities and also excludes the public tracks/roads (thereby eliminating the security risks of people moving through the rhino area) (Option B). The third option is a larger area that includes (possibly available) land units outside Ziwa and extends the size, not only to enable higher capacity and potential for population expansion for rhinos, but also to reduce the length of fencing required relative to the area enclosed. The extent of the areas of the three options are shown in Figure 3 and the size of calculated areas and fenced boundaries are presented below (Table 1), together with the size and circumference of circular areas of similar size (for comparison), and the size and proportion of areas of habitat enclosed (NBS GIS data)

A critical factor in common for all options is the length of the Lugogo River that would form the southern boundary of each area. Assuming that the river is sufficiently deep and will make an adequate barrier to movements of rhino, it may not be necessary to erect a fence along it (assuming that patrol cover for security can be sufficient along this boundary). The total area boundary (including river front) and length of fence line required for each option area were calculated from the GIS (Table 1) to allow cost estimates for the various fencing options to be made. Other necessary infrastructure developments specific to rhino management and protection (e.g. holding bomas, release paddock, scout/fence maintenance posts) will be required for all options, as well as all components related to staffing, staff housing, security and monitoring patrols, transport and communications. On the basis of available habitat and estimated maximum stocking densities, recommended maximum stocking rates for rhinos are provided for each option (Table 2).

Table 1 – Sanctuary/Reserve area options at Ziwa/Buruuli

Option	A		B		C	
	Ziwa Ranch		Internal Sanctuary		Extended Area 1	
Total Area (km ²)	61.07		42.07		107.20	
Boundary (km)	50.18		30.27		49.17	
Fence (excl river)	43.27		21.61		37.51	
Area/Boundary (km ² /km)	1.22		1.39		2.18	
Area/Fence (km ² /km, excl river)	1.41		1.95		2.86	
Circle radius	4.41		3.66		5.84	
Circle circumference	27.70		22.99		36.70	
Circle Area/Boundary (km ² /km)	2.20		1.83		2.92	
Woodland	45.67	75%	30.60	73%	80.78	75%
Bushland	0.42	1%	0.42	1%	0.42	0%
Grassland	9.99	16%	8.98	21%	17.54	16%
Swamp	1.95	3%	1.95	5%	3.13	3%
Other	3.04	5%	0.12	0%	5.33	5%
Wetland	1.95	3%	1.95	5%	3.13	3%
Seasonally Wet/inundated Land	18.83	31%	14.58	35%	26.39	25%
Dry Land	40.29	66%	25.54	61%	77.68	72%

Table 2 – Carrying Capacity estimates for rhino management at Ziwa/Buruuli

Option	A	B	C
	Ziwa Ranch	Internal Sanctuary	Extended Area 1
Total Area (km ²)	61.07	42.07	107.20
Available Area (km ²)	57.81	40.12	104.07
Estimated Maximum Production Stocking Rates:			
White Rhino	38	26	68
Black Rhino	9	6	17

Option A – Ziwa Ranch

The total ranch area is calculated as 61 km², but the complex boundary configuration and very low cost-effectiveness of the potential fence line (only 1.2 km²/km cf. 2.2 for a circular area of the same size) make this area a very expensive proposition. In addition, it is unlikely that rhinos would use or establish home ranges within the thin ‘extremities’ of the ranch, particularly the tongue of land north of Kasozi hill, thus further reducing the area available for rhinos. Another problem with narrow or pointed segments of fenced boundary is that they can act as traps for rhinos and other animals, where, when flushed or alarmed in these areas, they may be forced to run against or through the fence.

The security of the ranch as a rhino sanctuary may be compromised by the two public tracks running through the ranch (although this can be mitigated through checkpoint surveillance – e.g. successful rhino reserves at Lewa Downs in Kenya and Malilangwe in Zimbabwe both have public roads running through them, but these are both areas at least three times the size of Ziwa).

Black rhinos (*Diceros bicornis minor*)

With the assumption that the ‘foot’ of land north of Kasozi Hill (Figure 3) and the wetland areas are not available to rhinos, and using the carrying capacity density estimate for the Ziwa habitat (above), the 57 km² would allow a maximum production stocking rate of 9 black rhinos, and no more than 2 adult males. The current area of Ziwa ranch is not large enough to support a viable population of black rhinos, although it is conceivable that a small group managed between 3-9 animals (e.g. an adult male and two adult females could be managed, and offspring removed periodically from the breeding group) and managed there as part of a Uganda metapopulation.

White rhinos (*Ceratotherium simum simum*, or *C.s.cottoni*)

The same available area could carry a maximum of 38 white rhinos, and the current ranch would be suitable for a small-medium sized breeding population managed between 20 and approximately 40 animals for maximum breeding performance.

Opportunities and Threats

The advantage of using the current Ziwa ranch itself is centred on its immediate offer of availability, and if the boundaries could be fenced and/or secured (e.g. Lugogo), the

area would be feasible for white rhino conservation. Management of rhinos and cattle in the same area is possible and has been carried out quite effectively within existing successful rhino reserves elsewhere in Africa (e.g. Lewa Downs Conservancy in Kenya, lowveld rhino conservancies in Zimbabwe (Price Waterhouse 1994), including the movement of rhinos between fenced cattle paddocks with some gaps.

At the time of the visit the perimeter fence of Ziwa had recently been upgraded to 5-strand barbed wire with metal standards; however, the fence was being vandalised and all wire from two segments of more than 100 m had been removed in late January 2002. This was attributed to illegal herders coming into the ranch, and also illegal cutting of trees for charcoal production within and use outside the ranch boundary. The ranch currently employs Karamajong herders from northeastern Uganda, who would provide good material for training as law enforcement staff.

Option B – Internal Rhino Sanctuary

The rationale for the development of this smaller 42-km² sanctuary within Ziwa (Figure 3) is that it would have a smaller cost-effective fenced boundary (excluding the river only 22 km of fencing required), and no public access (the eastern boundary running along the north-south public track). The area could be upgraded quickly to a small rhino sanctuary, with existing infrastructure (e.g. headquarters, airstrip, etc) already in place inside the area, and at least two permanent water points in addition to the Lugogo river.

Black rhinos (*Diceros bicornis minor*)

With a maximum capacity of 6 animals, the area would be too small for black rhino conservation. Conceivably the area could be used as a site for rehabilitating one or two injured or orphaned animals, but the sanctuary area can be ruled out as a potential site for *in situ* breeding of this species.

White rhinos (*Ceratotherium simum simum*, or *C.s.cottoni*)

The sanctuary could carry up to 26 white rhinos, and it is possible that this estimate could be refined upwards following initial stocking (e.g. with 10 animals) and monitoring of habitat use and social carrying capacity. The area would be ideal for breeding of a small population of white rhinos, managed between 10 and approximately 30 animals. However it is unlikely that this area could be further subdivided and used for both white rhino species (e.g. if northern whites were available).

Opportunities and Threats

This option has the advantage that a small wild population of white rhinos could be developed rapidly in an area that would carry the least relative cost in terms of infrastructure development. Apart from the possible issue of fencing the Lugogo river front (which may be effected by a 'zig-zag' of fencing into inundated areas to allow access of wildlife and rhinos to water), it would be prudent to erect a high (2m) electric fence along all ranch boundaries (i.e. designed to deter and detect intrusion), with the configuration of internal electric fencing limited to a small (1.2 m) fence designed only to confine rhinos. A decision on the fence design will have to be made on the basis of a preliminary phase of testing the fence design and maintenance requirement before rhinos are introduced, as well as capital and maintenance costs against funds available.

One disadvantage of excluding the western 'New Wangorira' sector from the internal sanctuary is that this area is one of the more promising and potentially productive grazing areas for white rhinos. However, there is a public track running through this area, and the relative risks, demands and benefits of extending the sanctuary to include this area would have to be evaluated. As mentioned above, the division of Ziwa ranch into fenced areas (including an internal rhino sanctuary) would not necessarily preclude management of ranch cattle alongside rhinos and other wildlife enclosed.

Option C – Extended Rhino Conservation Area/Conservancy

Extending a wildlife reserve centred on rhino protection and management from Ziwa to include some units of adjoining land could substantially increase the area available for viable populations of rhinos and other wildlife, while increasing the cost-effectiveness of the perimeter electric fencing containing them. However, there would be serious challenges for harmonising management of existing domestic stock (cattle, goats) between the Ziwa stock and that of surrounding owners to ensure effective disease control in cattle. Options for expansion will be determined and constrained by the agreement and motivation of the owners of the land, the attitude of current inhabitants, and existing settlement areas. This may preclude the inclusion of some or all of the three areas to the east of Ziwa (Figure 3), particularly Area 2 (owners: Mukasa Muruli, others and communal, Area 3 (owners: Seru and others) and Area 4 (owner: Sajaabi). As advised by the Ziwa ranch manager, there appears to be potential for expansion and inclusion of four areas within a fenced rhino/wildlife area, where there has been some willingness or even strong motivation by the owners approached or canvassed so far. With the assumption that the external land units outlined (Figure 3) can be included, a total area of 107 km² could be secured with a minimum requirement of electric fence line of 37 km.

Black rhinos (*Diceros bicornis minor*)

The extended area could accommodate an estimated maximum production stocking of 17 black rhinos, including 4-5 adult males. This is some improvement on the very small number that could be managed within the ranch, but this estimate still does not reach the minimum founder population recommended for a new black rhino populations (20 rhinos). A population of black rhinos of this size could be managed (e.g. between 10-20 animals) in future with one or more other populations, particularly where surplus animals can be used to stock or supplement stocking of a large area with potential for developing a population of more than 100 rhinos (e.g. Murchison Falls NP: North).

White rhinos (*Ceratotherium simum simum*, or *C.s.cottoni*)

The potential maximum stocking rate of white rhinos is 68, and the extended area could carry a population of more than 50 animals (potentially a continentally important population).

Opportunities and Threats

Inclusion of the units outlined for an extended rhino conservation area (Figure 3) would carry liabilities in terms of the settled/cultivated areas which may be included (e.g. in the Sajaabi area), which appear to rule out any expansion of Ziwa to the north. The Sajaabi

area also adjoins the main Gulu road, and this carries an appreciable potential security risk for a rhino reserve. Without more detailed examination of the areas in question, and detailed surveys of the owners, community residents and neighbours will be necessary to define and refine the potential areas and limits to inclusion of additional land units with Ziwa.

Some of the challenges in extending Ziwa to a size that could accommodate viable populations of black and/or white rhinos (e.g. 20-50 animals) have already been described, and many of them have already been faced and solved in the process of development of rhino conservancies in Kenya and Zimbabwe (Price Waterhouse 1994). Here a number of land units under different ownership and/or management, and potentially comprising units of both private and state land, are managed as a unit with rhino conservation as the main focus and catalyst for wildlife protection, and wildlife utilisation as the primary land use and basis for the economy of the area and its human inhabitants.

Against a background of declining wildlife populations in the lower Kafu basin, but still with the potential for recovering these species within a large protected area developed between a number of private and state-owned ranching units, the extended Ziwa ranch offers a major opportunity or 'seed' area with which to start the process of piecing together land units within a conservancy approach. Here, the management of rhinos would be the main activity that would drive the development of necessary cooperation between landowners, and development of infrastructure and capacity in terms of wildlife protection and law enforcement to cover the wider area. This vision, and the incremental approach developed within an initial expansion of Ziwa to include a few neighbouring land units, could evolve through retention of ownership of current units and/or acquisition(s) and consolidation of land, but the benefits of inclusion and extension would have to be developed at an early stage (e.g. through tourist developments and activities and/or and a combination of game ranching for live sales/restocking and/or trophy hunting), ideally supplementing present land-use and stock management rather than being a necessary total replacement at the outset.

Remembering that the extended area (Option C) outlined still does not have sufficient area for a viable black rhino population, if there are clear possibilities for acquisition of neighbouring land units by Ziwa, and/or agreed common management under conservancy constitution, the most advantageous area to include and develop would be the land to the west of Ziwa and the Mukasa unit, including the Kafu river itself. Kiryana ranch (160 km², evaluated as feasible for rhino conservation in the 1998 feasibility study) lies on the western side of the Kafu, and has been recently acquired or leased by Ziwa Ranching Ltd. Consequently, the opportunity for including the intervening land and combining with Ziwa and Kiryana to produce a conservancy of at least 300 km² is an obvious goal. As well as the advantages of developing a larger area for protection and management of populations of the large vertebrates of the Lower Kafu basin, which could be used as a source area for breeding and future provision for restocking other private and protected areas in Uganda, an extended area of this size could carry a viable population of up to 50 black rhinos.

Without further definition and investigation of the feasibility of this final option, and some idea of the support available for a conservancy approach to wildlife management on private ranches in Uganda, this study can only point the way and recommend it as a model which has already proved successful elsewhere in Africa, particularly where the primary initial catalyst or flagship of a wildlife conservancy has been the conservation of rhinos. Evolution of conservancies on private land towards larger areas (e.g. > 500 km²) has also occurred with the realisation that in areas with relatively low carrying densities, particularly for black rhinos, areas needed to be expanded to keep densities low in order to encourage high population growth rates and minimise intraspecific aggression. Consequently, with initial funding constraints and before the main income-generating basis for amalgamating land units with wildlife as the primary resource has been developed, a phased approach will probably be necessary (i.e. starting with an initial 'sanctuary' phase, and moving onto subsequent phases of expansion when these become economically and socially feasible).

CONCLUSION

Ziwa ranch is feasible for rhino conservation and the development of a small rhino sanctuary. However, primarily due to habitat constraints the ranch area is only suitable for the development of a relatively small population of white rhinos (< 40 animals).

As a first phase in a process of developing a larger wildlife conservation area composed of Ziwa and surrounding land units/ranches (e.g. > 250 km² that could carry a small breeding population of black rhinos), a 42 km² area should be electric fenced, developed for rhino management and protection alongside and compatible with the existing cattle management operations, and stocked with a small founder population of white rhinos. An essential part of this first phase will be the development/improvement of tourist facilities and activities, based on the rhinos as the main stopover attraction on the Kampala-Murchison circuit. Numbers of other wildlife species enclosed within the sanctuary will build up and can be supplemented by other indigenous species to the area to add value to the area, both for tourist viewing, but also for use in a game ranching context in managing populations for production to supply other areas, including neighbouring protected ranches and other areas in Uganda.

Subsequent expansion of the fenced area to comprise the whole of Ziwa ranch and adjacent land units, whose owners wish to be included within a larger conservancy, is the recommended next stage in the process, likely to comprise numerous increments dependent on feasibility, logistics and obtaining approval of owners and community users as a result of clear economic and logistical advantages to individual constituents. The common management of Ziwa and Kiryana ranch, and the potential for a large and viable rhino conservancy area that could be developed with the intervening land units on the eastern side of the Kafu River, provide the basis for the planning of a final phase of development of a larger and viable rhino conservation area at Buruuli.

RECOMMENDATIONS

Phase I – development of a 42 km² rhino sanctuary within Ziwa

Timing: immediate to short term: 2002-2003

Development

- ☞ Construct, and/or upgrade existing fences to develop 22 km of electric fencing (as outlined in Figure 3: 2m high along northern ranch boundary; 2 m or 1.2 m high along fence lines internal to present Ziwa ranch).
- ☞ Carry out detailed security/fence line feasibility survey along north bank of Lugogo river, to determine necessity for erecting electric fence line along this boundary
- ☞ Monitor, evaluate and modify fence performance and configuration based on pilot/test phase prior to and following the introduction of rhinos and enclosure of other wildlife species
- ☞ Develop 3 scout/energiser/fence maintenance posts at ranch main gate, and western and eastern corners of electric fence and Lugogo river (grid squares 391 160 and 398 157)
- ☞ Purchase and maintain adequate stock of fence spares – wire, standards, insulators, etc, and 3 fence maintenance tool kits
- ☞ Construct staff housing at outposts and HQ required for staff complement.
- ☞ Construct complex of 6 holding bomas close to ranch HQ (white rhino size and configuration, also useable for holding black rhinos), including loading ramp, sliding doors allowing rotation of animals and boma cleaning, water supply, concrete drinking troughs, shaded areas for each pen, inspection platform(s), etc – consult AfRSG for recommended design)
- ☞ Construct 1-2 paddocks (1 ha in area) adjoining holding bomas (1 m high electric fencing, two live wires 100 cm, 60 cm high, two earth 80 cm, 40 cm)

Equipment

- ☞ Acquire/purchase two vehicles dedicated to rhino sanctuary operations (1 4x4 pickup or tractor/trailer for fence patrols maintenance, 1 4x4 pickup for patrols/operations). Fence vehicle may be replaced by one or more quad bikes, which may operate better in wet seasons/water logged ground
- ☞ Upgrade/develop internal VHF radio network, including 4 base-stations (HQ, 3 outposts) and a mobile set for each vehicle and > 3 handsets for scout patrols, solar chargers and spare batteries.

Staffing

- ☞ Establish and train staff complement for security and fence maintenance (e.g. 6-8 scouts; 4-6 fence staff in 3 teams of 2; 2 drivers). Scout training to include rhino monitoring/surveillance. Fence maintenance staff may be recruited locally, and/or retained from fence construction labour contracted.
- ☞ Purchase all items of expendable equipment and uniforms for staff complement

Stocking/veterinary

- ☞ Acquire/purchase founder stock of 5-10 white rhinos from Kenya (max 2 adult males), and develop stocking/release plan for these and other wildlife species

- ☞ Develop revised cattle management system for Ziwa, including the fenced sanctuary area
- ☞ Establish veterinary capacity/services for rhino translocation/treatment within Uganda for routine and emergency operations at Ziwa

Planning

- ☞ Carry out detailed security assessment and develop protection/staff plan, including outreach/intelligence network
- ☞ Carry out detailed ecological evaluation and survey of existing wildlife populations, including numbers of species enclosed within fenced sanctuary
- ☞ Develop and upgrade tourist infrastructure (low-impact tourist lodge) and activities, train and recruit employees from surrounding communities, and source local materials and produce
- ☞ Obtain independent evaluation of sanctuary developments and operation from existing rhino sanctuary/conservancy manager (e.g. Kenya: Lewa Downs Wildlife Conservancy)
- ☞ Develop outline management plan for Ziwa sanctuary and phased approach to expansion as a wildlife conservancy, including necessary approval and coordination with UWA/MTTI
- ☞ Use, modify and update existing outline budgets for all necessary budget items for sanctuary development and operation (e.g. as Brett 1998: Annex IV)

Phase II – develop extended rhino sanctuary/conservation area/ conservancy (Ziwa and adjacent land units)

Timing: immediate; for short-medium term development: 2003-2005

- ☞ Implement and/or continue survey of owners of adjacent land-units to the west (Mukasa Brothers), southeast (Mukasa Muruli and others), east (Kyapapa and others) and northeast (Sajaabi and others) of Ziwa (north of Lugogo river), and community/neighbour/user attitudes to inclusion within Ziwa, either on conservancy basis (common constitution/management agreement) or acquisition by Ziwa.
- ☞ Concentrate most effort on securing agreement or land acquisition with land owners to west (Mukasa brothers), possibly including land swap with extremities of land on the eastern side of Ziwa (Karakwende)
- ☞ Through ground and GPS surveys, determine extent of land units examined and canvassed for possible inclusion within fenced Ziwa rhino conservation area.
- ☞ Establish ownership/holding/use of land units/ranches south of Lugogo river (sharing common boundary with Ziwa and adjacent land units to north)
- ☞ Commence process of meetings with neighbouring owners/community representatives for information sharing, endorsement/buy-in to proposals and foundation for agreements
- ☞ Develop revised cattle management and disease control plan for Ziwa and surrounding land unit included within planned extended perimeter fence, and modify existing internal cattle fences/paddocks
- ☞ Develop estimates for construction/maintenance of revised electric fencing of perimeter of enlarged area

- ☞ Carry out detailed evaluation of economic options for wildlife-based land use in the greater Ziwa area, including inputs by conservancy planners and developers from Zimbabwe, Kenya and/or Namibia
- ☞ On the basis of individual and collective agreements, for which stakeholder/community meetings will be required, extend fencing to include adjacent units into rhino conservation area.

Phase III - plan and extend rhino conservation area/conservancy to including Ziwa ranch, Kiryana ranch and intervening land units

Timing; immediate-ongoing; development based on Phase II progress

- ☞ Use surveys and evaluations of Phase II to determine and decide on approach to and feasibility of defining a wildlife conservancy extending from Ziwa to Kiryana, including intervening land units on both sides of the Kafu river
- ☞ Based on progress of Phase I (including establishment, local awareness and recognition of the value of the rhino population), status of remnant wildlife populations in target areas, and economic analysis of the individual and collective potential for changes in land use, lobby UWA and Uganda Government/MTTI for support in acquiring/including land units.
- ☞ With existing constituents/land owners, develop constitution for rhino/wildlife conservancy (including roles, responsibilities and functions) and obtain endorsement for formal membership
- ☞ Implement necessary fencing/wildlife management options as agreed with conservancy constituents, ideally including extension of perimeter fencing and progressive removal on internal fencing

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REFERENCES

- Adcock, K (2001) RMG Black Rhino Carrying Capacity Model version 1. User guide. SADC Regional Programme for Rhino Conservation.
- Brett, R A (1998) Introduction and reintroduction of black and white rhinos to Uganda, and establishment of a rhino sanctuary. A feasibility study. Rhino Fund Uganda.
- Price Waterhouse Zimbabwe (1994) The Lowveld Conservancies: new opportunities for productive and sustainable land-use. Save Valley, Bubiana and Chiredzi River Conservancies. Price Waterhouse Zimbabwe.
- Lamprey, R H & Michelmore, F (1996) A survey of the Wildlife Protected Areas of Uganda. Phase II: April-June 1996. MTWA, Uganda

ANNEX I TERMS OF REFERENCE

To succeed in the reintroduction of the rhinoceros in Uganda, Rhino Fund Uganda aims to establish a rhino sanctuary for the breeding of (a mixture of) Eastern Black, Southern White or Northern White Rhinoceros.

RFU has been offered the use of approx. 80 sq km of land in Nakasongola (Buruuli) by Ziwa Ranchers Ltd. To assess the suitability of the land, a technical consultant is needed to carry out a feasibility study. The consultant will work closely with Rhino Fund Uganda staff, specifically with project coordinator Yvonne Verkaik and board member Wilhelm Moeller.

Tasks to be carried out by the consultant include:

- Meet with Rhino Fund Uganda staff, Uganda Wildlife Authority staff, Ziwa Ranchers staff and appropriate wildlife professionals to discuss the Buruuli location.
- Visit Buruuli to make an assessment of the suitability of the site. Appropriateness of the location will be based on habitat and safety and management issues.
- Assess the possibility of establishing a viable breeding population of Eastern Black Rhino and determine the maximum carrying capacity.
- Assess the possibility of establishing a viable breeding population of Northern or Southern White Rhino and determine the maximum carrying capacity.
- Make short field visits to neighboring ranches to assess their suitability as extensions of the rhino sanctuary at Buruuli
- Environmental Impact Assessment: Prepare a Project Brief and, if appropriate, prepare an Environmental Impact Statement based on guidelines as provided by Uganda's National Environment Management Authority. Likely environmental impacts of the establishment of the sanctuary are caused by: presence of visitors and tourist facilities (bandas), airstrip, electric fence.
- Make adjustments on the 5-year budget that was prepared in 1997 for establishing a rhino sanctuary on Nshara Ranch, to ensure that all required items are included for establishment of the sanctuary at Buruuli and that cost estimates are accurate.