SADC Regional Programme for Rhino Conservation

APPRAISAL OF THE POTENTIAL FOR RHINO CONSERVATION IN MOZAMBIQUE

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Detailed Evaluation of Feasibility and Reintroduction Options for Rhinos in Limpopo National Park

Scoping Evaluation of Feasibility and Reintroduction Options for Rhinos in Zinave National Park and Gile Game Reserve

Preliminary Guidelines for the Development of a Rhino Conservation Policy for Mozambique

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Summary

- Prior to the European exploration of Africa, the white rhino was found in Mozambique south of the Zambezi River and the black rhino was found throughout the country.
- During 1870, both the white rhino and the black rhino were reported west of the Limpopo River, between its confluences with the Elefantes and Nuanetsi Rivers. But by the late 1950s, excessive hunting had caused the extinction of the white rhino in Mozambique and the black rhino was extinct south of the Save River. During the 1960s and 1970s, a few rhinos entered *Coutada* 16 from South Africa and Zimbabwe.
- *Coutada* 16 was proclaimed Limpopo National Park (NP) during November 2001. It is part of the Great Limpopo Transfrontier Park, which includes Kruger NP in South Africa and Gonarezhou NP in Zimbabwe. The development of Limpopo NP is being funded by an initial grant of 6 million euros secured by the Peace Parks Foundation (PPF) from the German Development Bank.
- During 2002 and 2003, approximately 2000 animals of a variety of species, including two white rhinos, were released into a fenced, 350 km^2 sanctuary in the south-west of Limpopo NP. During recent years, a small number of white rhinos have moved from Kruger NP, through gaps in Kruger's eastern boundary fence and into Limpopo NP. It is planned that an additional ten white rhinos will be captured in Kruger NP and released in the Limpopo sanctuary during the 2004 dry season.
- Since 2000, small numbers of rhinos have been killed in Kruger NP by Mozambican poachers. At least one of the poaching gangs originated from an area just to the south-west of Limpopo NP. The PPF project staff are aware that one white rhino was poached in Limpopo NP during 2003, allegedly by one of the park's field rangers, but neither the carcass nor the horns were recovered.
- Marc Stalmans has prepared a map of the landscapes of Limpopo NP, using the same landscape definitions as Gertenbach used in Kruger NP. The landscapes of Kruger NP that are preferred by white rhinos have: undulating topography with uplands, bottomlands and watercourses; sandy soils with few stones or rocks on the soil surface; access to permanent water sources; a moderate to dense grass layer of good quality grasses; an open to moderate low-shrub layer; a moderately dense tree layer; and small pans for mud wallowing.
- Most of Limpopo NP is covered by landscapes that were never used by white rhinos in Kruger NP. The Limpopo landscapes that are likely to be used by white rhinos are mainly to the south and west of the Shingwedzi River and include the sanctuary. This is also the only area of Limpopo NP that has permanent surface water *and* is remote from human settlement. Hence it is also the area most likely to be favoured by black rhinos.
- A previous assessment suggests that the sanctuary can support 30-50 white rhinos and that 30 should be released initially. This is in line with the guidelines of the IUCN/SSC African Rhino Specialist Group (AfRSG)/SADC Regional Programme for Rhino Conservation, which recommend a founder population of at least 20 animals. It is likely that the sanctuary would also support at least 20 black rhinos.
- As more and more of the Kruger boundary fence, which separates Kruger NP from Limpopo NP, is removed, white rhinos in Limpopo NP will cease to be a separate population and instead will simply be part of the Kruger-Limpopo population.
- During recent years, law-enforcement efforts in Limpopo NP have intensified, with the establishment of the PPF project and the recruitment, training and deployment of approximately 70 field rangers. For the Limpopo NP as a whole, this is equivalent to an average density of 1 ranger per 143 km^2. Two pickets (patrols) of six rangers each are deployed in the sanctuary and the remaining rangers are deployed through the remainder of the park. These numbers are equivalent to average densities of 1 ranger per 29 km^2 in the sanctuary and 1 ranger per 166 km^2 in the remainder of the park. The ranger density in the sanctuary is close to that recommended for rhino protection.
- The release of white rhinos into the Limpopo sanctuary will make this area a sanctuary *sensu* AfRSG. Although the sanctuary strategy will make it easier to safeguard rhinos, the continued immigration of other individuals from Kruger NP, though the gaps in the Kruger fence, will mean that there are always some individuals that are in Limpopo NP but not in the sanctuary. These individuals will be more difficult to protect. During the late dry season, rhinos outside the sanctuary will be vulnerable to poaching because their movements are predictable when they are dependent on a few sources of surface water for drinking.

- One option which might reduce the likelihood that rhinos are poached is to dehorn some or all individuals, and to ensure that maximum publicity is given to the dehorning exercise.
- There is no long-term plan for the management of the Limpopo sanctuary and the range of species that it contains. Options include the removal of the fence that separates the sanctuary from Kruger NP, and replacement of the fence that separates the sanctuary from the remainder of Limpopo NP with a low fence that most large animals, but not rhinos, can jump or step over.
- It is recommended that no black rhinos are released in Limpopo NP until it has been demonstrated that white rhinos can be adequately protected there, and that sufficient and sustainable funding is available for rhino protection.
- The field rangers in Limpopo NP are relatively well trained and equipped, although being recent recruits, they have limited experience. It is recommended that they attend refresher courses and receive additional training in law enforcement. Some rangers should be trained in rhino monitoring and some staff members need to be trained to enter these observations into a computer database.
- Mozambicans with a suitable (veterinary?) background need to be trained and given opportunities to acquire experience in the management, capture and handling of rhinos.
- Approximately 4350 people live along the Shingwedzi River and an estimated 20 000 live along the Limpopo and Elefantes Rivers. Their main economic activity is rain-fed agriculture, complemented by cattle raising. Community liaison is an important part of the park management programme and this liaison has two priorities, namely re-alignment of the park boundary along the Limpopo River and to the south-east of Massingir Dam, and the voluntary resettlement outside the park of communities currently resident within the Shingwedzi watershed.
- The Limpopo NP management plan proposes a community programme that includes part-ownership of the park's assets (mainly tourism concessions); an employment policy that favours local people for jobs in the development and management of the park and its commercial enterprises; and profitable opportunities for target communities to provide goods and services.
- The reintroduction of the white rhino in Limpopo is just a single element of the park's wildlife restocking programme and this programme is just one element in the development plan for Limpopo NP. Therefore the potential benefits – and costs – to local communities of the reintroduction of the white rhino cannot easily or usefully be separated from those related to the general wildlife restocking exercise and the broader programme of park development. An important consequence of this is that the attitude of local people towards the rhino reintroduction may be determined by aspects of park management or development that have nothing to do with the rhino reintroduction programme.
- The black rhino inhabits a wide range of vegetation types across Africa and it is likely that it once occurred in what is now Zinave National Park, but that it was eliminated by excessive hunting during the late nineteenth or early twentieth century. Zinave NP is within the former range of the southern white rhino and, if the vegetation is suitable, it is likely that the white rhino occurred there. A field visit is required to assess the suitability of the vegetation in Zinave NP for rhinos. But security is a major factor for rhino reintroductions. Habitat suitability is irrelevant unless the area is secure, with long-term funding and a field ranger force that is adequate in number, and well trained, equipped, motivated and led. It is reported that numerous people are resident in Zinave NP.
- Gile Game Reserve is situated north of the Zambezi River and therefore is outside the former range of the white rhino. For this reason alone, white rhinos should not be released there. The black rhino was present in the reserve until at least the late 1950s. The dominant vegetation is *Brachystegia* woodland, but thickets fringe the base of inselbergs and most rivers are perennial. From the biological viewpoint, the black rhino would be a suitable species for reintroduction. However, a field visit is necessary to assess the carrying capacity for black rhinos, the security of the reserve's borders and the extent and effectiveness of law enforcement activities.
- Some preliminary guidelines for the development of a rhino conservation policy for Mozambique are given.

Table of Contents

Evaluation of Feasibility and Reintroduction Options for Rhinos in Limpopo NP

Past numbers and distribution of black and white rhinos in Limpopo NP

Prior to the European exploration of Mozambique, the southern white rhinoceros *Ceratotherium simum simum* occupied all suitable vegetation south of the Zambezi River in Mozambique, and the south-central black rhinoceros *Diceros bicornis minor* was found throughout the country (Sidney 1965, du Plessis 1969, Emslie & Brooks 1999). During 1870, Elton (1873, as reported by du Plessis 1969) noted the presence of both species west of the Limpopo River, between the confluence of the Limpopo and Elefantes Rivers, and the confluence of the Limpopo and Nuanetsi Rivers (in other words, inside the current Limpopo National Park (NP), between the park's south-east corner and a point some 180 km north-westwards). However, by 1896, both species had been hunted close to extinction in the adjacent Transvaal lowveld of South Africa (Kirby 1896) and the same is probably true for the area of the current Limpopo NP. In 1923, Stevenson-Hamilton (1947), the first warden of Kruger NP, saw fresh sign of a single black rhino near the Mozambican border and he believed that this individual had strayed from Mozambique and later returned there. At the time of his writing, Stevenson-Hamilton (1947) suggested that there were 'east of the Transvaal border, a few scattered individuals'.

By the late 1950s, when Sidney (1965) was writing, the black rhino was still found in many areas of Mozambique north of the Save River, but was reported to be extinct south of the Save River (Fig. 1). However, Ken Tinley (in a letter to du Plessis, 1969) stated that the black rhino also still occurred on the upper Limpopo River near Pafuri (i.e. near the northern-most point of Limpopo NP). Smithers & Lobão Tello (1976) presented a similar distribution map (Fig. 2) to that of Sidney (1965), but also recorded the presence in *Coutada* 16 of a single black rhino, which they believed may have entered Mozambique after some black rhinos were released in Gonarezhou NP in Zimbabwe.

Material records suggest that, by the early years of the 20th century, the southern white rhino was confined to two small populations, one in Zululand (Player & Feely 1960) and another between the Zambezi and Save Rivers, north-west of Gorongosa, in central Mozambique (although see Rookmaker (2000) for unconfirmed records of southern white rhinos elsewhere, including some in an area just 10-20 km northwards of Limpopo NP). The central Mozambican population survived until at least the late 1930s (Sidney 1965, du Plessis 1969) and probably went extinct during the 1940s (Tinley 1977). By the late 1950s, when Sidney (1965) was writing, the white rhino was extinct in Mozambique. However, the Zululand population of white rhino prospered and became the source population for all reintroduced populations of the southern white rhino, including that in Kruger NP (Pienaar 1970). Thus, by the time that Smithers & Lobão Tello (1976) published their distribution map (Fig. 3), the white rhino had been reintroduced to Gorongosa NP and Maputo Game Reserve (GR), and some animals from the reintroduced population in Kruger NP had wandered eastwards across the international border into Limpopo NP (Pienaar 1970). However, this international border has been fenced since 1976 and this fence prevented the eastward movement of rhinos during the remainder of the 20th century. By 1995, the white rhino was again extinct in Mozambique (Brooks 1996).

In summary, it appears that, as a result of excessive hunting, the white rhino was absent from Limpopo NP from at least the end of the 19th century until the 1960s and 1970s, when a few individuals entered from Kruger NP. At least one of the rhinos that entered Mozambique was poached (Smithers & Lobão Tello 1976) and there is no evidence that a breeding population of white rhinos became established in Limpopo NP. The eastern boundary fence of Kruger NP prevented the movement of rhinos from the mid-1970s until the end of the 20th century, but within the last few years, white rhinos have again moved from Kruger NP into Limpopo NP, crossing the international border either through a 14-15 km gap that was deliberately opened in the fence during 2003, or through gaps where the border fence crosses rivers and floodwaters have recently damaged the fence. Two white rhinos were seen alive in Mozambique during 2000 (Emslie 2000), presumably after they moved there from Kruger NP, and, during 2002, two adult male white rhinos were captured in Limpopo NP and released into the enclosure in the south-west corner of the park. Additional individuals survive outside the enclosure, but the total number of white rhinos in Limpopo NP during March 2004 was small, probably <10 (B. Swanepoel, pers. comm.).

The black rhino also suffered from excessive hunting. During some periods of the 20th century it appears to have been rare in Limpopo NP, while during others it was absent. There is no evidence that there are any in Limpopo NP today.

Because the earliest accounts of rhinos in Limpopo NP coincide with the period of major population decline as a consequent of excessive hunting, there is no historical information available about the numbers or distribution of animals within the park.

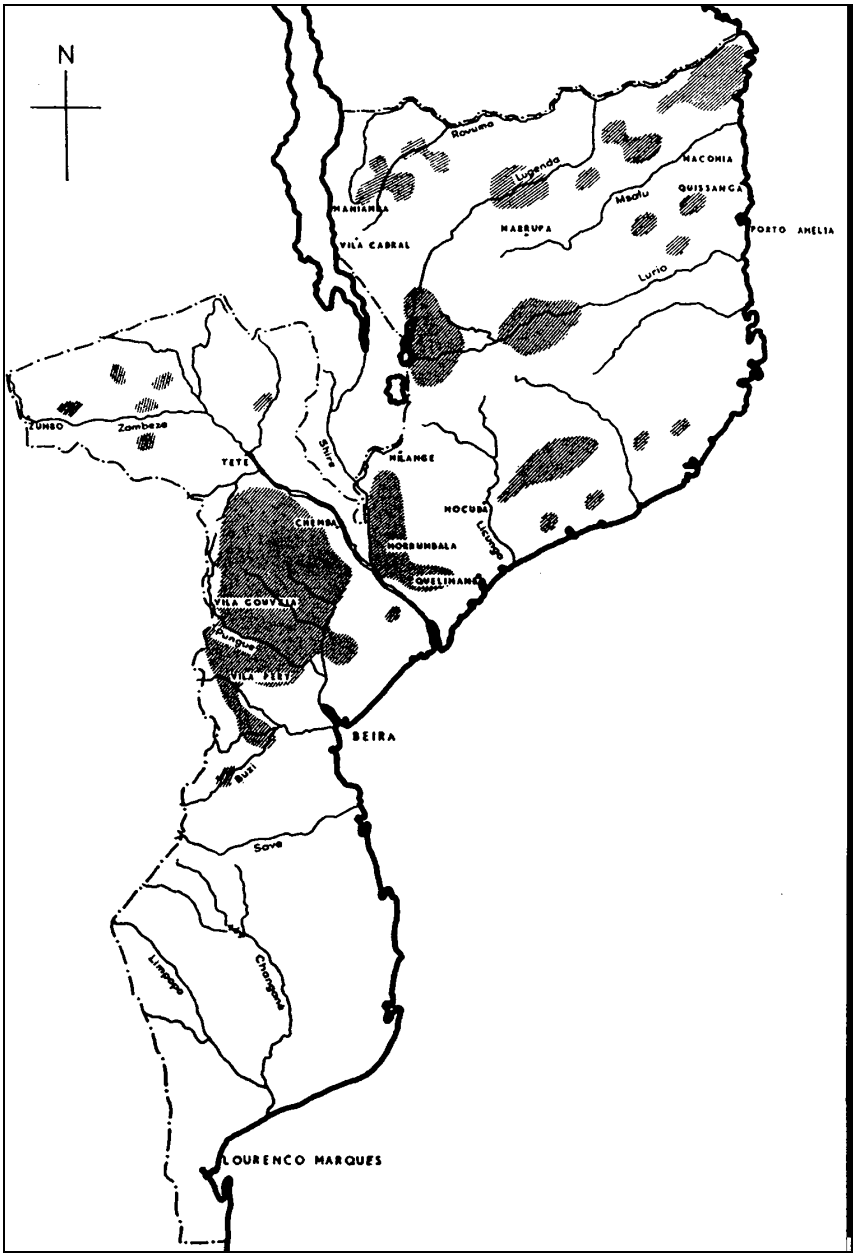

Figure 1. The distribution of the black rhinoceros in Mozambique during the late 1950s (map from Sidney 1965). Although Sidney's work was not published until 1965, it was accepted for publication during 1961. Her paper of approximately 400 pages was undoubtedly several years in preparation and so it is assumed here that her distribution maps refer to the late 1950s. Some place names have changed since this map was published.

Local extinction of rhinos in Limpopo NP

The main reason for the extinction of rhinos in Limpopo NP has not been specifically documented, but all indirect accounts imply that it was excessive hunting. More than a century ago, excessive hunting in the adjacent Transvaal had reduced the populations of both the white rhino and the black rhino to such a degree that both species were bordering on extinction (Kirby 1896). Smithers & Lobão Tello (1976) pointed out that hundreds of professional hunters, both legal and illegal, operated in Mozambique during the 20th century and were responsible for the local extinction of many large mammals, including the black rhino. An expanding road network, the development of modern rifles with telescopic sights, the use of four-wheel drive vehicles in areas without roads, and night-hunting with spotlights, all helped hunters to kill excessive numbers of animals. Much of the hunting was for meat, reflecting the absence of a developed ranching industry that could provide people with beef as an alternative to game meat. Civil strife started in Mozambique during 1962 and continued for more than 30 years. All sides in this protracted civil war had ready access to firearms and ammunition and made liberal use of them to kill wild animals for meat.

There are no records of remnant rhinos in Limpopo NP during the late 1980s. The eastern boundary fence of Kruger NP was complete by this time and thus rhinos could no longer move from Kruger NP into Limpopo NP, as they had done during the 1960s (Pienaar 1970).

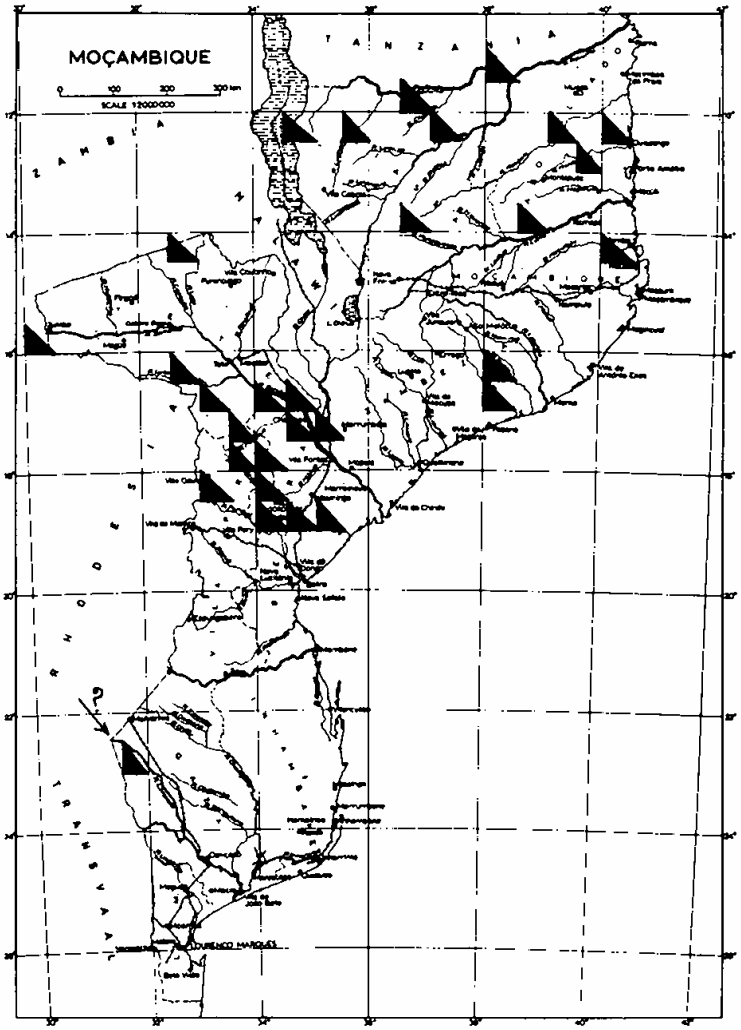

Figure 2. The distribution of the black rhinoceros in Mozambique, after Smithers & Lobão Tello (1976). The exact period during which these sightings were made is unclear, but the map was probably intended to represent distribution at the time of publication.

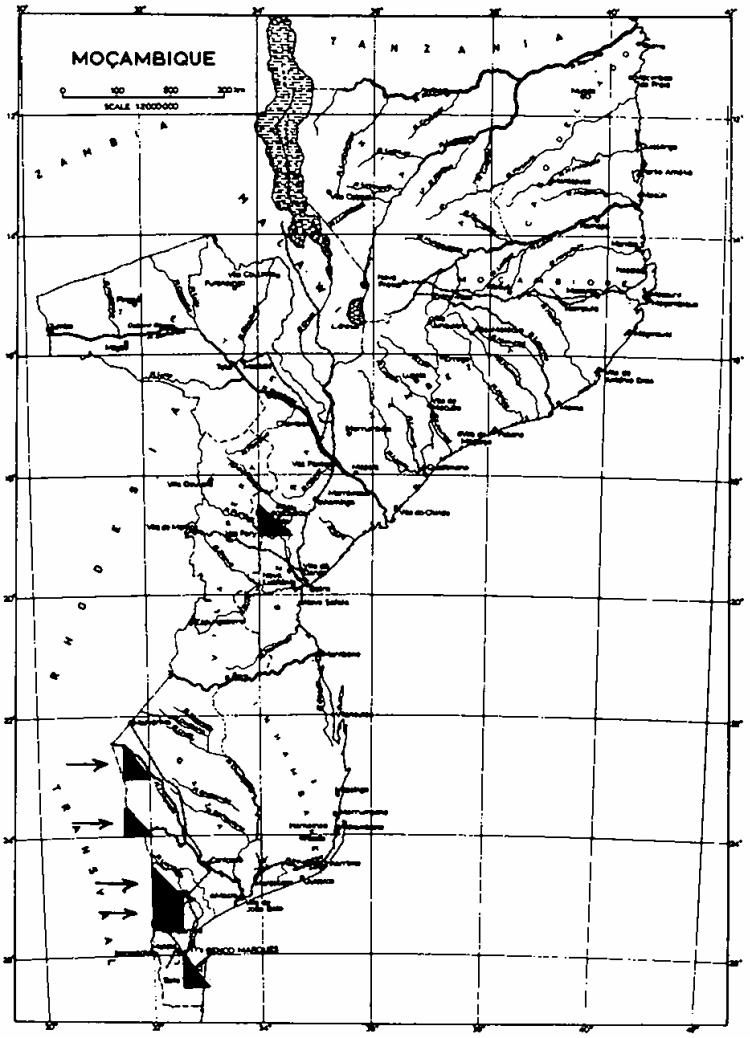

Figure 3. Distribution of the white rhinoceros in Mozambique, after Smithers & Lobão Tello (1976). By 1976, the white rhino had been reintroduced to Gorongosa NP in central Mozambique and to Maputo GR in the south. Records of white rhinos along the international border with South Africa's Transvaal Province represent the occasional movements of animals from the reintroduced population in Kruger NP.

Plans for rhino conservation in Limpopo NP

The history of Limpopo NP is summarised in the park's management plan (Grossman & Holden 2003) and this summary is extracted from that. The area proclaimed as Limpopo NP during November 2001 was formerly used as a safari hunting zone (*Coutada* 16). As early as 1938, the linking of Kruger NP, *Coutada* 16 and Gonarezhou NP in Zimbabwe was mooted. After the Mozambique Peace Accord of 1992, on the recommendation of the Mozambican Council of Ministers, the Global Environment Facility, through the World Bank, funded feasibility analyses. The long-held vision of linking the three national parks, as well as key interstitial areas, became a reality with the formal agreements of the Governments of Mozambique, South Africa and Zimbabwe on 10th November 2000, to establish the Great Limpopo Transfrontier Park and Conservation Area. One of the first steps taken by the Mozambican Government to implement the agreement was to change the legal status of *Coutada* 16 to that of a national park. A formal treaty establishing the Transfrontier Park was signed by the Heads of State during December 2002.

The western boundary of Limpopo NP is the border with South Africa and it stretches north-south for nearly 200 km. The Zimbabwean border touches on the most northerly tip of the park. The Limpopo River forms the eastern boundary of the park, whilst the Elefantes River forms the southern boundary. The course of the Limpopo River is of fundamental importance in determining the physical position of the north-eastern boundary and a number of related factors need to be considered. These include the

hydrological regime of the river, which flooded extensively during early 2000 and which periodically flows at a high level. The extent of the 2000 floods was so great that the valley was filled and the floodplain boundaries were exceeded.

The support zone (so called as it is intended to provide support to the park whilst at the same time the park benefits the people living adjacent to it in this zone) or buffer zone (legal term) of the park extends westwards from the Limpopo River and northwards from the Elefantes River in the area between the latter's confluence with the Limpopo, and Massingir Dam. The position of the western boundary of this zone is unclear as the map contained in the park's proclamation reflects certain surveyed points on the floodplain, while the text indicates that the boundary lies 5 km west of the Limpopo River. In any event, this boundary is to be refined by a dedicated team working together with the local communities in order that the proclamation can be suitably amended. Its relocation will take into account the use of the land by local residents.

Great Limpopo Transfrontier Park

Limpopo NP is a part of the Great Limpopo Transfrontier Park (TP), which also includes Kruger NP and Gonarezhou NP. However, the original vision for this area also included Banhine NP and Zinave NP in Mozambique, as well as the land between the parks. The planning and development of this greater area is the subject of ongoing work by the government of Mozambique and various NGOs (Grossman & Holden 2003).

Kruger NP, lying immediately to the west of Limpopo NP, has an important bearing on the planning and development of Limpopo NP (Grossman & Holden 2003). There are several reasons for this, the most important being the need to fulfil one of the primary objectives of transfrontier conservation areas (TFCAs), which is to manage ecosystems holistically (Grossman & Holden 2003). In the past, Kruger NP was managed as if it were an island, with no consideration being taken of neighbours, but the thinking on this has changed recently. It is now intended that the Kruger NP and Limpopo NP management authorities co-operate to harmonise their respective management and development plans, with the intention of improving the ecological management of the area. The zoning of the two parks will be complementary and supportive and will be based on natural and existing man-made features. Gonarezhou NP is not contiguous with Limpopo NP or Kruger NP, but is separated from the north of Kruger NP by communal land.

A first step in permitting the natural movement of animals between the national parks that are part of the Great Limpopo TP came during 2003, when a 15 km stretch of fence along the international border and eastern boundary of Kruger NP was removed (D. Pienaar, pers. comm.). In addition to this man-made gap, there are several other gaps, particularly at places where the fence crosses rivers.

The Peace Parks Foundation Project

The development of Limpopo NP over the next five years is being funded by an initial grant of 6 million euros secured by the Peace Parks Foundation (PPF) from the German Government through the German Development Bank (Kreditanstalt fur Wiederaufbau). Additional funding has been made available by other donors including the World Bank, the USAID Regional Centre for Southern Africa and the IUCN. A grant of approximately one million euros has been provided for the relocation of non-threatening wildlife, mainly antelopes, to Limpopo NP. The following account of the PPF project activities is based on reports filed on the PPF website.

On 1 August 2001, a project implementation unit (PIU) was appointed to manage and develop the park. The unit is based at Massingir, at the entrance to the park. There is a project steering committee, consisting of two members from the Mozambican Ministry of Tourism and two members from the PPF, which oversees implementation of the project.

At the end of 2003, the project staff included a project manager, a park director, a financial manager, a support zone co-ordinator, a community liaison officer, an administration clerk, an anti-poaching co-ordinator, a nature conservator, a support zone advisor and 73 field rangers. The field rangers are deployed in the field, with five or six rangers per picket (patrol). During 2003, 27 rangers undertook a refresher course and 15 new rangers were given leadership training.

Park Management

Following a planning workshop for stakeholders, a planning committee was formed. The lead consultants in the drafting of the management plan submitted the draft plan at the end of November 2002. The final draft has now been completed (Grossman & Holden 2003).

Community Liaison

The two priorities with regard to community liaison in Limpopo NP are:

1. the need for park boundary re-alignment along the Limpopo River and to the south-east of Massingir dam; and
2. the future (i.e. voluntary resettlement outside the park, or remaining inside the park) of the communities currently located in the park within the Shingwedzi River watershed.

When the project started, the communities and NGOs viewed the project negatively, as they believed that the communities had not been consulted on the development of Limpopo NP as a whole and on the introduction of wildlife in particular. The PIU therefore formulated a strategic approach before engaging with the communities. A Social Development Framework document was compiled, which described how the PIU would approach the participation process, the structures which would be required to engage with the communities, e.g. village level steering committees, and the creation of a planning and development forum (support group). The framework document was presented at a management planning workshop that was held in Maputo during April 2002.

It was agreed at this workshop that the process of information dissemination and the creation of community structures should include NGOs. This decision was welcomed by the PIU because it meant that efforts would be combined and that the confusion created in the past by having different groups talking to the same communities would be prevented. Various meetings were held with the NGO forum. It was agreed to create two teams consisting of representatives from the five NGOs working in the area and a community liaison officer (CLO) from Limpopo NP. The CLO would also act as co-ordinator for the group. A set of guidelines was developed, which the teams used to ensure that the same message reached different villages.

Project teams have held meetings with villagers. The background to the project was discussed with them and the participation of the villagers in the planning process was emphasised. The creation of village steering committees was discussed and the formation process decided. Two individuals from each committee were then identified to join the support group and represent the village in future participation processes.

A consultant was appointed to assist with the drafting of a voluntary resettlement policy and compensation framework. The team responsible for the mapping of the resource use areas in the support zone was due to finish their survey by early February 2004. A spatial planning exercise will then be undertaken to determine an appropriate boundary for the support zone, possible corridors to allow the wildlife access to the Limpopo River, as well as the establishment of resource use areas.

A workshop was held during December 2003 and attended by the provincial governor, district administrators, provincial and local government officials, representatives of the affected communities and local leaders, NGOs and other stakeholders. The workshop reached consensus on the principle issues with regard to resettlement. The need for establishing a liaison mechanism whereby local people, local and provincial government and other stakeholders could get involved in the management and development issues of the park was discussed. The establishment of such a broad representative forum was supported and the composition of the project liaison board was decided.

Tourism Development

After a consultant completed the first draft of a tourism development plan, a workshop was held with representatives from interested parties. The second phase of the tourism development plan was presented to the steering committee at a meeting during November 2003. There was agreement that two of the tourism opportunities were immediately ready for development: a wilderness trail in the enclosure, and two four-wheel drive safari trails along the Limpopo and Shingwedzi Rivers.

Poaching and Antipoaching Operations

There are currently 73 field rangers employed at Limpopo NP. Eleven pickets, each of five or six rangers, are deployed in the park. Two or three men in each picket are armed with automatic rifles. The activities and achievements of the field ranger force during 2003 are summarised in Table 1.

During March 2004, the installation of masts for a network of repeater stations began, in order to permit staff almost anywhere in the park to be able to use a VHF radio system for communication.

Since 2000, small numbers of elephants and rhinos have been poached in Kruger NP by poachers entering from Mozambique. At least one of the poaching gangs originated from the Godji area, just to the south-west of Massingir Dam and just southwards, across the Elefantes River, from the Limpopo NP sanctuary. The PPF project staff are aware that one white rhino was poached in Limpopo NP during 2003, allegedly by one of the park's field rangers. An arrest was made, but the suspect was released, because neither the horns nor the carcass were recovered.

Table 1. Summary of antipoaching activities and achievements during 2003 (Source: Z. Macamero, Limpopo NP protection manager)

Antipoaching activities and achievements	Number
Antipoaching activities	
Foot patrols (covering 25-30 km daily)	900
Vehicle patrols	150
Bicycle patrols	755
Ambushes	250
Achievements	
Wire snares recovered	400
Poachers caught:	30
with weapons	23
snaring	7
Firearms recovered	33

Animal reintroductions to Limpopo NP

Wildlife populations declined drastically during the 25 years prior to the establishment of Limpopo NP, primarily because of uncontrolled hunting during the Mozambican civil war.

A group of 25 elephants was translocated to Limpopo NP from Kruger NP during October 2001, but all of these animals soon returned to Kruger NP.

Although it was planned initially to introduce wildlife that would pose no threat to the local communities, some people objected to the relocation of wild animals to an area where people lived. It was therefore decided to build an enclosure into which the wildlife could be released. This enclosure has several advantages. First, wildlife numbers could increase in the proposed tourism zone without impacting on the local people and, secondly, because the wildlife is concentrated in a relatively small area, it is easier to protect from poaching. The initial intention was that, after a few years, once an amicable solution has been agreed with the local communities, it will be possible to move the wildlife out of the enclosure and use it as an Intensive Protection Zone (IPZ). Breeding populations of rare species such as rhino, sable and roan would be introduced into the enclosure where they could be managed until such time that their numbers have increased significantly. It is envisaged that the enclosure will be used for the park's first tourism development project, because investors will be more interested in a project that is situated in an enclosure that contains some wildlife.

One community objected to the proposed route of the enclosure fence as it would have fenced in a waterhole that was used by these people and their cattle. Furthermore, the community made extensive use of the dam edge for agriculture, especially during the winter when the water level dropped. Therefore, the fence route was revised to exclude the water hole and dam edge. The fence is about 48 km long and consists of 17 strands of steel wire with four electric wires outrigged on the inside and one on the outside.

The fence was completed during 2002. An area of 350 km^2 was enclosed in the south-west corner of Limpopo NP, along the border of Kruger NP and north of the Elefantes River and Massingir Dam (see Fig. 4 for map showing location). The enclosure is known locally as the sanctuary[1]. During 2002 and 2003, approximately 2000 animals were moved from Kruger NP into this sanctuary, including 825 impalas, 507 zebras, 496 wildebeests, 86 elephants, 24 waterbucks, 17 giraffes and two white rhinos (Stalmans 2004). A survey during 2003 of the wildlife in the sanctuary also revealed the presence of least eight buffaloes, 36 kudus and 24 sable antelopes, all of which, presumably, were inside the sanctuary when it was fenced. The rapid restocking of wildlife in the sanctuary was intended to provide an area within Limpopo NP that contained relatively high densities of wildlife and thus had significant potential for ecotourism (Stalmans 2004). The sanctuary's ecological carrying capacity for large herbivores was estimated by Stalmans & Peel (2003) using: 1) their personal experience and expertise; 2) Coe, Cumming & Phillipson's (1976) regression between wildlife stocking rate and mean annual rainfall; and 3) population estimates for neighbouring survey blocks in Kruger NP.

After the initial wildlife restocking of the sanctuary, a new restocking strategy was proposed: instead of simply releasing additional animals of a variety of species in the sanctuary, only selected rare and valuable species (mainly sable antelope and white rhino) would be released there (Stalmans 2004). This approach would be combined with the natural movement of animals through the gaps in the Kruger boundary fence, and the translocation of various other species to two sites elsewhere in Limpopo NP. Plans for the future management of the sanctuary have not yet been finalised.

Reintroduction of the white rhino to Limpopo NP

During the past few years, a few white rhinos have moved from Kruger NP, through the gaps in Kruger's eastern boundary fence and into Limpopo NP. During 2002, two of these immigrants (both adult males) were captured in Limpopo NP and moved into the sanctuary. Currently, some additional individuals, including at least one young female, are roaming elsewhere in Limpopo NP, but so far there is no evidence of breeding among the white rhinos in Limpopo NP, although this may just be a matter of time.

It is planned that during the 2004 dry season, ten white rhinos will be captured in Kruger NP and released into the sanctuary in Limpopo NP. Some of the individuals currently living in the park, but outside the sanctuary, might be captured and moved into the sanctuary. At present, the reintroduction of the white rhino to Limpopo NP has not been planned beyond 2004, but it is likely that South African National Parks would provide additional white rhinos if requested to do so (D. Pienaar, pers. comm.).

Stalmans (2004) considered the suitability of the sanctuary specifically for the white rhino. He considered two plant communities to be largely unsuitable and the other communities to be of medium suitability. He concluded that a total of 30 to 50 white rhinos would be appropriate in the sanctuary and recommended that 30 be introduced.

It is likely that white rhinos will continue to enter Limpopo NP from Kruger NP though gaps in the Kruger boundary fence. It is planned that the gap in the northern part of the Kruger NP boundary fence will be increased to approximately 40 km during 2004. A long-term aim of management is to remove the entire fence between Kruger NP and Limpopo NP, but no timetable for this has been prepared. Even before this happens, so long as there are gaps in the fence, any white rhinos in Limpopo NP (but outside the sanctuary) will not be an isolated population, but simply part of the much more numerous Kruger-Limpopo population.

[1] Within rhino conservation circles, the term 'sanctuary' has a defined meaning (Emslie & Brooks 1999). A sanctuary is 'a small area of state-protected, private or communal land in which rhinos are deliberately confined through perimeter fencing or other methods, and where law enforcement staff are deployed at a high density (one field ranger per 10–30 km^2) to protect the rhino population. The confinement of rhinos within a sanctuary allows close observation and relatively intensive management of the population.' The sanctuary approach is based on the principle of concentrating law enforcement activity.

If, as is planned, some additional white rhinos are released into the Limpopo NP enclosure during 2004, this enclosure – which is already know locally as the sanctuary - will also be a sanctuary as defined by the AfRSG (Emslie & Brooks 1999).

Vegetation and landscapes of Limpopo NP and its sanctuary

Gertenbach (1983) mapped 35 landscape types in Kruger NP, with a landscape defined as an area with a specific geomorphology, climate, soil and vegetation pattern. Stalmans & Carvalho (2002) used the same landscape types to map ten landscapes in Limpopo NP (Fig. 4, see Table 4). Each of these landscapes contains one or more plant communities and some plant communities occur in more than one landscape. The ten landscapes include 15 plant communities, but these plant communities have not been mapped within Limpopo NP.

The landscapes and plant communities within the sanctuary were determined and mapped by Stalmans & Carvalho (2002) and Stalmans & Peel (2003). Landscape 31 (Lebombo North) covers 66.2 % of the sanctuary, landscape 26 (mopane shrubveld on calcrete) covers 29.7 % and landscape 30 (Pumbe Sandveld) covers 4.1 % (Table 2).

Plant community 6 (*Colophospermum mopane – Panicum maximum* short woodland) is the most extensive plant community and covers 49.8 % of the sanctuary (Table 3). Community 5 (*Combretum apiculatum – Andropogon gayanus* low woodland) is typical of the broad crests found on the Lebombos and comprises 36.1 % of the sanctuary.

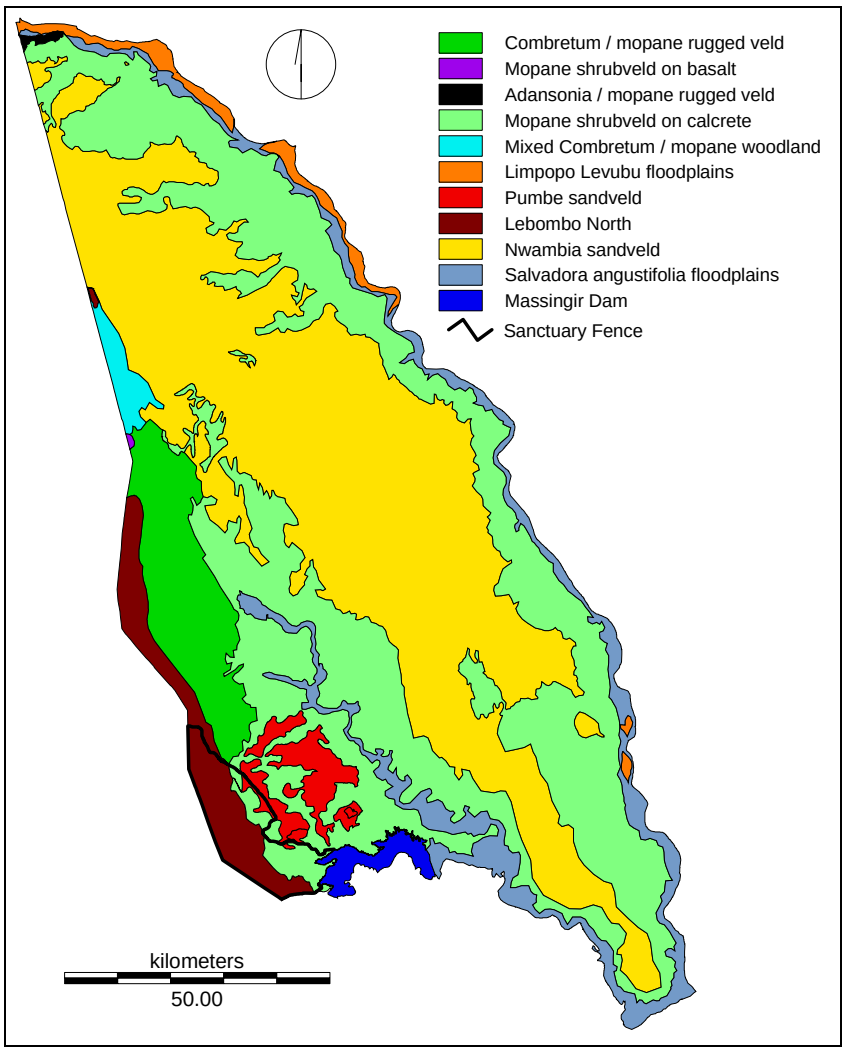

Figure 4. The landscapes of Limpopo National Park, as mapped by Stalmans & Carvalho (2002). Landscape types follow those used by Gertenbach (1983) to map Kruger NP.

Table 2. The landscapes and principal vegetation communities of the Limpopo NP sanctuary, as determined by Stalmans & Peel (2003). Plant communities follow Stalmans & Carvalho (2002).

Landscape scale	Intermediate scale		Community scale	
			Number	Size (ha)
Landscape 31 Lebombo North 66.2 % - 23 160 ha	Gorge (steep slopes towards Massingir Dam) (7.5 %)		1	1737
	Remaining areas (92.5 %)	Crests (59 %)	5	12 639
		Midslopes & footslopes (37 %)	6	7926
		Valley bottom (4 %)	7	857
Landscape 26 Mopane on calcrete 29.7 % - 10 403 ha	Gorge (steep slopes towards Massingir Dam) (5 %)		1	520
	Remaining areas (95 %)	Crests & slopes (96 %)	6	9487
		Valley bottom (4 %)	7	395
Landscape 30 Pumbe Sandveld 4.1% - 1437 ha	Homogeneous terrain		4	1437

Table 3. The extent of the different vegetation communities within the Limpopo NP sanctuary, as determined by Stalmans & Peel (2003). Plant communities follow Stalmans & Carvalho (2002).

Community number	Plant Community	Size (km^2)	Percent of sanctuary
1	*Androstachys johnsonii – Guibourtia conjugata* short forest	22.57	6.4
4	*Combretum apiculatum – Pogonarthria squarrosa* low woodland	14.37	4.1
5	*Combretum apiculatum – Andropogon gayanus* low woodland	126.39	36.1
6	*Colophospermum mopane – Panicum maximum* short woodland	174.23	49.8
7	*Colophospermum mopane – Combretum imberbe* tall shrubland	12.52	3.6
11	*Acacia xanthophloea – Phragmites* sp. woodland	*	< 1
13	*Plugia dioscurus – Setaria incrassata* short grassland	*	< 1
14	*Sporobolus consimilis – Setaria incrassata* tall grassland	*	< 1

* Not mapped

Food, habitat and carrying capacity of white and black rhinos in Limpopo NP

There have been no studies of the diets or habitats of black or white rhinos in Limpopo NP. Therefore, information from the adjacent Kruger NP and elsewhere is used to predict the likely diets and habitats of rhinos in Limpopo NP.

Diet of the white rhino

The white rhino is a selective grazer, with a preference for short grasses (Pienaar 1994c). In Kruger NP, it eats grasses such as *Panicum maximum*, *Sporobolus nitens*, *Dactyloctenium aegyptium*, *Panicum coloratum*, *Urochloa mossambicensis* and *Digitaria* species (Pienaar, Bothma & Theron 1992, Pienaar 1994c). *Themeda triandra* was grazed only after a fire when it was freshly sprouting. In Umfolozi GR also, *Urochloa*, *Panicum* and *Digitaria* were frequently eaten and *Themeda triandra*, although the dominant grass in the area, was not preferred (Player & Feely 1960).

Habitat preferences of the white rhino

The distribution of white rhinos seen during aerial surveys of Kruger NP, in relation to landscape type, was studied by Pienaar *et al*. (1992, 1993a), who calculated the mean density of white rhinos in each landscape type and determined which landscapes were preferred or avoided. Here, the mean densities of white rhinos and the preference indices for the landscapes in Kruger NP are considered only for those landscapes found in Limpopo NP (Table 4). All the preference indices are negative, indicating that none of the landscapes found in Limpopo NP are selected by white rhinos in Kruger NP. In fact of the ten landscape types in Limpopo NP, four were always devoid of white rhinos during 13 annual surveys of Kruger NP. However, the mean densities in the other landscapes indicates the *relative* importance of each landscape to white rhinos.

Table 4. The landscapes mapped by Stalmans & Carvalho (2002) in Limpopo NP and the densities of white rhinos seen in the same landscapes during aerial surveys of central and northern Kruger NP during 1979-1991 (Pienaar *et al*. 1993a). Landscape numbers follow Gertenbach (1983).

Landscape number	Landscape	Mean density of white rhinos in similar landscape in Kruger NP	Landscape preference index *
22	*Combretum* spp. / *Colophospermum mopane*	0.0021	-0.8160
23	*Colophospermum mopane* shrubveld on basalt	0.0007	-0.9411
25	*Adansonia digitata* / *Colophospermum mopane*	0	-1
26	*Colophospermum mopane* shrubveld on calcrete	0	-1
27	Mixed *Combretum* spp. / *Colophospermum mopane* woodland	0.0016	-0.8636
28	Limpopo Levubu floodplain	0	-1
30	Pumbe sandveld	0.0086	-0.2496
31	Lebombo North	0.0008	-0.9262
32	Nwambia sandveld	0	-1
35	*Salvadora angustifolia* floodplain	0.0018	-0.8477

* Positive values (maximum +1) indicate that landscape use was greater than the proportion of that landscape type in central and northern Kruger NP; negative values (minimum –1) indicate that landscape use was less than the proportion of that landscape type in central and northern Kruger NP; zero indicates that the landscape type was used in proportion to its occurrence in central and northern Kruger NP (Pienaar *et al*. 1992, 1993a).

Factors influencing the distribution of the white rhino

In Umfolozi GR, Player & Feely (1960) identified four factors that had a major influence on the distribution of white rhinos:

- the quality of the grazing, because this determined the rhinos' food supply;
- the availability of surface water throughout the year for drinking and for wallowing in wet mud during the hot months;
- cover, in the form of clumps or extensive areas of thick bush, to provide shelter from very hot, or cold, windy weather; and
- the absence of rugged topography.

The landscapes of Kruger NP that were preferred by white rhinos have the following characteristics (Pienaar *et al*. 1993a, Pienaar 1994c):

- undulating topography with uplands, bottomlands and watercourses;
- sandy soils with few stones or rocks on the soil surface;
- access to permanent water sources (for drinking, although white rhinos can go for up to three days without drinking);
- a moderate to dense grass layer of good quality grasses (i.e. an abundance of high quality food);
- an open to moderate low-shrub (<2 m) layer (a dense layer of low shrubs is likely to reduce grass production and interfere with the rhinos' feeding);
- a moderately dense tree layer (to provide shady resting sites during the midday heat); and
- the presence of small pans (for wallowing in mud).

White rhinos are partial to freshly burnt areas and Pienaar (1994c) saw them eat burnt grass stubble the day after a fire.

Carrying capacity of the white rhino in Limpopo NP

Carrying capacity of the sanctuary

The sanctuary of about 350 km^2 is situated in the south-west of Limpopo NP, adjacent to the international border and Kruger NP. The rainfall stations at Olifants and Letaba, both in Kruger NP to the west of the sanctuary, receive an average of 497 and 458 mm respectively of rain annually (Zambatis 2003).

Stalmans & Peel (2003) used a mean annual rainfall of 495 mm in Coe, Cumming & Phillipson's (1976) equation (relating wildlife stocking rate to mean annual rainfall) to estimate a possible average stocking rate (for all large herbivores) in the sanctuary of 3093[2] kg km^{-2}, with low and high estimates of 1807 and 4378 kg km^{-2}. Their own 'expert' estimate of herbivore carrying capacity was close to the latter figure. Stalmans & Peel (2003) then considered the suitability of the different plant communities for each herbivore species (see Table 5 for their figures for rhinos) and the possible composition of the large herbivore community in terms of feeder category (e.g. bulk grazers, concentrate grazers, mixed feeders and browsers) and species (see Table 6 for possible species composition of bulk grazer category). Stalmans & Peel (2003) suggested that the sanctuary could support 20-30 white rhinos (at an overall mean density of 0.057–0.086 rhinos km^{-2}).

Later, Stalmans (2004) considered the suitability of the sanctuary specifically for the white rhino and the sable antelope. He considered the *Androstachys johnsonii – Guibourtia conjugata* short forest (plant community 1) and the *Combretum apiculatum – Andropogon gayanus* low woodland (community 5) to be largely unsuitable for the white rhino. The suitability of the other vegetation communities, covering about 200 km^2 in total, was largely 'medium' for the white rhino (Table 5). Stalmans (2004) suggested that 'based on experience in other areas of average suitability', a total of 30 to 50 white rhinos in the sanctuary would be appropriate. This is equivalent to a mean density of 0.086-0.143 rhinos km^{-2}. Given the low overall stocking rate of the sanctuary, Stalmans (2004) believed that social interactions between males, not food, would be the limiting factor for the white rhino. He recommended that 30 white rhinos be introduced to the sanctuary, and that intensive monitoring should focus on:

- the total number of rhinos;
- the age and sex composition of the population; and
- the degree of inter-male conflict, and the frequency of injuries caused by fighting.

[2] Stalmans & Peel (2003) give a figure of 3013 km km^{-2}, but this appears to be a misprint. When Stalmans & Peel's estimate of mean annual rainfall (495 mm) is inserted into Coe *et al*.'s (1976) equation, the estimated large herbivore biomass is 3093 kg km^{-2}.

Table 5. Average habitat suitability scores of the plant communities in the sanctuary [scale 1 (marginal) to 5 (ideal)], from Stalmans & Peel (2003). The overall habitat suitability score for the sanctuary takes into account the relative extent of the different plant communities.

Community number	Plant community	Mean habitat suitability score	
		Black Rhino	White Rhino
1	*Androstachys johnsonii – Guibourtia conjugata* short forest	1	1
4	*Combretum apiculatum – Pogonarthria squarrosa* low woodland	1.0	2.5
5	*Combretum apiculatum – Andropogon gayanus* low woodland	1.0	1.7
6	*Colophospermum mopane – Panicum maximum* short woodland	1.3	2.6
7	*Colophospermum mopane – Combretum imberbe* tall shrubland	1.3	3.3
11	*Acacia xanthophloea – Phragmites* sp. woodland	2.0	4.0
13	*Plugia dioscurus – Setaria incrassata* short grassland	1.0	3.0
14	*Sporobolus consimilis – Setaria incrassata* tall grassland	1.0	3.3
Overall habitat suitability score		1.2	2.2

Table 6. Potential density of bulk grazers in the 350 km^2 sanctuary, based on different approximations of carrying capacity, from Stalmans & Peel (2003).

	Carrying capacity estimate (individuals km^{-2})			
	Coe *et al*. (1976) – minimum	Coe *et al*. (1976) - average	Coe *et al*. (1976) - maximum	Stalmans & Peel's 'expert'
White rhino	0.057	0.057	0.086	0.086
Hippopotamus	0.029	0.029	0.029	0.029
Waterbuck	0.29	0.57	0.86	0.86
Zebra	0.86	1.6	1.7	1.7
Buffalo	0.57	1.14	2.9	2.9
Sable antelope	0.11	0.14	0.14	0.14

Carrying capacity of the entire National Park

The landscape preferences of white rhinos in Kruger NP (Pienaar *et al*. 1992, 1993a) were studied during 1979-1991, a period during which the number of rhinos was increasing after the species was reintroduced during the 1960s (Pienaar 1970). Hence the mean density recorded in different landscapes during this period (Table 4) would have been significantly less than the ecological carrying capacities of the same landscapes. Most of the white rhinos translocated to Kruger NP were released in the south (Pienaar 1994a) and so the number of individuals initially increased more rapidly here than in the northern and central regions. Six landscapes occur in both southern Kruger NP and in the central and northern sections (but, by chance, not in Limpopo NP). In southern Kruger NP, the mean density of white rhinos in these six landscapes was, on average, 11 (range 4-22) times greater than that in the same landscapes in the central and northern sections. But, of course, even the mean densities in the different landscapes of southern Kruger NP were recorded when the number of rhinos was increasing. During 1993, the mean density of white rhinos in southern Kruger NP was 0.4 km^{-2} (Pienaar 1994b), approximately twice the overall mean density recorded in the same area during the 1979-1991 aerial surveys (Pienaar *et al*. 1992). High-density areas contained 1.4 rhinos km^{-2} during 1993, almost three times the greatest landscape-specific mean density recorded during the aerial surveys (0.5 km^{-2} in granitoid lowlands with *Acacia grandicornuta* tree-savanna).

During the mid or late 1990s, the densities of white rhinos in two landscapes in Timbavati Private Nature Reserve, just to the west of Kruger NP, were compared with the mean densities recorded in the same landscapes in Kruger NP during 1979-1991 (Pienaar *et al*. 1993a, Roche 2000). Rhino densities were about 10-fold greater in Timbavati than in Kruger.

Taken overall, these figures suggest that the landscapes in northern and central Kruger NP (and therefore by implication, those same landscapes in Limpopo NP) could support densities of white rhinos that are 1-2 orders of magnitude greater than the densities listed in Table 4. However, it is important to note, first, that about 80 % of Limpopo NP is covered by Nwambia sandveld (landscape 32, covering 41.1 %), or *Colophospermum mopane* shrubveld on calcrete (landscape 26, covering 38.8 %) (Stalmans & Carvalho 2002), and secondly that, during 13 annual surveys of the wildlife in Kruger NP, these two landscapes were always empty of white rhinos (Pienaar *et al*. 1993a). The degree to which rhinos use any particular landscape may depend partly on what alternatives are available. Thus, just because these two landscapes are not (yet?) used by white rhinos in Kruger NP does not necessarily mean that they would never be used in Limpopo NP. However, it does suggest that, at best, the majority of Limpopo NP is poor-quality habitat for white rhinos. The suitable landscapes are mainly in the south-west of the park (Fig. 5a).

By now, however, the diligent reader will have noticed a contradiction: on the basis of the data of Pienaar *et al*. (1993a), landscape 26 (*Colophospermum mopane* shrubveld on calcrete) is unsuitable for the white rhino (Table 4); but the dominant plant community of this landscape is community 6 (*Colophospermum mopane – Panicum maximum* short woodland), which Stalmans (2004) considered to be of 'medium' suitability for the white rhino (Table 5).

Two other factors likely to have a major impact on the distribution of the white rhino in Limpopo NP are the distribution of surface water for drinking during the late dry season, and the distribution of human settlements, which are likely to have a negative effect on the rhinos. At present, in the absence of artificial waterpoints, surface water during the late dry season is largely limited to Massingir Dam, the Limpopo, Shingwedzi and Elefantes Rivers, and the rivers that drain eastwards from the Lebombo Hills (which are along the western border of Limpopo NP, north-westwards of Massingir Dam) (Fig. 5b).

During the studies of Pienaar *et al*. (1992, 1993a), there were numerous artificial water points in Kruger NP and so it is unclear what distance territorial white rhinos would be prepared to travel to water at the end of the dry season. A figure of 10 km is used here. Although somewhat arbitrary, this figure is similar to the figure of 8 km suggested by Adcock (2001) for the black rhino. As more sections of the Kruger boundary fence are removed, the map of perennial water distribution in Limpopo NP can be revised to take account of any permanent water sources that are in Kruger NP, but close to the border with Limpopo NP.

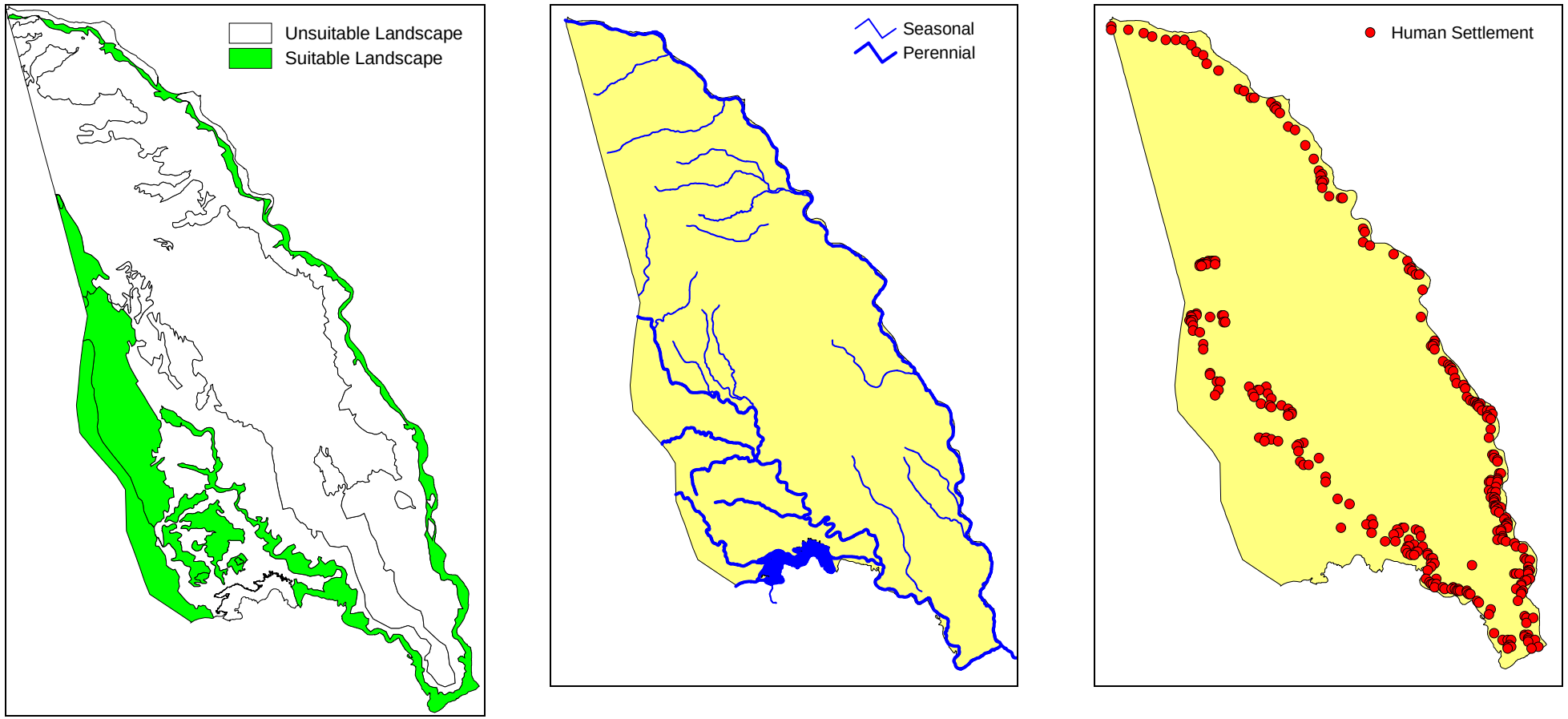

Figure 5. Maps of Limpopo NP, showing distribution of: (a) landscapes suitable for the white rhino; (b) surface water during the late dry season; and (c) human settlements. Maps provided by M. Stalmans and C. Beech.

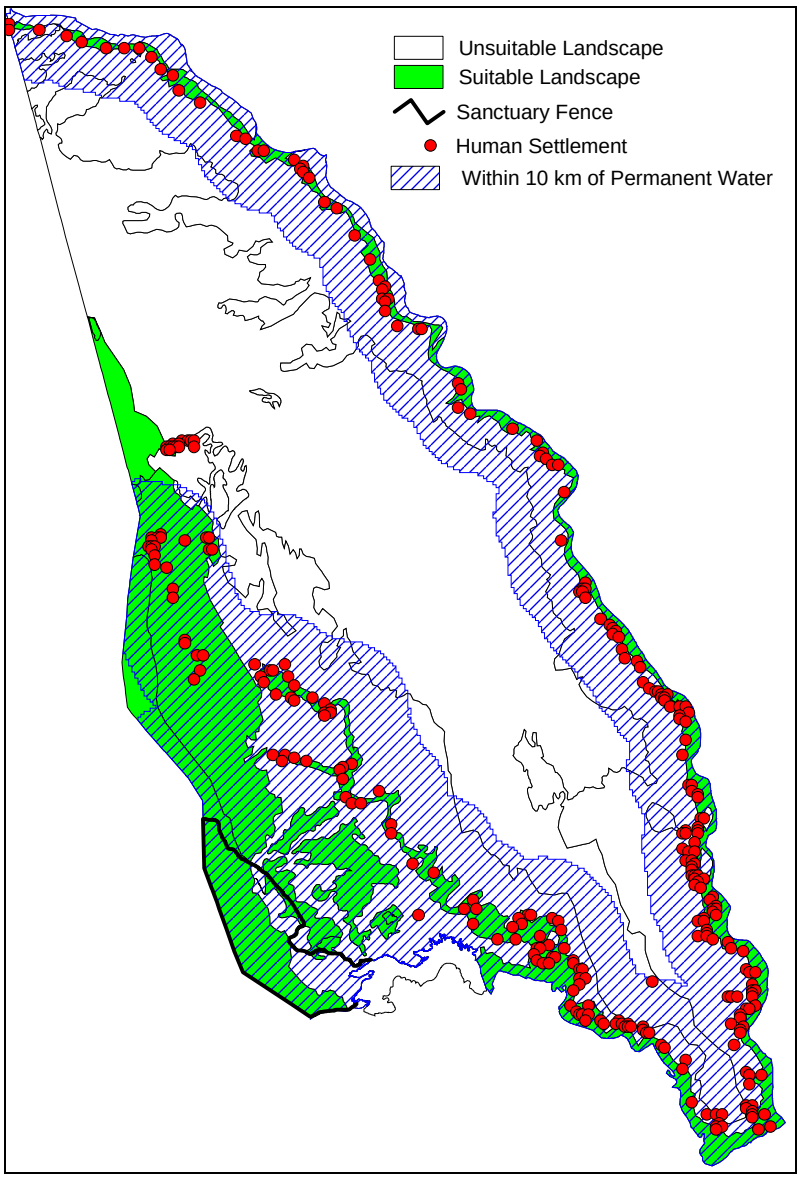

Figure 6. The suitability or otherwise of the landscapes of Limpopo National Park as habitat for the white rhino, on the basis of the landscape-specific densities of white rhinos seen during 13 annual aerial surveys of northern and central Kruger NP (Pienaar *et al*. 1993a). Unsuitable landscapes are those in which white rhinos were never seen during these surveys.

Human settlements in Limpopo NP are situated mainly along the Limpopo, Shingwedzi and Elefantes Rivers (Fig. 5c). Human activities are likely to have a negative impact on the distribution of the white rhino. First, settlements close to permanent water sources may deprive rhinos of access to that water. Secondly, rhinos are likely to avoid feeding or resting in the vicinity of human settlements, fields or domestic livestock (although if people do not harass the white rhinos, it is likely that, given time, they would become quite tolerant of people and their activities).

When the regions of Limpopo NP that are within 10 km of perennial water are mapped, it is found that almost all the landscapes mapped as suitable for the white rhino are within that distance of water (Fig. 6). It appears that the area of Limpopo NP that is most suitable for the white rhino is the south-west corner of the park, north-west of Massingir Dam and south and west of the Shingwedzi River. This area includes the sanctuary.

Diet of the black rhino

The black rhino was reintroduced to Kruger NP, with the first release of animals during 1971 (Pienaar 1994a), but no information has been published about its diet there. Elsewhere, the black rhino is a browser and commonly eats herbs and low bushes (Goddard 1970a, Emslie & Adcock 1994). The plant genera that rank high in the diet of black rhinos in southern Africa are *Acacia*, *Aloe*, *Bauhinia*, *Commiphora*, *Croton*, *Diospyros*, *Diplorhynchus*, *Disperma*, *Euphorbia*, *Vitex*, and the fallen fruits of *Kigelia africana* (Smithers 1983). Genera that are eaten in Namibia, East Africa and Zimbabwe include *Acacia*, *Bauhinia*, *Combretum*, *Cordia*, *Euphorbia* and *Grewia*. Plant size is important to black rhinos, which show a marked preference for plants that are shorter than 1 m (Emslie & Adcock 1994).

Habitat preferences of the black rhino

No information has been published about the habitat preferences of the black rhino in Kruger NP. Elsewhere, rhino densities are generally low in grassland and greater in shrubland (Goddard 1970b, Frame 1980, Emslie & Adcock 1994, Tatman, Steven-Woods & Smith 2000). The importance of woodland and forest to black rhinos depends greatly on the availability of preferred browse within the reach of rhinos. Riverine areas are often important and, at Hluhluwe, the margins of evergreen forests were preferred areas during the wet season.

Factors influencing the distribution of the black rhino

The distribution of surface water during the dry season has a major influence on the distribution of black rhinos, which drink regularly. The importance of riverine areas to black rhinos probably reflects both the close proximity of this surface water and the favourable soil moisture regime in these areas ensuring that plant productivity continues even after the end of the rainy season (Emslie & Adcock 1994). Areas of dense bush are important to black rhinos for providing shelter and a place to keep cool during the heat of the day (Goddard 1970b, Frame 1980, Emslie & Adcock 1994, Tatman, Steven-Woods & Smith 2000), but may be less important for feeding. The importance of different vegetation types depends greatly on the availability of preferred (as food) browse within reach of the animals. Browse more than 2 m above the ground is unavailable to black rhinos.

Carrying capacity of the black rhino in Limpopo NP

Carrying capacity of the sanctuary

Stalmans & Peel (2003) considered the vegetation in the sanctuary to be less suitable for the black rhino than for the white rhino (Table 5), but they did not estimate its carrying capacity for black rhinos. If the sanctuary is ever considered as a possible reintroduction site for the black rhino, the first question would probably be whether it could support at least 20 rhinos. To support 20 rhinos, the 350 km^2 sanctuary would need to have a carrying capacity of at least 0.057 km^{-2}. By the standard of black rhinos, this is a low carrying capacity (Adcock 2001) and does not disagree with the claim that the suitability of sanctuary for the black rhino is poor (Stalmans & Peel 2003). During the 1970s, a mean density of 0.085 rhinos km^{-2} was recorded in *Colophospermum mopane* and *Combretum-Terminalia* woodlands in South Luangwa NP, Zambia (Liberg 1973). Given the abundance of mopane at both sites, and the ready availability of permanent water in the Limpopo sanctuary, it is likely that this sanctuary could support at least 20 black rhinos.

Carrying capacity of the entire National Park

No information has been published on the use by black rhinos of the different landscapes of Kruger NP and the absence of such a study complicates any attempt to determine the suitability of the landscapes of Limpopo NP for black rhinos. In one study area near Skukuza in Kruger NP, the black rhino density was 0.2 rhinos km^{-2}, but the vegetation and landscapes in this study area are not described (Brooks 1983).

However, across Africa, the black rhino uses a broad range of vegetation types and it is likely that all the vegetation communities in Limpopo NP would be used by black rhinos, if not for feeding, then for resting. Thus, it is likely that the range of the black rhino within Limpopo NP will be limited not by vegetation types, but by the area of the park that is within reach of permanent water during the late dry season. This area totals 6310 km^2 (Fig. 6). However, the Limpopo and Shingwedzi Rivers are the major sources of perennial water in Limpopo NP and the areas alongside these rivers are heavily settled by people. The

area of the park that is within 10 km of permanent water *and* more than (an arbitrary) 10 km from human settlement is only 765 km^2, including the sanctuary (Fig. 7). However, the likely range of the black rhino in Limpopo NP will be increased if some of the people currently living along the Shingwedzi River decide to resettle outside the park, which is one of the aims of the park's community programme; or if some settlement-free corridors are established along the Limpopo River; or if additional sources of permanent water are located away from the Limpopo, Shingwedzi or Elefantes Rivers.

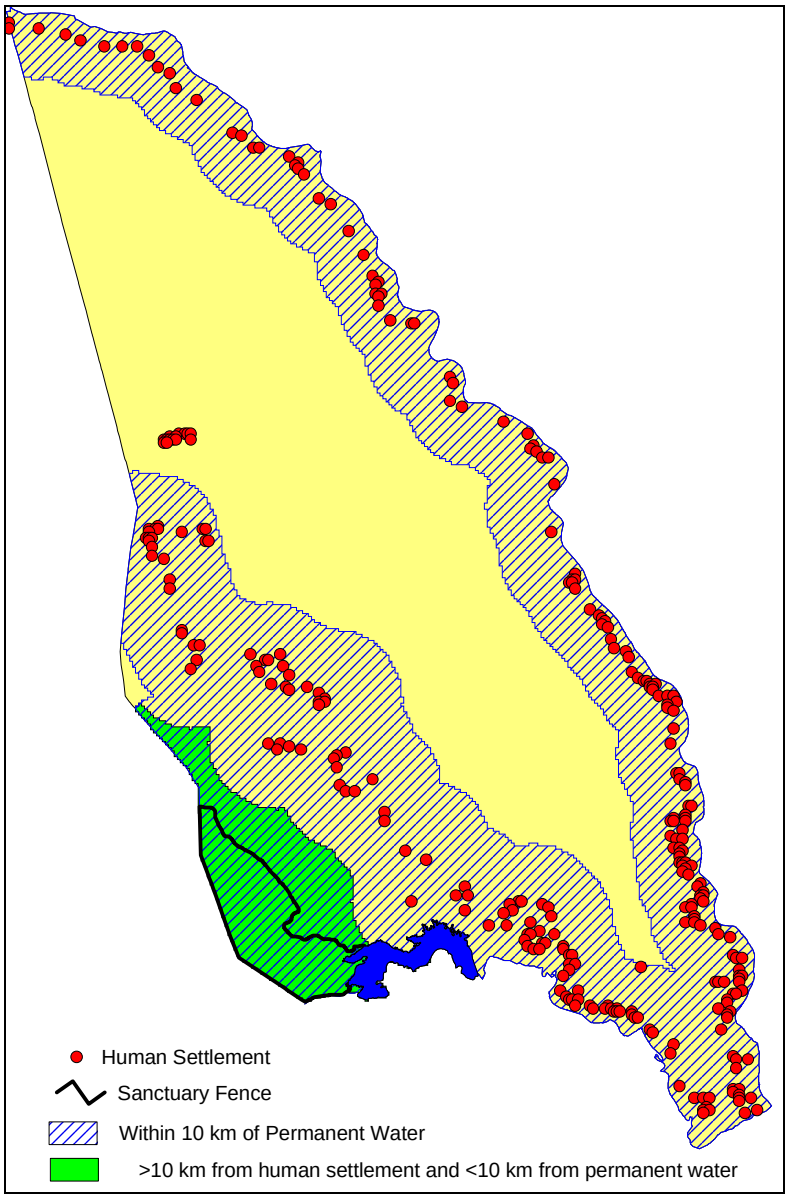

Figure 7. Only 735 km^2 in the south-west of Limpopo NP is within 10 km of permanent water *and* more than 10 km from human settlement. The voluntary resettlement of people living along the Shingwedzi or Limpopo Rivers and/or the location of permanent water sources away from the major rivers will increase the likely range of the black rhino in Limpopo NP.

Evaluation of the plan to reintroduce the white rhino to Limpopo NP

The plan to reintroduce the white rhino to Limpopo NP is evaluated using established criteria for reintroductions generally (IUCN 1998) and rhino reintroductions in particular (AfRSG/SADC RPRC 2001).

Pre-project activities: Biological

Feasibility study and background research

IUCN guideline: Individuals to be released should preferably be of the same subspecies as those that were extirpated.

AfRSG/SADC guideline: Founders to be from more than one source population of the same subspecies.

Comment: The current plan proposes the release of white rhinos of the subspecies *Ceratotherium simum simum*, the southern white rhino. This is the same subspecies as that which used to occur in southern Mozambique (Emslie & Brooks 1999).

All living southern white rhinos are descended from a relatively small number of animals that lived in the Umfolozi GR complex during the early 20th century (Player & Feely 1960). Thus, whatever the direct source of the rhinos that are released into Limpopo NP, they will be genetically similar to those in Umfolozi GR. On theoretical grounds, it would be expected that the population in Umfolozi GR would have greater genetic variability than any one of the populations (e.g. the one in Kruger NP) derived from individuals removed from Umfolozi GR. Thus, on theoretical grounds, it would be valuable if the white rhinos to be released in Limpopo NP included some individuals from Umfolozi GR. However, the practical value of this might be questionable, given that all previous reintroductions of white rhinos have been (at the biological level) very successful, so long as the reintroductions involved sufficient individuals and occurred in areas that were definitely within the former distributional range of the southern white rhino.

IUCN guideline: Detailed studies should be made of the status and biology of wild populations to determine the species' critical needs.

Comment: The ecology of the white rhino has been studied in detail (Player & Feely 1960, Condy 1973, Conway & Goodman 1989, Pienaar *et al*. 1992, 1993a, 1993b, Pienaar 1994b, 1994c, Rachlow 1998, Rachlow, Kie & Berger 1999). No additional studies are proposed and none are needed before reintroducing white rhinos to Limpopo NP.

IUCN guideline: The species, if any, that has filled the void created by the loss of the species concerned should be determined: an understanding of the effect the reintroduced species will have on the ecosystem is important for ascertaining the success of the re-introduced population.

Comment: No species has filled the void created by the elimination of the white rhino from Limpopo NP. The numbers of all large, wild herbivores in Limpopo NP have declined greatly, as a result of excessive hunting, since the white rhino was eliminated.

IUCN guideline: The build-up of the released population should be modelled under various sets of conditions, in order to specify the optimal number and composition of individuals to be released per year and the number of years necessary to promote establishment of a viable population.

AfRSG/SADC guideline: Each population should be established with 20 or more effective founders and the sex ratio of the founder group should be as close to parity as possible. Where there are plans to release just a few animals initially, there should be a clear plan to introduce the additional founders, up to the target of 20 or more.

Comment: It is proposed to release initially ten individuals in the sanctuary (to add to the two already there). There is no definite plan or timetable for the release of additional animals, although Stalmans (2004) proposed the release of 30 individuals in the sanctuary and South African National Parks would probably be willing to provide additional animals after 2004 (D. Pienaar, pers. comm.). There has been no mention of the sex ratio of the founder population, although two animals already in the sanctuary are males. The suggestion by the IUCN that the released population should be modelled is probably superseded by the AfRSG/SADC guidelines, which are based on extensive experience of rhino reintroductions.

IUCN guideline: A Population and Habitat Viability Analysis will aid in identifying significant environmental and population variables and assessing their potential interactions, which would guide long-term management.

AfRSG/SADC guidelines: Each population should be established with 20 or more effective founders. For purposes of genetic management, there should be periodic exchange of effective breeders between populations of the same subspecies. Rapid rates of population growth should be maintained.

Comment: Long-term management of the reintroduced population has not been addressed, although Stalmans (2004) has emphasised the need to monitor the rhinos in the sanctuary to ensure that the population growth rate remains high.

Previous reintroductions

IUCN guideline: Thorough research into previous re-introductions of the same or similar species and wide-ranging contacts with persons having relevant expertise should be conducted prior to and while developing the re-introduction protocol.

Comment: The nature conservator in Limpopo NP has experience of capturing white rhinos and caring for them in bomas, as well as wider experience of the management of parks that contain white rhinos. The staff of Kruger NP, who have extensive experience of capturing, moving and releasing white rhinos, are also involved in the project.

Choice of release site and type

IUCN guideline: The reintroduction site should be within the historic range of the species. For a reintroduction, there should be no remnant population to prevent disease spread, social disruption and introduction of alien genes. A re-introduction may have to be made into an area which is fenced, but it should be within the species' former natural habitat and range.

Comment: Limpopo NP is within the historic range of the white rhino and contains no remnant population. The few individuals currently there have recently moved into the park from the adjacent Kruger NP. It is proposed to release the rhinos into a fenced area that is within the species' former habitat and range.

IUCN guideline: The reintroduction area should have assured, long-term protection.

Comment: The proposed reintroduction site is in Limpopo NP which, by virtue of its legal status as a National Park, should remain, for the foreseeable future, a place where conservation is the major form of land-use.

Evaluation of reintroduction site

IUCN guideline: Re-introductions should only take place where the habitat and landscape requirements of the species are satisfied, and likely to be sustained for the foreseeable future. The possibility of natural habitat change since extirpation must be considered. Likewise, a change in the legal/political or cultural environment since the species' extirpation needs to be ascertained and evaluated as a possible constraint. The area should have sufficient carrying capacity to sustain growth of the re-introduced population and support a viable (self-sustaining) population in the long run.

AfRSG/SADC guidelines: Each population should be established in an area with a carrying capacity of at least 100 rhinos.

Comment: The sanctuary in Limpopo NP meets the habitat and landscape requirements of rhinos (principally food, drinking water and cover). Water is available year-round in a perennial river that runs through the sanctuary.

There is no evidence of habitat change within Limpopo NP since rhinos were extirpated.

A recent and important change in the legal/cultural environment is the transformation of the reintroduction area from a *Coutada* into a national park. This legal change has had major effects on the local people, particularly those who now find themselves living inside the national park.

A recent and important change in the political environment is the development of the TFCA, with ministerial involvement in its development. The administrative transfer of the responsibility for

Mozambican national parks from the DNFFB to the Direcção Nacional das Areas de Conservação (DNAC) is another such change.

The carrying capacity of Limpopo NP for white rhinos is uncertain (although probably >100). However, the animals in Limpopo NP (at least those outside the sanctuary) will not be a separate population, but simply an extension of the Greater Kruger population which already numbers several thousand animals. Thus, uncertainty about the carrying capacity for white rhinos of Limpopo NP is not a major issue.

IUCN guideline: Identification and elimination, or reduction to a sufficient level, of previous causes of decline.

Comment: Excessive hunting was the cause of the elimination of the white rhino from Limpopo NP. During recent years, law-enforcement efforts have intensified, with the establishment of the PPF Project and the recruitment, training and deployment of approximately 70 field rangers. For the Limpopo NP as a whole, this is equivalent to a mean ranger density of 1 ranger per 143 km^2. But two pickets (patrols) of six rangers each are deployed in the sanctuary and the remaining 58 rangers are deployed through the remainder of the park. These numbers are equivalent to mean densities of 1 ranger per 29 km^2 in the sanctuary and 1 ranger per 166 km^2 in the remainder of the park. The ranger density in the sanctuary is close to the recommended density for the rhino protection, namely 1 ranger per 20 km^2 (Bell & Clarke 1986), although Martin (1991), on the basis of rhino poaching and law enforcement in Zimbabwe, suggested 1 ranger per 10 km^2.

During recent years, one rhino has been poached in Limpopo NP and poachers from Mozambique have crossed into Kruger NP and killed small numbers of elephants and rhinos. Thus, it is likely that once the presence of rhinos in Limpopo NP becomes more widely known, these animals will be under serious threat from poachers.

Although the release of white rhinos in the sanctuary will make it easier to safeguard them there, the continued immigration of other individuals from Kruger NP, though the gaps in the Kruger fence, will mean that there are always some individuals that are in Limpopo NP but not in the sanctuary. These individuals will be more difficult to protect, because they are likely to be scattered over a larger area, where it will be more difficult to maintain a high density of ranger patrols. During the late dry season, rhinos outside the sanctuary will be vulnerable to poaching because their movements will be predictable while they will be dependent on the limited supplies of perennial water for drinking.

One option which *might* reduce the possibility that rhinos are poached is to dehorn some or all individuals, and to ensure that maximum publicity is given to the dehorning exercise. However, horns soon regrow and in Hwange NP, Zimbabwe, white rhinos were poached despite having been dehorned (Rachlow & Berger 1997).

An alternative security measure would be to insert a transponder microchip into each horn of all rhinos released in Limpopo NP and all rhinos that are captured for whatever reason. While the presence of a microchip will not prevent rhinos being poached, it would make it easier to establish the provenance of any rhino horns recovered by law enforcement officers.

Availability of suitable release stock

IUCN guideline: It is desirable that source animals come from wild populations, which ideally should be closely related genetically to the original native stock and show similar ecological characteristics.

Comment: The white rhinos in Kruger NP, and any other potential founders, are wild animals, which, as far as is known, are closely related to and show similar ecological characteristics to the original stock in Limpopo NP.

IUCN guideline: Removal of individuals for reintroduction must not endanger the wild source stock. Stock availability must be guaranteed to meet the project protocol. Individuals should be removed from a wild population only after the effects of translocation on the donor population has been assessed and it is guaranteed that these effects will not be negative.

Comment: Removal of individuals from Kruger NP (or Umfolozi GR) would not endanger these source stocks. For several years, individuals have been removed from Kruger NP (and for longer from Umfolozi GR) without the removals having any adverse effect on the donor population.

IUCN guidelines: Prospective release stock must be subjected to a thorough veterinary screening process before shipment from original source. Animals infected with or positive for non-endemic or contagious pathogens with a potential impact on population levels should not be shipped. The uninfected, negative remainder to be quarantined and retested before shipment. Stock must meet health regulations prescribed by the veterinary authorities of the recipient country. Adequate provision for quarantine if necessary. Minimise risk of infection during shipment.

Comment: As a result of the removal of a section of the Kruger NP fence along the border with Limpopo NP, individuals of all species of large mammals can now move freely between the two parks. Consequently, any pathogens present in one park can easily be moved to the other and the park management authorities (and national veterinary authorities) have accepted that this is a consequence of the establishment of a conservation area that straddles an international boundary. Thus, if the white rhinos to be released in Limpopo NP are captured in Kruger NP, these individuals will stay within the TFCA for the entire period of their capture, transport and pre-release confinement. Only if some of the white rhinos to be released in Limpopo NP come from outside the Great Limpopo TP will it be necessary to test them for pathogens not endemic to the area.

Pre-project activities: Socio-economic and legal requirements

IUCN guideline: Reintroductions are generally long-term projects that require the commitment of long-term financial and political support.

Comment: The reintroduction has the support of the DNAC within the Ministry of Tourism and therefore has the political support of the government of Mozambique. However, the current, well-funded Peace Parks Foundation project is two years into a five-year project. A continued high level of funding for Limpopo NP after the end of this project is not yet assured and is dependent upon the future implementation of a tourism development plan that generates almost all the finance required for park management. The absence of assured, long-term funding for the management of Limpopo NP and, by implication, the rhino reintroduction is a concern.

IUCN guideline: Socio-economic studies should be made to assess impacts, costs and benefits of the reintroduction to local people.

Comment: Limpopo NP was created only a few years ago and the PPF project is currently engaged in a wide-ranging process of consultation with the local people, particularly those who live inside the park along the Shingwedzi or Limpopo Rivers, to discuss not only species reintroductions and park management generally, but particularly the possible resettlement outside the park of some or all of the people who currently live inside it. It was as a result of the concerns of the local people about possible human-wildlife conflict, following the release of elephants in the park during 2001, that since then reintroductions have taken place inside the sanctuary. However, this solution is likely to become increasingly academic as the number of animals entering Limpopo NP through the gaps in the Kruger fence increases. The potential for conflict between people and wildlife is increased by the fact that at the end of the dry season, drinking water for wildlife is limited largely to surface water in the Shingwedzi and Limpopo Rivers and the Massingir Dam, the very same areas where there are concentrations of people and settlements. Nonetheless, white rhinos are not aggressive animals, although given their poor eyesight and large size, there is always the slight risk of a mishap or accidental injury to the unwary person walking in their range.

The benefits to the local people from a reintroduction of white rhino would probably be limited, but a rhino reintroduction is just one step (although quite a large one) towards creating a national park that contains the megaherbivores and a wide range of smaller species needed to attract tourists and thus provide job opportunities for local people.

IUCN guideline: A thorough assessment of attitudes of local people to the proposed project is necessary to ensure long-term protection of the reintroduced population, especially if the species' decline was due to human factors. The programme should be fully understood, accepted and supported by local communities.

Comment: No assessment specifically relating to the reintroduction of the white rhino has been carried out. It is unlikely that the local people will object to the release of rhinos in the sanctuary, but at the same time as the reintroduction takes place, other rhinos will emigrate from Kruger NP to Limpopo NP through the fence gaps. If rhinos outside the sanctuary were captured and moved inside, this would speed up the arrival of the day when it is considered desirable to limit the number of rhinos in the

sanctuary and move out the surplus animals. However, capturing the immigrants and moving them into the sanctuary may ensure a period of a few years during which there are few rhinos outside the sanctuary and therefore little likelihood of conflicts between rhinos and local people. During this period, the PPF project can continue discussions with the local people and, it is hoped, produce a long-term agreement that limits the potential for human-wildlife conflict and satisfies both parties. It should be pointed out that there is probably much greater potential for conflict with local people when one considers species other than rhinos, for example, elephants – which often raid crops – or carnivores – which, sooner or later, will kill some of the domestic livestock kept by people resident in the park.

IUCN guideline: Where the security of the re-introduced population is at risk from human activities, measures should be taken to minimise these in the reintroduction area. If these measures are inadequate, the reintroduction should be abandoned or alternative release sites sought.

Comment: An advantage of releasing the rhinos in the Limpopo NP sanctuary is that it will be easier to monitor and protect them there. The density of DNAC field rangers operating in the sanctuary is similar to that generally recommended for protecting rhinos, namely 1 ranger per 20 km^2 (Bell & Clarke 1986). Currently, the antipoaching staff in the park deal mainly with subsistence poachers, local people who take the occasional antelopes for food. However, it is likely that when news that rhinos have been reintroduced to Limpopo NP reaches a wider audience, the antipoaching staff will have to deal with more determined and experienced poachers, who have already shown their intentions and abilities by poaching some elephants and rhinos in Kruger NP during the past few years.

IUCN guidelines: The policy of the country to reintroductions and to the species concerned should be assessed. Reintroduction should take place with the full permission and involvement of all relevant government agencies of the recipient country.

Comment: There have been two reintroductions of the white rhino to Mozambique during the past, to Maputo GR and Gorongosa NP (Smithers & Lobão Tello 1976). Both reintroductions failed because the government failed to provide the support, manpower and resources necessary to safeguard the reintroduced populations. The current government, acting through the DNAC, is supportive of future reintroductions of rhinos and, with the assistance of the SADC RPRC, is currently preparing a national policy for rhino conservation. DNAC supports the proposed reintroduction of white rhinos in Limpopo NP and is a co-sponsor of the reintroduction plan.

IUCN guideline: If the species poses potential risk to life or property, these risks should be minimised and adequate provision made for compensation where necessary.

Comment: White rhinos pose little risk to life or property. White rhinos are not aggressive animals, although given their poor eyesight and large size, there is always the slight risk of a mishap or accidental injury to the unwary person, walking in their range, who comes across them at very close quarters. But even under these conditions, the most likely reaction of a rhino will be to run away. Elephants, which can freely enter Limpopo NP through the gaps in the Kruger fence, are much more likely to create human-wildlife conflicts than are white rhinos. And of course, the white rhinos in the sanctuary will be physically separated from the local people and their fields and livestock.

Planning, preparation and release stages

IUCN guideline: Approval of relevant government agencies and land owners, and co-ordination with national and international organisations.

Comment: The proposed release of white rhinos in Limpopo NP is part of a wider plan to reintroduce a wide range of large herbivores to Limpopo NP, as part a still wider plan to create a transfrontier conservation area. The creation of this TFCA is supported by the governments of South Africa and Mozambique. The government of Mozambique, acting through the DNAC, has approved the plan to reintroduce the white rhino to Limpopo NP. The government owns all land in Mozambique (individuals can lease land, but are not allowed to own it). The SADC RPRC is sponsoring this evaluation study.

IUCN guideline: Construction of a multidisciplinary team with access to expert technical advice for all phases of the programme.

Comment: The PPF project staff and the DNAC staff at Limpopo NP have access to expert technical advice from the staff of Kruger NP, including biologists, veterinarians and law-enforcement staff. Through the PPF and the SADC RPRC, they also have access to a wider circle of expertise, if this is required.

IUCN guideline: Identification of short-term and long-term success indicators and prediction of programme duration, in the context of agreed aims and objectives.

AfRSG/SADC guidelines: An annual population growth rate of 5 % is a minimum target. The average intercalving interval of adult females can be monitored and should be no more than 3 years (ideally, nearer 2 years), while the average age at which each female has her first calf should not exceed 8 years (ideally, nearer 6 years). Rhinos are relatively slowly-breeding animals and therefore their management during a re-introduction programme must be proactive (potential breeding constraints must be avoided before they arise), rather than reactive (simply responding to problems once they become apparent).

Comments: Short-term success indicators would include a post-release survival rate of >90 %. Long-term success indicators would include a mean intercalving interval (for surviving calves) of <3 years, a mean age for females at first calving of <8 years, and a mean exponential rate of increase for the population number of >0.05.

IUCN guideline: Secure adequate funding for all programme phases.

Comment: The PPF project has secured adequate funding to cover the costs of the white rhino reintroduction and management programme for the next three years. The availability of funds to provide the necessary level of protection for the rhino population after the end of the PPF project is uncertain. The absence of assured, long-term funding is a serious concern.

IUCN guidelines: Design of pre- and post-release monitoring programme: monitoring the health and survival of individuals is important.

Comment: Stalmans (2004) has recommended that there be intensive monitoring of the reintroduced population and his recommendations are supported here. All rhinos that are captured for any reason should be ear-notched so that they are individually identifiable. There is a need for some DNAC field rangers to receive specialised training in the monitoring of rhinos, so that they are capable of recognising individuals and recording their location, physical condition, survival and breeding. The age of a female when she produces her first calf and the interval between consecutive births are both useful measures of a population's wellbeing, once the immediate post-release phase is over. It is recommended that the PPF project and DNAC maintain a database of the information collected by the monitoring staff. The SADC RPRC has developed a database that is suitable for the management of these data.

IUCN guidelines: Appropriate health and genetic screening of release stock. If release stock is wild-caught, check that stock is free of infectious or contagious pathogens before shipment; and will not be exposed to vectors of disease agents that may be present at the release site (and absent at the source site) and to which it may have no acquired immunity.

AfRSG/SADC guideline: An area that shows repeated outbreaks of anthrax is an undesirable reintroduction site.

Comments: Tsetse flies *Glossina* spp., which are the vector for *Trypanosoma* spp. (the parasites that cause trypanosomiasis) are absent from Kruger NP and Limpopo NP, but are present to the north of Limpopo NP (D. Pienaar, pers. comm.) and may be extending their range southwards. If tsetse flies extend their range into Limpopo NP, it is likely that any rhinos moved into that range will become infected by *Trypanosoma* spp. and occasionally rhinos have died under these circumstances (Taylor 1986, Mihok *et al*. 1992). There is a need for continued monitoring of tsetse fly distribution within the TFCA.

Anthrax epidemics occur regularly in Kruger NP and it is likely that anthrax is already present in Limpopo NP. The species principally affected in Kruger NP are the kudu and buffalo (Bengis 2000), although there have been occasional cases amongst white rhinos (R. Bengis, pers. comm.). However, even though they can catch it, rhinos are regarded as not behaviourally-susceptible to anthrax in

Kruger NP (R. Bengis, pers. comm.). Furthermore, the success of the white rhino reintroduction in Kruger NP suggests that anthrax will not be a concern (at least for rhino management) in Limpopo NP.

IUCN guidelines: If vaccinations are required prior to release, allow sufficient time for the development of acquired immunity. Appropriate veterinary measures as required throughout the programme, including adequate quarantine arrangements, especially where founder stock crosses international borders. Development of transport plans, with special emphasis on ways to minimise stress on the individuals during transport.

Comments: If wild rhinos are captured in Kruger NP and released in Limpopo NP, no vaccinations appear necessary.

The IUCN guideline requiring 'adequate quarantine arrangements, especially where founder stock crosses international borders' is superseded by the development of a TFCA, which is intended to allow wild animals (and any pathogens and/or parasites carried by them) to cross international borders freely, so long as they are confined within the borders of the TFCA.

The Kruger NP staff members who will capture and transport the white rhinos have considerable experience of these procedures.

IUCN guideline: Determination of the release strategy.

Comment: The rhinos can be freed initially into bomas within the sanctuary. If these bomas are constructed of fences similar to that along the sanctuary's eastern border, the rhinos will experience an electric fence for the first time when they are at least partly sedated. The advantage of this is that if they are partially sedated, they are less likely to charge through an electrified fence when encountering it for the first time.

If ten white rhinos are released into the Limpopo NP sanctuary during 2004 (to add to the two males already there) and additional animals are released there during 2005, it is important that careful consideration is given to developing a release strategy that minimises the likelihood of fights between already-released and newly-released males (and therefore minimises the risks of deaths).

IUCN guideline: Establishment of policy on interventions.

Comment: Such a policy still has to be developed, but it is recommended here that, if the health or wellbeing of any rhinos is threatened, management should immediately intervene to remedy the problem.

IUCN guideline: Development of conservation education for long-term support; professional training of individuals; public relations through mass media and local community; involvement where possible of local people.

Comment: Every opportunity needs to be taken to train DNAC (and possibly other Mozambican) staff in the skills needed for rhino protection, monitoring, research and veterinary medicine. The PPF project's involvement with the local people has not yet extended to a programme of conservation education in the local schools. Staff at DNAC head office are well placed to promote public relations through the national media.

IUCN guideline: Welfare of animals for release is of paramount concern through all stages.

Comment: There is no reason to believe that the reintroduction plan will not fully comply with this guideline.

Post-release activities

IUCN guideline: Post-release monitoring is required of all, or a sample of, individuals. Demographic, ecological and behavioural studies of released stock must be undertaken.

Comment Stalmans (2004) has recommended that there be intensive monitoring of the reintroduced population and his recommendations are supported here. All rhinos that are captured for any reason

should be ear-notched so that they are individually identifiable. There is a need for some DNAC field rangers to receive specialised training in the monitoring of rhinos, so that they are capable of recognising individuals and recording their location, physical condition, survival and breeding. Demographic studies are probably the most important: the age of a female when she produces her first calf and the interval between consecutive births are both useful measures of a population's wellbeing, once the immediate post-release phase is over. It is recommended that the PPF project and DNAC maintain a database of the information collected by the monitoring staff. The SADC RPRC has developed a database that is suitable for the management of these data.

IUCN guideline: Study the processes of long-term adaptation by individuals and the population.

Comment: Given that there have been many reintroductions of white rhinos elsewhere in southern Africa, such a study is not seen as a priority in Limpopo NP.

IUCN guideline: Record and investigate any mortalities..

Comment: Recording mortalities would be part of the recommended monitoring programme.

IUCN guideline: Management interventions when necessary.

Comment: It is recommended here that, if the health or wellbeing of any rhino is threatened, management should immediately intervene to remedy the problem.

IUCN guideline: Decisions for revising, rescheduling, or discontinuing the programme where necessary.

Comment: The progress of the white rhino reintroduction programme should be reviewed annually by PPF project and DNAC staff.

IUCN guideline: Habitat protection or restoration to continue where necessary.

Comment: The reintroduction of the white rhino in Limpopo NP is not dependent on a habitat restoration programme.

IUCN guideline: Continuing public relations activities, including education and mass media coverage.

Comment: Mozambique bears the distinction of being the only country where the white rhino has gone extinct twice. The success of the reintroduction in Limpopo NP depends on the long-term commitment by government of adequate manpower and resources to safeguard the park and its wildlife. Long-term support by government is more likely to be forthcoming if the project enjoys widespread support amongst the Mozambican public.

IUCN guideline: Evaluate the cost-effectiveness and success of reintroduction techniques.

Comment: The white rhino reintroduction in Limpopo NP will use mainly well-established techniques that have succeeded during other white rhino reintroductions. Nonetheless, there is nearly always scope for the continued evaluation of the cost-effectiveness and success of differing management techniques.

IUCN guideline: Regular publication in scientific and popular literature.

Comment: Recommended here as part of any conservation programme.

Management of the white rhino in Limpopo NP

The release of white rhinos into the Limpopo NP enclosure will allow this fenced area to be managed as a rhino sanctuary *sensu* Emslie & Brooks (1999). It will be possible to ensure that this sanctuary receives a greater density of antipoaching patrols than other parts of the park. Given suitable training, some field rangers in these patrols will also be able to record all sightings of rhinos and the rangers' observations, once entered into a database, will allow monitoring of the condition of individuals and important population parameters, such as survival rates, intercalving interval and age at first calf. All captured rhinos should be individually ear-notched to facilitate monitoring. The insertion of microchips into horns is relatively inexpensive and may facilitate investigations if any rhinos are poached.

The sanctuary is 350 km^2 in extent and appears large enough to accommodate >20 white rhinos. Stalmans (2004) believed that it could accommodate 30-50 white rhinos and recommended the release of 30 animals. It is recommended here that a timetable be prepared for the release during the near future of at least 18 additional white rhinos into the sanctuary, thereby forming a founder population of at least 20 individuals. The sex ratio of these animals should be close to 1:1. The reintroduction plan must also take account of the need to minimise fighting between adult males, which is particularly likely to occur when additional males are added to an area where other males have already established territories. In Kruger NP, the maximum territory size of males was approximately 14 km^2 (Pienaar *et al*. 1993b) and so the sanctuary should easily be large enough to accommodate the 10 males. The perennial Machampane River running approximately south-eastwards through the enclosure should ensure that the distribution of water supplies during the late dry season is not a factor limiting the number of territorial males.

Stalmans (2004) has suggested that future management of the sanctuary should concentrate on less common species, such as the white rhino and sable antelope. If this is the accepted plan, management actions should favour the priority species. Other large grazers or mixed feeders that eat significant quantities of grass, which are in the sanctuary and thus potential competitors for food with white rhinos, include zebra (419 counted during the 2003 wildlife survey), wildebeest (323 counted), elephant (82 counted) and buffalo (8 counted).

There are four options that allow the rhino sanctuary to be maintained as such without, at the same time, allowing the number of species that are potential competitors with white rhinos to increase unrestrained:

1. replace the eastern fence of the sanctuary with a low 'rhino fence', which serves as a barrier to rhinos but not to all other large grazers; or
2. remove the western fence of the sanctuary, so that there is free movement of all species between Kruger NP and the Limpopo NP sanctuary (free movement of all species between Kruger NP and Limpopo NP is the long-term aim of the TFCA); or
3. remove the western fence of the sanctuary *and* replace the eastern fence with a 'rhino fence'; or
4. retain the present fences, but remove from the sanctuary some of the more numerous large grazers.

The first three options would make the sanctuary less attractive as a place to breed sable antelope, because changes to any of the present sanctuary fences would permit sable to leave the sanctuary and allow their potential competitors, as well as their predators such as lions, to enter it. In the long-run, only option 4 appears to allow the sanctuary to be used to breed white rhinos and sable antelopes. Stalmans (2004) recommended that the breeding of sable antelope in the sanctuary should take precedence over the requirements of the white rhino population.

Once 20 white rhinos, males and females, have been released into the sanctuary and their security assured, births are likely to cause the total number of rhinos to increase at a significant rate. In Kruger NP, the growth rate of the white rhino population has averaged 8 % annually (Pienaar 1994a). As the number of rhinos in the sanctuary approaches carrying capacity, there are likely to be increases in inter-male fighting, the intercalving interval and the age at first calf (Rachlow 1998). Effective management requires that the rhino density in the sanctuary is reduced before this stage is reached. Capture and removal appears the most likely management action, although if a few rhinos were shot by fee-paying hunters, the biological consequences would be identical. However, the local people, who would be arrested if they hunted a rhino, may well see the legal hunting of rhinos as the application of double-standards. Park managers should have several years during which to decide where to release rhinos removed from the sanctuary.

In contrast, an immediate decision is needed about how to manage those white rhinos that move of their own accord from Kruger NP, though the gaps in the Kruger fence, into Limpopo NP. There are two options:

1. In the short-term, while the number of white rhinos in the sanctuary is well below the estimated carrying capacity, it is possible to move white rhinos from other parts of Limpopo NP into the sanctuary (although the problem of inter-male fighting remains if new males are released into the sanctuary after others have established territories);
2. Once the number of white rhinos in the sanctuary approaches 75% of the estimated carrying capacity, no more white rhinos should be released here and it will probably be necessary to manage the additional animals within the wider park. Providing security will probably be made easier by the fact that the largest landscape in Limpopo NP, the Nwambia sandveld, is of low suitability for white rhinos. The landscapes that white rhinos will probably prefer are largely in the south-west of the park, close to the sanctuary. However, it is unlikely that this area can be patrolled as intensively as the sanctuary and additional measures may be desirable. These could include dehorning, the insertion of radio transmitters into horns, or both (i.e. remove one horn and implant a transmitter into the other). The use of horn-implant transmitters and microchips may deter some poachers if the insertion of these devices is well publicised.

   As the number of white rhinos outside the sanctuary increases, consideration should be given to establishing an IPZ adjacent to, but outside, the sanctuary. The IPZ would be larger than the sanctuary and be patrolled more frequently than the remainder of the park.

The security of rhinos within the wider Limpopo NP can be improved by ensuring that development of the national park is undertaken with the approval of the local people. While white rhinos present little threat to people, their livestock, or their crops, if there are significant human-wildlife conflicts, the people may act to remove what they perceive as the threats without differentiating between different species of wildlife.

Monitoring in the sanctuary

The physical condition, survival and reproduction of white rhinos in the sanctuary should be monitored at the individual level, to ensure that the rate of population increase is high and remains so. Trained field rangers should be able to monitor rhinos during antipoaching patrols.

Stalmans (2004), when considering the translocation of additional sable antelope into the sanctuary, recommended that monitoring include the available phytomass, leaf table height and species composition of the grass layer. However, his recommendations for monitoring the white rhinos were entirely animal-based, although he did suggest that the condition of rhinos be monitored by means of nutrient analysis of faeces. This recommendation was based on the expectation that the nutrient content of faeces would be related to the nutrient content of the food, which is likely to be so. However, the precise nature of this relationship is unknown and will be expensive and time-consuming to establish. Others (e.g. Rachlow 1998) have successfully used visible muscle deterioration as a measure of body condition of rhinos and it is recommended that this method is also used in the sanctuary.

Vegetation monitoring is often time-consuming and many vegetation monitoring programmes in Africa have been established but not maintained. A monitoring programme is more likely to be maintained if it is quick and simple to apply. Furthermore, when establishing a general vegetation monitoring programme, it is often difficult to anticipate which parameters will be of most interest in the future. As regards the plans to reintroduce the white rhino to the sanctuary, there appears to be no pressing need for vegetation monitoring. It is likely that other species, e.g. the elephant, will have a greater and more immediate impact on the vegetation than will the white rhino. In any conservation area, photopanoramas provide a simple, quick and effective way of recording habitat changes (Dunham 1989).

Outline recommendations for the future reintroduction of black rhinos to Limpopo NP

Adequate security

In southern Africa, black rhinos are less numerous and thus more valuable than white rhinos (Emslie 2002). Hence, no black rhinos should be released into Limpopo NP until it has been clearly demonstrated over a period of several years that the white rhinos in Limpopo NP can be adequately protected (e.g. the number of animals poached is not so great as to prevent the population number from increasing).

Long-term funding

Rhino conservation is both expensive and a long-term commitment. The cost is often beyond that which African governments are prepared to meet through their funding of government departments. Hence, prior to the reintroduction of the black rhino to Limpopo NP, it should be demonstrated that adequate and sustainable funding is available, particularly for rhino security.

Landscape preferences of black rhinos

Ideally, the landscape preferences of black rhinos in Kruger NP should be determined, as has already been done for white rhinos (Pienaar *et al*. 1992, 1993a). This will make it easier to assess the suitability of Limpopo NP and its sanctuary as habitat for black rhinos. However, as with the white rhino, black rhinos in Limpopo NP will not be a discrete population, but part of a more numerous Kruger-Limpopo population. Thus, it is not essential that it is known before a reintroduction that Limpopo NP can support >100 black rhinos. It is likely that as more sections of the Kruger fence are removed, some black rhinos will move of their own free will from Kruger NP to Limpopo NP. Thus, the rhinos themselves may determine habitat suitability and quality in Limpopo NP. However, the number of black rhinos in Kruger NP is in the hundreds, an order of magnitude smaller than the number of white rhinos (D. Pienaar, pers. comm.). Thus, the natural emigration of black rhinos from Kruger NP to Limpopo NP is likely to be a slower process than has been the case for the white rhino (although emigration rates may also be affected by the rate at which the Kruger fence is removed, and the plans for this have not been finalised beyond 2004).

Carrying capacity of sanctuary for black rhinos

When the time is right for a reintroduction of the black rhino, it will be easier to safeguard them against poachers by releasing the animals into the present sanctuary, which, by that time, is likely to contain a significant number of white rhinos. Enclosing both white rhinos and black rhinos in the same sanctuary will certainly be cost-effective, because it will cost approximately the same to protect a population of one rhino species as to protect populations of two species. Stalmans & Peel (2003) considered the vegetation in the present sanctuary to be poor for the black rhino, but they did not consider the potential carrying capacity of the sanctuary for black rhino, in the way that they did for white rhino. A more detailed assessment of the carrying capacity of the sanctuary for the black rhino should be conducted once it has been demonstrated that Limpopo NP management is capable of protecting the white rhinos in the same sanctuary. In the absence of comparative data of landscape-specific carrying capacity data from Kruger NP, the Rhino Management Group model of black rhino carrying capacity (Adcock 2001) can be used. As discussed earlier, it is likely that the present sanctuary can support at least 20 black rhinos.

Sanctuary fence design

It is likely to be several years before consideration is given to releasing the black rhino in Limpopo NP and during that time, the number of elephants in the sanctuary can be expected to increase, as will their effects on the woody vegetation. In these circumstances, it will probably be desirable to retain the sanctuary as such for rhinos, but allow the immigration to other parts of Limpopo NP of at least some individuals of the other species, such as elephant. One options that would achieve this would be to modify the structure of eastern boundary fence of the sanctuary, replacing the present design with a low, electrified fence that is a barrier to rhinos, but which other large herbivores can jump or step over. However, elephant cow herds containing small calves will probably not cross even a low fence.

Capacity requirements

Rhino protection

After appointment, each Limpopo NP field ranger attended a training course. However, there remains a need for field rangers to attend refresher courses. Most (all?) of the ranger force was recruited within the past two years and so, by definition, the rangers have limited experience of antipoaching.

Additional training can also be provided to the Limpopo NP staff by experienced law enforcement officers from other parks, e.g. the staff of the Environmental Crime Investigation Services in SANParks.

The density of field rangers appears adequate to provide security for the rhino sanctuary. The density of field rangers in the remainder of the park may not be adequate to provide security for a rhino population, but this will depend of the level of threat from poachers. Experience in fighting rhino poachers elsewhere in Africa emphasises the importance of monitoring poaching and law-enforcement, and being prepared to reassign funding and resources if necessary (Leader-Williams 1990, Leader-Williams, Albon & Berry 1990).

The management structure of Limpopo NP includes a low ratio of officers to rangers, and there may be a need to recruit additional officers. Adequate security for the rhinos in the sanctuary will depend not only on a high density of patrols operating there, but also on effective management of these patrols. Consideration should be given to the appointment of an officer whose primary responsibility would be security in the sanctuary.

The PPF project is well funded at present and consequently the field rangers have adequate equipment, although while on patrol most rangers do not yet have rifles, the provision of which is the responsibility of the government of Mozambique.

Rhino monitoring

Monitoring of the rhinos requires that some field rangers receive training in rhino monitoring, e.g. assessing the condition of individuals. There is the option to: 1) send field rangers on an AfRSG training course; or 2) send a DNAC staff member, a PPF project staff member, or both, on a trainers' training course (Emslie 2003).

At least one DNAC staff member, preferably more than one, and a PPF project staff member need to be capable of establishing and maintaining the rhino database, using the reports of the field rangers. Limpopo NP staff need training in the use of the SADC RPRC database.

Rhino management

DNAC staff have no experience in the management of rhinos. Currently, the PPF project is planned to last only another three years and so there is a need to develop expertise of rhino management among Mozambican staff before the end of the PPF project.

A good start in animal capture is provided by the Zimbabwean course entitled *Chemical and physical restraint of wild animals* and it is recommended that one or two Mozambican vets, or experienced senior staff members, first attend this course and then 'shadow' members of the Kruger NP capture team and PPF staff members during the capture, transport and release of rhinos in the Limpopo NP sanctuary.

Local Communities

Distribution of people and settlements within Limpopo NP and on its boundaries

There are numerous human settlements along the Limpopo River, the Shingwedzi River and the Elefantes River downstream of Massingir dam (Fig. 8). Approximately 4350 people live along the Shingwedzi River with about 5200 cattle (Grossman & Holden 2003). Population density decreases and villages become smaller as one moves northwards up the Shingwedzi River. It is estimated that an additional 20 000 people live along the Limpopo and Elefantes Rivers, within the support zone (Grossman & Holden 2003). The main economic activity in the region is rain-fed agriculture (e.g. growing maize, pumpkins and beans), complemented by the raising of livestock, particularly cattle.

Strategies for possible future involvement of communities in rhino conservation

A principal objective of Limpopo NP is:

To ensure the participation of local communities in the development and management of the park and to ensure an equitable flow of benefits to these communities. Such benefits should include equity-sharing in tourism developments and operations, human resource development and capacity building, employment creation, the development of opportunities for small, medium and micro enterprises, and improved natural resource management leading to improved livelihoods (Grossman & Holden 2003).

The objectives of the park's community programme are:

1. The implementation of a programme for the voluntary resettlement of people currently resident within the boundaries of the park.
2. The development of a support programme for residents who choose to remain in the park, including negotiations to concentrate these remaining residents into enclaves along the Shingwedzi River and near Massingir Dam, and the preparation of integrated development plans for these proposed enclaves. Elements addressed by these plans would include fencing.
3. The implementation of a programme for sustainable resource utilisation within the resource use and support zones of the park.
4. The implementation of a programme for effective community empowerment and participation in the planning, management and development of the park.
5. The implementation of a programme for the optimal participation of local communities in the sustainable economic development of the park and its surrounds and for ensuring an optimal flow of associated benefits to these communities. These benefits would include:
    a) *Equity* in or *ownership* of the productive assets of Limpopo NP (mainly tourism concessions) with equity based on long-standing residential rights;
    b) *Employment opportunities* during the development and management of the park and its commercial enterprises, by favouring local people and facilitating training; and
    c) *Secondary enterprise* links between the economic activities of the park and suppliers of goods and services from the target community, and other income generating projects.
6. The facilitation of the planning and sustainable development of the support zone and its integration into the planning and development of the region and the greater TFCA.

The extensive measures that the PIU has taken to meet these objectives by liaising with the local people and government representatives were outlined earlier.

The reintroduction of the white rhino is just a single element of the wildlife restocking programme and this programme is just one element (although a major one) in the development plan for Limpopo NP. Therefore the potential benefits – and costs – to local communities of the reintroduction of the white rhino cannot easily or usefully be separated from those related to the general wildlife restocking exercise and the broader programme of park development.

An important consequence of this is that the attitude of local people towards the rhino reintroduction may be determined by aspects of park management and development that have nothing to do with the rhino reintroduction programme.

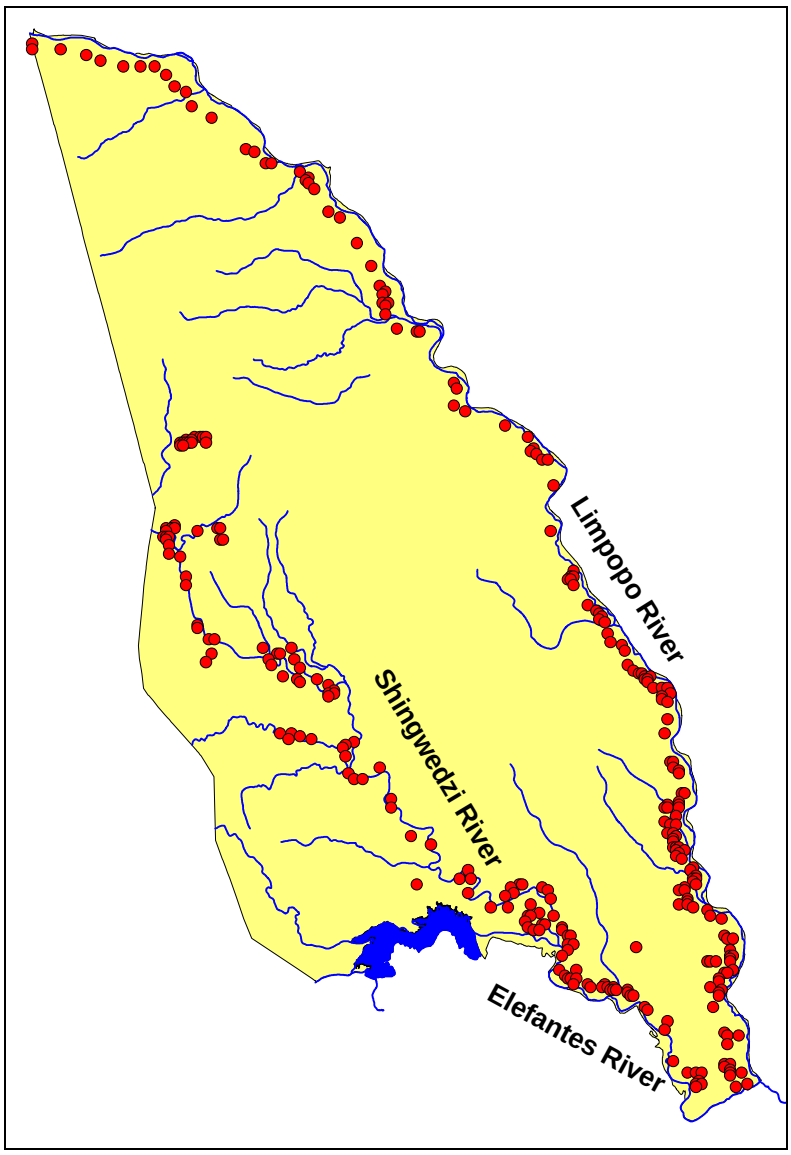

Figure 8. The distribution of human settlements (red dots) in Limpopo NP. Surface flow in many of the streamlines shown on this map ceases during the dry season. Map of hut distribution provided by C. Beech.

Evaluation of Feasibility and Reintroduction Options for Rhinos in Zinave NP

By the time that Sidney (1965) and Smithers & Lobão Tello (1976) surveyed the distribution of rhinos within Mozambique (Figs 1, 2 and 3), the white rhino was extinct nationally and the black rhino were extinct south of the Save River (except for a few reintroduced populations of white rhinos and occasional immigrants from neighbouring countries). Annotated lists of the mammals recorded in the Zinave area during the 1960s do not mention rhinos (Dalquest 1965, 1968).

Situated on the south bank of the Save River, Zinave National Park is approximately 5000 km^2 in extent (Tinley *et al*. 1976). It was established as a private safari hunting area during 1962 and was proclaimed a national park during 1972 (WCMC 1986). Mean annual rainfall is approximately 600-700 mm (Smithers & Lobão Tello 1976), but the park represents an important faunistic and floristic transition zone between moist tropical and arid tropical environments. The major vegetation types are *Brachystegia* and mopane woodlands, *Acacia*, *Combretum* tree savanna and sandy grasslands (Tinley *et al*. 1976). The park used to contain numerous elephants, but permanent human settlement and many cattle are reported to be present (WCMC 1993). The area suffered from military activity after 1976, with poaching by local people and regular and irregular military forces.

Across Africa, the black rhino inhabits, or used to until recently, a wide range of environments, from the deserts of Namibia to the forests of Mt Kenya (Sidney 1965). Given this wide tolerance, it is most likely that the black rhino used to occur in what is now Zinave NP, but that it was eliminated by excessive hunting sometime during the late nineteenth century or early twentieth century, as happened elsewhere in southern Mozambique. A field visit would be required to assess the habitat suitability of Zinave NP for the black rhino.

Zinave NP is within the former range of the southern white rhino and, if the vegetation is suitable, it is likely that the white rhino used to occur in this area, but that it also was eliminated by excessive hunting sometime during the late nineteenth, or early twentieth, century. A field visit would be required to assess the habitat suitability of Zinave NP for the white rhino.

But when considering the reintroduction of rhinos, security is a major factor. The reintroduction area must be secure, with long-term funding and a field ranger force that is adequate in number, and well trained, equipped, motivated and led. Habitat suitability is irrelevant unless the area is secure.

Evaluation of Feasibility and Reintroduction Options for Rhinos in Gile GR

Gile Game Reserve is situated north of the Zambezi River and therefore is outside the former range of the southern white rhino (Emslie & Brooks 1999). For this reason alone, it is recommended that white rhinos should not be released here.

Gile GR was first proclaimed during 1940 with an area of approximately 5000 km^2, but this was reduced to approximately 2100 km^2 during 1960 (WCMC 1986). Mean annual rainfall is approximately 1200 mm (Smithers & Lobão Tello 1976). The dominant vegetation type is *Brachystegia* woodland with dambos, but there are inselbergs and numerous rivers (Tinley *et al*. 1976). Thickets fringe the base of the inselbergs and the most of the rivers, some arising from hot springs, are perennial (P. Dutton, pers. comm.).

The black rhino was shown as occurring in the vicinity of Gile GR both on Sidney's (1965) map of the distribution of the black rhino in Mozambique during the late 1950s (Fig. 1), and on Smithers & Lobão Tello's (1976) map (Fig. 2). Tinley *et al*. (1976) also implied that the black rhino occurred in Gile GR and P. Dutton (pers. comm.) confirms that they were present there until a 'few years' before he visited during 1973. *Brachystegia* woodland generally supports only a low density of black rhinos (e.g. 0.08 km^{-2} in *Brachystegia* woodland above the Muchinga escarpment in South Luangwa National Park, Zambia (Liberg 1973)). Even if black rhinos used to be found in Gile GR at a similar, low density, the reserve would probably support a population of >100 black rhinos. However, given the presence of thickets and the perennial water supply, it is likely that rhino density here used to be greater than in Zambian *Brachystegia* woodland.

Hence, from the biological viewpoint, the black rhino would be a suitable species to consider reintroducing to Gile GR. However, a field visit is necessary to assess the likely carrying capacity for black rhinos, the security of the reserve's borders (have people or domestic livestock invaded the reserve?) and the extent and effectiveness of law enforcement activities.

When considering the reintroduction of rhinos, security is a major factor. The reintroduction area must be secure, with long-term funding and a field ranger force that is adequate in number, and well trained, equipped, motivated and led. Habitat suitability is irrelevant unless the area is secure.

Preliminary Guidelines for the Development of a Rhino Conservation Policy for Mozambique

- The goal of the rhino conservation policy should be to conserve viable populations of the southern white rhino and the south-central black rhino in Mozambique.
- These populations could be on state-protected land, or on privately-managed land.
- All plans to reintroduce rhinos to sites within Mozambique should follow the IUCN (1998) guidelines for reintroductions and the AfRSG/SADC RPRC (2001) guidelines for rhino reintroductions.
- Particular attention should be paid to the following aspects:

  Original Distributional Range Reintroductions should occur only at sites within the species' former distributional range, which was south of the Zambezi River for the white rhino and throughout Mozambique for the black rhino.

  Suitable Habitat Reintroductions should occur only at sites with vegetation types suitable for the species.

  Size of Area and Carrying Capacity Ideally, reintroductions should occur only in areas capable of supporting populations of at least 100 rhinos.

  Security Reintroductions should occur only in areas with security adequate to protect rhinos in the long-term. Expert opinion recommends that the density of field rangers in areas with rhino populations should be at least one ranger per 20 km^2.
- The number of southern white rhinos in Africa is an order of magnitude greater than the number of south-central black rhinos. Therefore, it is recommended that initial reintroductions should be of the commoner and less-valuable white rhino.
- Antipoaching units need to be well trained, motivated and supplied with modern equipment. Such forces are expensive to establish and maintain. Assured, long-term funding is essential if rhino populations are to be secure. The estimated total cost of managing a rhino population varies from US$500 per km^2 annually using 1 ranger per 20 km^2, to US$1500 per km^2 annually using 1 ranger per 10 km^2 (Martin 1996).
- Rhino protection elsewhere in Africa often failed because the available manpower and funding were spread thinly over large areas (Leader-Williams *et al*. 1990). Rhino protection in Mozambique should be concentrated in relatively small areas, such as a sanctuary or an Intensive Protection Zone (IPZ) (Emslie & Brooks 1999). Rhino protection costs can be minimised by selecting, as sanctuaries or IPZs, areas with a high carrying capacity for rhinos. The ideal protection site would have high carrying capacities for both black and white rhinos.
- Successful rhino conservation requires that managers monitor rhino populations, illegal activities and law enforcement.
- Rhino populations should be managed to maintain high rates of population growth. This will require the removal of some individuals from a population before there is any density-dependent decline in production (e.g. an increase in the age at first calf, or in the intercalving interval). The individuals removed can be the founders for new reintroductions.
- If there is more than one population in Mozambique numbering less than 100 individuals, the populations of that species should be managed as a metapopulation.
- Rhino conservation elsewhere in southern Africa has benefited from laws that permit private individuals to own, buy and sell rhinos, because these ownership rights have encouraged individuals to establish and protect rhino populations. If individuals in Mozambique had similar rights, this would encourage the import of rhinos, the establishment of viable populations of rhinos on privately-managed land and investment in their security.
- Rhino conservation in South Africa has included permitting safari hunters to shoot small numbers of white rhinos, particularly adult males regarded by managers as surplus to breeding requirements. The funds generated by safari hunting can be used for rhino conservation. However, the safari hunting of rare species is often a controversial subject. It is recommended that Mozambique permit the legal hunting of rhinos when certain population criteria are met. For example, the legal hunting of a small, sustainable quota of white rhinos might be permitted in Mozambique when the IUCN/SSC African

Rhino Specialist Group estimates that the total number of white rhinos in Mozambique exceeds 500 *and* the total number of white rhinos in southern Africa exceeds 10 000. The sport hunting of rhinos can be justified to the Mozambican and international publics only if the funds raised from hunting are demonstrably used for rhino conservation.

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