# Government Gazette
# Staatskoerant

REPUBLIC OF SOUTH AFRICA
REPUBLIEK VAN SUID AFRIKA

Vol. 650 22 August Augustus 2019 No. 42660



ISSN 1682-5843

9 771682 584003 42660

## Contents

**DEPARTMENT OF ENVIRONMENTAL AFFAIRS**

**NO. 1105** **22 AUGUST 2019**

## NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT NO. 10 OF 2004)

## NON-DETRIMENT FINDINGS

## CONSULTATION IN TERMS OF SECTION 62(3) OF THE NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT NO.10 OF 2004)

I, Barbara Dallas Creecy, Minister of Environment, Forestry and Fisheries, hereby, under section 62A of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), give notice of my intention to repeal non-detriment findings for *Ceratotherium simum simum* (white rhinoceros) made by the Scientific Authority, published under Government Notice No. 575 in the Government *Gazette* No. 40021 of 27 May 2016; and, under section 62(3) of the National Environmental Management: Biodiversity Act, 2004 ( Act No.10 of 2004), give notice of my intention to publish non-detriment findings for *Ceratotherium simum simum* (white rhinoceros) made by the Scientific Authority in the Schedule hereto.

Members of the public are invited to submit to the Scientific Authority, within 30 days from the date of the publication of the notice in the *Gazette*, written scientific information relating to the non-detriment findings to the following addresses:

By post to: Chair: Scientific Authority
South African National Biodiversity Institute
Attention: Ms M Pfab
Private Bag X101
**PRETORIA**
0001

By hand at: 2 Cussonia Avenue, Brummeria, Pretoria, 0001
By e-mail: m.pfab@sanbi.org.za
By fax: 086 555 9863

Comments received after the closing date may not be considered.

**MS B D CREECY, MP**
**MINISTER OF ENVIRONMENT, FORESTRY AND FISHERIES**

## SCHEDULE

**Non-detriment finding for Ceratotherium simum simum (Southern white rhinoceros)**
Reference Number: Cer_sim_Jul2018
Date: 12 July 2018
Issued by the Scientific Authority of South Africa

### Summary of findings

The South African population of *Ceratotherium simum simum* (white rhinoceros) is included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), for the exclusive purpose of allowing international trade in live animals to appropriate and acceptable destinations and the export of hunting trophies. All other specimens, including the horn, are deemed to be specimens of species included in Appendix I, meaning that the export of specimens for commercial purposes is prohibited (Article III). However, specimens bred in captivity for commercial purposes are deemed to be specimens of species included in Appendix II (Article VII) of CITES and therefore may be traded. In terms of Article IV of the Convention, an export permit shall only be granted for an Appendix II species when a Scientific Authority of the State of export has advised that such export will not be detrimental to the survival of that species. This document details the undertaking of a non-detriment finding (NDF) for *C. simum simum,* and is based on the best available information, current as of March 2018.

The white rhinoceros is a long-lived species with both sexes living between 30 and 40 years. The species has a low reproductive rate, with females in wild populations giving birth to their first calf on average between 6 and 7 years. Inter-calving intervals average 2.9 years, with a gestation period of approximately 16 months. Males are capable of mating at a similar age range to females, but due to social constraints tend to only mate successfully after the age of 10 – 12 years. A relatively adaptable species, being able to survive in a variety of grassland and savannah habitats, the white rhinoceros favours short grasses on grazing lawns, but can switch to taller relatively fibrous bunch grasses when short grass is unavailable. They are thus able to persist and reproduce in nutrient poor areas, as evidenced by their current distribution. Individuals disperse rapidly into new areas and in unfenced areas can move over very large distances. The species is conservation dependent, occurring solely in protected areas and on game farms and game reserves, but it is tolerant of human activity and can be ranched under semi-intensive management.

The distribution of the white rhinoceros in South Africa is fragmented, as all subpopulations exist in fenced protected areas or private/community game farms and reserves. However, it is widespread, occurring in more than 350 state, private and communal game farms and reserves across all nine provinces and is regarded as a common species in South Africa. The total area occupied by white rhinoceros within South Africa exceeds 49,000 km$^2$, of which approximately 18,000 km$^2$ is private or communal land. According to data gathered from a survey of rhinoceroses on private and state land by the IUCN African Rhinoceros Specialist Group (AfRSG), the total South African wild white rhinoceros population comprises approximately 17,208 individuals (as at the end of 2015) of which 12,273 (72%) and 4,735 (28%) occur on state-owned and private land respectively. The largest subpopulations occur in the greater Kruger National Park (KNP) (which incorporates adjacent private and state reserves) and Hluhluwe-iMfolozi Park. The Kruger National Park (KNP) subpopulation was estimated at 8,875 in 2015. An additional 1,517 (as of 2017) white rhinoceros reside in South Africa's largest captive breeding facility under semi-intensive management.

Analyses undertaken by AfRSG indicate that the national average growth rate of the white rhinoceros population was just over 7% from 1991 to 2012. A number of key events apparently contributed to the rapid increase in the national population of white rhinoceros since the late 1800s when no more than 50 white rhinoceroses survived in the iMfolozi Game Reserve in what was then Natal, including the development of chemical capture drugs, mass translocations, and policy changes both locally and internationally that allowed for private ownership, live sale auctions and limited trophy hunting. These factors have until recently created sufficient economic incentives for

private ownership, thereby facilitating the expansion of rhinoceros range and numbers. A 2015 publication by the AfRSG indicates a levelling off or possibly a slight decline in the national population. This is due primarily to a decline in numbers in KNP, which has suffered the brunt of rhinoceros poaching since 2007, as well as significant numbers of white rhinoceros being translocated from wild populations to smaller secure areas where the animals are subjected to semi-intensive / intensive management. While currently stable, the future trend in the population is unpredictable, and could increase by 1.9% or decrease by 3.9% after 5 years depending on future poaching levels.

Detailed recent quantitative data exist on white rhinoceros numbers, poaching rates and population performances for most subpopulations over the past 30 years due to a process of confidential annual white rhinoceros status reporting to the Southern African Development Community (SADC) Rhinoceros Management Group (RMG), as well as regular reporting to IUCN/SSC AfRSG. The monitoring method employed in the KNP is primarily one of conducting block counts, while formal distance sampling using line and point transects is employed in the Hluhluwe iMfolozi Park in KwaZulu-Natal. Monitoring of the remainder of the national herd is variable with many private land owners monitoring their rhinoceroses closely. Even though there are some concerns regarding adequate budgets to conduct regular counts and implement intensive monitoring on the ground, very good population estimates exist and in most cases direct population estimates are used to monitor the effects of harvest. The quality of monitoring in some subpopulations has recently declined as field staff are having to increasingly focus on anti-poaching, with less time available for other conservation activities such as monitoring.

The continuing loss of rhinoceroses to poaching for their horn is currently the major threat to South Africa's white rhinoceros population. Poaching of wild white rhinoceroses has been increasing each year from 2007 (when 13 were poached), and reached a peak in 2014 when 1,151 were poached in the country (an estimated 6.5% of the wild population). Poaching has since declined slightly with an estimated 1,009 wild white rhinoceroses (approximately 6% of the national population) poached in 2016. This is likely to indicate a positive response to the anti-poaching interventions employed nationally and specifically in KNP. However, the number of incursions into KNP continues to increase, so should the current measures to curb poaching be removed, poaching of white rhinoceroses in KNP would increase dramatically. There is also evidence that poaching has increased in other hotspots, particularly in northern KwaZulu-Natal. The threat of rhinoceros poaching is thus currently considered to be substantial, though reversible. If the current funding and resources were to be removed the severity of the threat would increase substantially. In order for the current efforts to continue, significant financial inputs from external sources are required.

Since 2010, the South African government has launched a variety of initiatives in collaboration with various stakeholders to address the poaching threat and ensure the long-term conservation of the species, and in 2014 Cabinet adopted an integrated four-pronged approach to curb rhinoceros poaching. A national white rhinoceros strategy was approved in 2000 and in December 2015 a national Biodiversity Management Plan (BMP) for white rhinoceros was gazetted for implementation in terms of section 43 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA). This plan will form the basis for greater coordination between existing and future plans and is informed by the National Strategy for the Safety and Security of Rhino Populations in South Africa as well as the Rhinoceros Issues Management Report.

A high proportion (72%) of the white rhinoceros population is generally well-managed within protected areas, with offtakes (primarily translocations of animals) managed in terms of ecological management plans. The white rhinoceros subpopulation in KNP (52% of the national population) is managed in accordance with an adaptive management plan. Management of white rhinoceroses on private land is undertaken for different purposes and is thus more variable. In KwaZulu-Natal, a management strategy and a status reporting framework currently supports fixed stocking rate management and therefore constant harvest management for some of the subpopulations in the province.

*Ceratotherium simum simum* is listed as protected in terms of section 56 of NEMBA and various provincial ordinances and acts provide further legislative protection. Permits are therefore required to undertake a variety of activities, e.g. hunting, keeping, selling and other forms of direct use. The white rhinoceros population in South

Africa is generally subjected to two forms of legal offtake, namely management removals of animals and trophy hunting. An estimated 1.4% of the national herd is translocated from protected areas annually. Although the removal of live animals for translocation purposes is not considered to be a form of harvest since these animals are not permanently removed from the national population, there are some international exports of live animals. Between 2005 and 2016 a total of 774 live white rhinoceroses were exported from South Africa, constituting approximately 22% of the total exports of this species from South Africa during this time period. Live animals were exported primarily for re-introduction purposes (33% of live exports), to zoos (27% of live exports) and breeding facilities (26% of live exports). The main destination countries were Namibia (38% of live exports), China (32% of live exports), and Botswana (7% of live exports), with Namibia and Botswana importing live white rhinoceroses mainly for re-introduction purposes, and China mainly for zoos and breeding facilities.

Legal hunting of white rhinoceroses, typically on private land, is mostly economically motivated. Prior to 2005, the number of white rhinoceroses hunted was generally a function of market forces, with the market supporting the legal hunting of an average of 36 – 70 animals annually. After 2005 the number of rhinoceroses hunted increased, and by 2011 an average of 116 animals (0.6% of the national population) were hunted, with many of these hunts being undertaken by non-traditional hunters ("pseudo hunters"), most likely in an attempt to source the horn. Through better regulation introduced in 2012, the occurrence of "pseudo hunts" has reduced considerably and since then an average of only 70 white rhinoceroses (0.43% of the national population) have been legally hunted annually. This clamp down on pseudo hunting was however followed by an escalation in the poaching rate. White rhinoceros hunting trophies exported from South Africa between 2005 and 2015 were primarily imported by the United States of America (40%), China (10%), Poland (8%) and the Russian Federation (8%); in total 1,115 trophies. Setting a hunting quota has been unnecessary to date as the legal offtake has been well within sustainable levels. Trophy hunting removes surplus adult males, whilst generating important conservation revenue (while poaching targets animals of all ages and sexes).

A moratorium to prohibit the sale of rhinoceros horn or rhinoceros horn products within the country was implemented in February 2009 to afford the Department of Environmental Affairs (DEA) an opportunity to develop and implement permanent measures aimed at eliminating the illegal international trade in rhinoceros horns. However, the moratorium was set aside by the High Court of South Africa in November 2015, thereby rendering the domestic trade in rhinoceros horn within the borders of the country legal once again. In order to effectively manage the legal domestic trade in rhinoceros horn, draft regulatory measures were published for public comment in February 2017, but the regulations are yet to be finalized. In March 2018, the Private Rhino Owners Association (PROA) launched Rhino Horn Trade Africa (RHTA), an initiative that will facilitate the legal trade of rhinoceros horn via an online trade desk, which aims to provide a managed, efficient platform from which genuine buyers and sellers can trade in legal, humanely acquired rhinoceros horn.

The amended Norms and Standards for the Marking of Rhinoceros and Rhinoceros Horn and for the Hunting of Rhinoceros for Trophy Hunting Purposes (published in April 2012, Gazette No. 35248) require that all rhinoceros hunts are attended by conservation officials. Provinces indicate that this legal requirement is being complied with. The regulations further require that a DNA sample must be collected from each animal, as well as from both horns. A possession permit as well as a DNA certificate is issued to the owner of the rhinoceros horn and all DNA samples are stored on the RHODIS database to ensure traceability. The system is well managed and rhinoceros horn stockpiles are regularly audited. There is a high level of confidence in the monitoring of both illegal and legal harvests of white rhinoceroses in state protected areas, which constitute 72% of the national herd. Rhinoceroses are individually known in smaller properties where there is also a high confidence in carcass detection rates.

The revenue generated by the state and the private sector from owning, selling, translocating, viewing (via ecotourism) and the legal hunting of white rhinoceros has greatly contributed to the conservation of this species in South Africa. The white rhinoceros population is now 10 times larger since trophy hunting was introduced in 1968. Due to the significant economic benefits of hunting to game farmers (worth approximately $19 million over the period 2004 – 2008), together with live sales and ecotourism, the private sector has increasingly stocked these animals, effectively maintaining rapid meta-population growth and contributing to the expansion of the species' range, with a further approximate 18,000 km$^2$ added to the conservation estate in South Africa. The

private sector in South Africa now conserves more rhinoceroses than there are black and white rhinoceroses in the whole of the rest of Africa. Live sales of surplus animals to the private sector have also been highly beneficial to conservation agencies, generating vital conservation revenue and preventing overstocking in established subpopulations.

Due to the increased rate of poaching, the cost of rhinoceros security has increased substantially in recent years. At the same time demand for trophy hunting has been declining while the commercial international sale of legal rhinoceros horn remains prohibited under CITES. These factors have contributed to a negative shift in the cost benefit ratio of owning wild white rhinoceroses, leading to a reduction in the live sale price and reduced incentives to buy and conserve wild white rhinoceroses. The result has been that many private rhinoceros owners are showing an increasing tendency to disinvest in the species, especially in the provinces of Limpopo, Mpumalanga and KwaZulu-Natal. Given that approximately 28% of the national herd is kept on 18,000 km$^2$ of privately-owned land, the loss of private sector interest in keeping white rhinoceros is a significant concern for the conservation of the species and its habitat. The reduced introduction of rhinoceroses to new areas is expected to result in a decline in the meta-population growth rate, the total population size as well as the financial income to the conservation agencies that rely upon funds generated from rhinoceros sales to conserve and protect rhinoceroses. Income of the three largest rhinoceros sellers earned from the sale of white rhinoceros has reduced from a total of ~R100 million in 2009 when 370 rhinoceroses were sold to R20 million in 2014 when only 60 were sold. Furthermore, between 2009 and 2012 there was a reduction in the average price of white rhinoceros, from R365 000 per animal in 2009 to R258 000 in 2012. Total loss of revenue is estimated at R373 million. Interestingly, in 2012 suggestions that South Africa would consider submitting a proposal to the 17$^{th}$ CoP to CITES to trade in rhinoceros horn saw a temporary recovery in the average price for a white rhinoceros.

The 72% of the national herd that is kept in state controlled protected areas is strictly protected, with legal hunting negligible (<10 per year). However, the high poaching rate is indicative of the limited effectiveness of these protected areas, and a number of key subpopulations are showing signs of decline despite the significant resources that have been deployed towards gaining control over illegal activities. Poaching has occurred in most protected areas with some, notably the KNP, struggling to combat these illegal activities. This primarily arises from the long permeable border with Mozambique and that country's inadequate legal and wildlife protection systems. Improved protection measures (enhanced intelligence gathering and effective prosecution with deterrent sentences), as well as active regional cooperation (especially from Mozambique), are required to combat poaching. The international ban on the commercial trade in rhinoceros horn, in place now for more than 40 years, has also failed to effectively provide strict protection to the species, despite the numerous anti-poaching measures implemented in South Africa. These measures importantly fail to address the cause of the escalating poaching levels (high demand for black market horn at high prices, i.e. the low supply to demand ratio, coupled with poverty and unemployment in rural communities).

It is unlikely that the current investment in the protection of rhinoceroses from current sources (government and donors) can be sustained in the long term. It is estimated that between R0.87 billion and R1.29 billon per annum is required to secure rhinoceroses in the state owned protected area system, while private game farms and reserves have spent collectively approximately R2 billion on the management and specifically the protection of rhinoceroses between 2009 and 2017. Furthermore, a large portion of the rhinoceros security and enforcement budgets in a number of provinces are funded by international donors and are therefore at risk of donor fatigue. It is thus important that alternative sources of revenue be explored to protect rhinoceroses. There is a certain economic value that could be derived from rhinoceros horn that could be allocated to the protection of the species. At present, the majority of private reserves have to fund their own security measures, but income derived from the sale of rhinoceros horn would assist both government and the private sector to continue funding anti-poaching measures. As a result of the continuing illegal trade in rhinoceros horn and the apparent failure of the CITES trade ban, there have been calls from some segments of the conservation community to reconsider current policies, including the 40-year ban on the international trade in rhinoceros products, and to establish a legal, well-regulated international market for trading rhinoceros horn. A plethora of peer-reviewed papers recently published in the scientific literature also argue for a legal trade in rhinoceros horn.

In conclusion, the non-detriment finding undertaken for the white rhinoceros, as summarized in the analyses of the key considerations above, demonstrates that legal international trade in live animals to appropriate and acceptable destinations and the export of hunting trophies poses a low risk to the survival of this species in South Africa (Fig. 1 and 2) and should be allowed to continue. In fact, legal hunting of white rhinoceros incentivizes the conservation and protection of the species in South Africa, and legal and illegal harvests combined are currently still within sustainable levels. It is however highly unlikely that current investment from government, external donors and private rhinoceros owners in the protection of this species can be sustained in the long term, and it is recommended that a legal trade in rhinoceros horn as an alternative source of funds be explored. The export, for primarily non-commercial purposes, of rhinoceros horn that has been legally sourced, either through natural mortalities and/or horn harvest from wild populations, or from captive breeding facilities, will not be detrimental to the survival of the species in the wild provided that (1) the income derived from these exports contributes directly to the conservation of wild rhinoceros populations and (2) the captive breeding facilities meet the Scientific Authority's approved criteria for the captive breeding of white rhinoceros. Considering the data and information presented in this NDF, it is clear that *C. simum simum* does not meet the biological criteria for inclusion in Appendix I of CITES and a proposal to effect a straight Appendix II listing (i.e. without an annotation) can be considered. The registration of captive breeding facilities in accordance with CITES Resolution Conf. 12.10 (Rev. CoP15) in order to allow for the commercial trade in rhinoceros horn can also be considered.

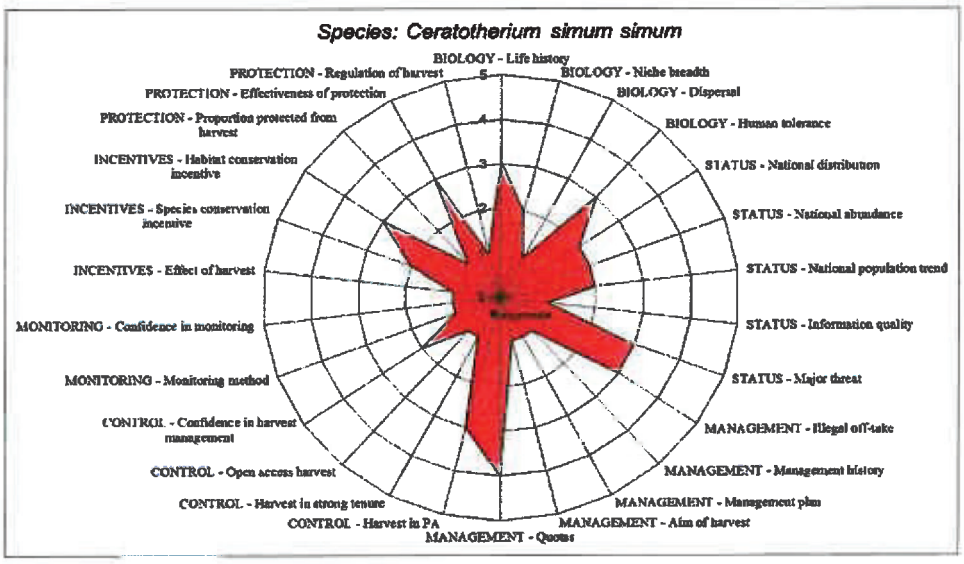


**Figure 1.** Radar chart summarizing the non-detriment finding assessment undertaken for *Ceratotherium simum simum* (southern white rhinoceros) in accordance with the CITES NDF checklist. Explanations of scores given are detailed in Table 1. Higher scores are indicative of higher risks to the species. The limited shaded area in the radar chart demonstrates an overall low risk to the species.

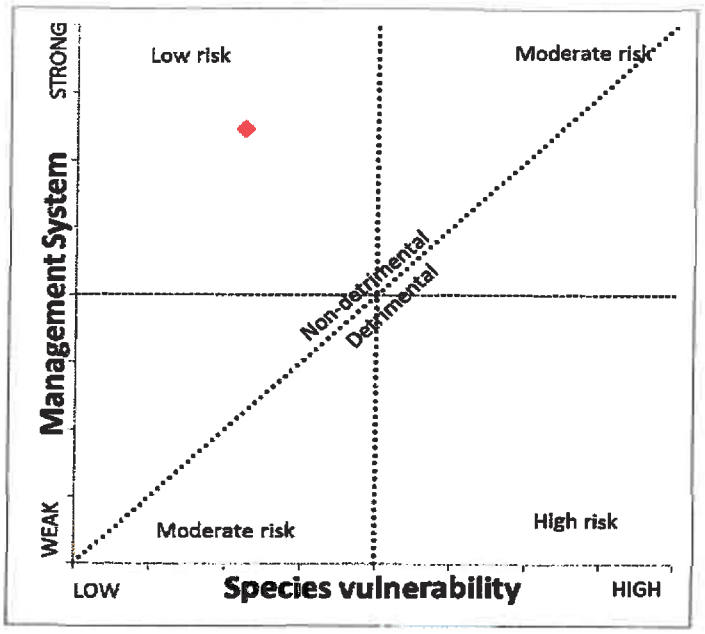


**Figure 2:** The risk of trading in *Ceratotherium simum simum* (southern white rhinoceros), as represented by the relationship between species vulnerability (biology and status) and the management system to which the species is subjected (management, control, monitoring, incentives and protection). The figure demonstrates that the species is at a low risk, and that trade is not detrimental.

**Table 1.** Detailed NDF assessment for *Ceratotherium simum simum* (southern white rhinoceros) undertaken in accordance with the CITES NDF checklist. Scores assigned to each question are indicated (bold text and shaded blocks) along with detailed explanations/justifications where relevant. Higher scores are indicative of higher risks to the species.

| **Biological characteristics** | | |
|---|---|---|
| **1. Life history:** What is the species' life history? | High reproductive rate, long-lived | 1 |
| | High reproductive rate, short-lived | 2 |
| | **Low reproductive rate, long-lived** | **3** |
| | Low reproductive rate, short-lived | 4 |
| | Uncertain | 5 |
| The white rhinoceros is long-lived with both sexes living to approximately 30 – 40 years in the wild. White rhinoceros are sedentary and semi-social. Cohesive groups consist mostly of mother-offspring associations, or small groups of sub-adults (Owen-Smith, 1988). Adult bulls are generally solitary. Females give birth to their first calf on average between 6 and 7 years in wild populations (range 4.1 to 13.5 years) (AfSRG, 2018, In prep.). Inter-calving intervals average 2.9 years (1.7 - 5 years), with a gestation period of approximately 16 months. Males are capable of mating at a similar age range to females, but due to social constraints tend to only mate successfully after 10 - 12 years old (Shrader & Owen-Smith, 2002). Youngsters can become independent of their mother around the time of the birth of the next offspring, when aged between 2.2 and 3.3 years (Owen-Smith, 1988). White rhinoceros thus have a low reproductive rate. | | |
| **2. Ecological adaptability:** To what extent is the species adaptable (habitat, diet, environmental tolerance etc.)? | Extreme generalist | 1 |
| | **Generalist** | **2** |
| | Specialist | 3 |
| | Extreme specialist | 4 |
| | Uncertain | 5 |
| The white rhinoceros is a relatively adaptable species which is able to survive in a variety of habitats from grassland to savannah, and inhabits areas with mean annual rainfall ranging from 350 mm per year to 1,500 mm per year. Juvenile mortality rates during the winter months on the Highveld are however high which is thought to be due to a combination of low temperatures and poor grazing quality. White rhinoceros favour short grasses on grazing lawns with short leafy *Themeda triandra* and broad leaved *Panicum maximum* and *P. deustum* growing under trees (Emslie, pers. com.), but can switch to taller relatively fibrous bunch grasses when short grass is unavailable. Grasslands growing on nutrient-poor soils tend to be avoided (Owen-Smith, 1988), and grazing in such areas predominates in nutrient hotspots such as around termitaria or along wetlands or drainage lines. They are thus able to persist and reproduce in nutrient poor areas, as evidenced by their current distribution. Favoured short grass species include *Panicum coloratum*, *Urochloa mosambicensis*, *Cynodon dactylon*, *Digitaria spp.* and *Sporobolus spp.* (Owen-Smith, 1988). About 35 other grass species are eaten to a lesser extent (Skinner & Chimimba, 2005), but species such as *Cymbopogon plurinodis, Bothriochloa insculpta* and *Aristida* spp. are avoided. They do not appear to compensate for seasonal declines in food quality by switching to other species or increasing the number of species eaten and may instead draw on fat reserves during the dry season (Shrader, *et al.*, 2006), or if possible feed higher-up in the catena where reserve grazing of taller *Themeda triandra* can occur (Emslie, pers. com). | | |

| | | |
|---|---|---|
| **3. Dispersal efficiency:** How efficient is the species' dispersal mechanism at key life stages? | **Very good** | 1 |
| | Good | 2 |
| | Medium | 3 |
| | Poor | 4 |
| | Uncertain | 5 |

Individual dispersal is a process that takes place at the juvenile stage. White rhinoceros calves generally leave their mothers from 2.5 – 3.5 years of age to form groupings with other adult females and/or other sub-adults, subsequently dispersing into new areas. Individuals have been known to move over distances of 40 – 50 km during drought conditions. White rhinoceros of all ages are known to disperse. Biological barriers however may inhibit their dispersal. Shrader and Owen-Smith (2002) suggest that the "buddy system" exemplified by shifting temporary associations among sub-adults, and between sub-adults and some adult females, could be important in ameliorating potential costs of dispersal into unfamiliar habitat. Males have non-overlapping territories which are known to range from 0.75 km² to 14 km² in typical savannahs. The boundaries of their home ranges are commonly aligned with topographic features such as rivers, watersheds or roads (Skinner & Chimimba, 2005).

| | | |
|---|---|---|
| **4. Interaction with humans:** Is the species tolerant to human activity other than harvest? | No interaction | 1 |
| | Pest / Commensal | 2 |
| | **Tolerant** | **3** |
| | Sensitive | 4 |
| | Uncertain | 5 |

The species is conservation dependent, occurring solely in protected areas and on game farms and reserves, but it is tolerant to local human activity and can be ranched under semi-intensive conditions. Under these conditions, where the density of animals is higher and regular anaesthetic procedures for management purposes and/or translocation are likely to increase stress levels, there is no detectable difference in cow fertility (Ververs, *et al.*, 2017). In addition, Badenhorst, *et al.* (2016) found that faecal glucocorticoid metabolite (fGCM) levels do not differ between ranched and free-ranging adult individuals, though routine dehorning procedures do result in short-term stress responses that dissipate after 72 hours (Badenhorst, *et al.*, 2016).

**National status**

| | | |
|---|---|---|
| **5. National distribution:** How is the species distributed nationally? | Widespread, contiguous in country | 1 |
| | **Widespread, fragmented in country** | **2** |
| | Restricted and fragmented | 3 |
| | Localized | 4 |
| | Uncertain | 5 |

The total area occupied by white rhinoceros within South Africa exceeds 49,000 km², of which approximately 18,000 km² is private or communal land. There are approximately 350 sub-populations of white rhinoceros in state, private or communal protected areas and game farms across all nine provinces of South Africa. The largest subpopulations occur in the greater Kruger National Park (KNP) (which incorporates adjacent private and state reserves) and Hluhluwe-iMfolozi Park.

Although the white rhinoceros population in South Africa is severely fragmented (as all sub-populations exist in fenced protected areas and are thus functionally genetically isolated), ongoing gene flow, through translocations among reserves, does occur in an unstructured manner.

| | | |
|---|---|---|
| **6. National abundance:** What is the abundance nationally? | Very abundant | 1 |
| | **Common** | **2** |
| | Uncommon | 3 |
| | Rare | 4 |
| | Uncertain | 5 |

Of all the African rhinoceroses, the southern white rhinoceros is the most abundant (Emslie, *et al.*, 2016), with total numbers far exceeding that of a minimum viable population (Reed, *et al.*, 2003). Currently there are approximately 20,375 (19,666 – 21,085 individuals) white rhinoceroses on the continent (Emslie *et al.*, 2016) of which approximately 90% occurred in South Africa in 2014 (Emslie *et al.*, 2016) (Fig. 3).

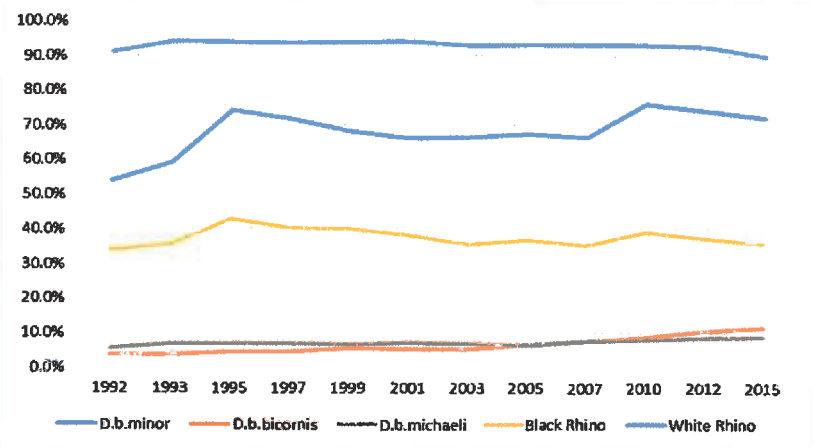


**Figure 3:** The estimated proportion of Africa's wild rhinoceros (both species) conserved by South Africa between 1992 and 2015 (Source: IUCN SSC African Rhino Specialist Group).

According to data gathered from a survey of rhinoceroses on private and state land by the SADC Rhino Management Group and data from the IUCN SSC's African Rhino Specialist Group (AfRSG), the total wild South African white rhinoceros population as of end 2015 was estimated at 17,208 individuals with 90% bootstrapped confidence levels of 16,549 – 17,863 (Fig. 4). Of these wild white rhinoceroses, 12,473 (72%) and 4,735 (28%) occurred on state-owned and private land respectively. As of the end of 2015 the KNP subpopulation was estimated at 8,875 with 95% CI of 8,365 – 9,337 (Ferreira, *et al.*, 2017). The KwaZulu-Natal (KZN) white rhinoceros population at the end of 2017, comprising 10 subpopulations in state protected areas and 32 subpopulations on private and communal land throughout the province, was estimated to be 2,676, with 2,136 animals in protected areas and 540 animals on private and communal land (Goodman, *et al.*, 2017).

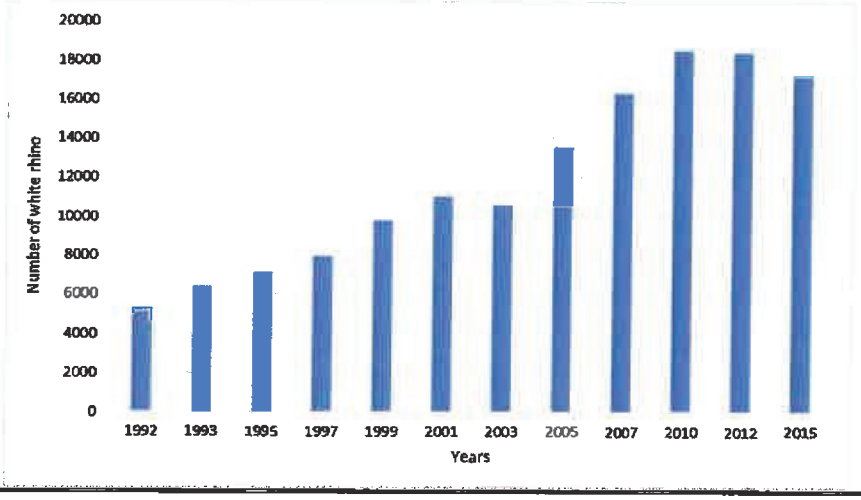

**Figure 4:** The estimated number of wild white rhinoceroses in South Africa from 1992 to 2015 (Source: IUCN SSC African Rhino Specialist Group).

The largest captive breeding operation for white rhinoceros has a population of 1,517 (as of November 2017) animals on an area of approximately 8,200 ha. This population has been breeding well, achieving an average annual population growth rate of 9.7%. Furthermore, due to highly effective anti-poaching measures, the operation has lost less than 0.02% of its rhinoceroses to poaching in the 10 years since its inception, which is significantly less than the national average. If sound management of this population continues and genetic heterozygosity is maintained at a high level, wild populations could be augmented with these captive bred rhinoceroses sometime in the future if needed. It is within this context that criteria for the captive breeding of white rhinoceros (*Ceratotherium simum simum*) have been developed (SANBI, 2018) and approved by South Africa's CITES Scientific Authority for implementation in South Africa.

| | | |
|---|---|---|
| **7. National population trend:** What is the recent national population trend? | Increasing | 1 |
| | **Stable** | **2** |
| | Reduced, but stable | 3 |
| | Reduced and still decreasing | 4 |
| | Uncertain | 5 |

The white rhinoceros is the most numerous of the African rhinoceros species, and ranged from Morocco to South Africa during the Pleistocene (Skinner & Chimimba, 2005). The northern white rhinoceros is now effectively extinct and South Africa is the main stronghold for the southern white rhinoceros, which has grown from a single remnant population of probably less than 50 animals at the turn of the 20th century, in what is now the Hluhluwe-iMfolozi Park, to over 17,000 individuals in the country.

White rhinoceros numbers in Africa increased rapidly from 1992 to 2010 (averaging 7.1% growth per year) followed by a levelling off that coincided with escalating poaching levels (Emslie, *et al.*, 2016). From 2012 to 2015, white rhinoceros numbers on the continent seemed to decline at a non-significant rate of 0.4% per year (Emslie & Adcock, 2016). In South Africa, white rhinoceros numbers increased threefold from over 5,000 individuals in 1992 to an estimated 18,910 animals in 2012 (Fig. 4). According to analyses undertaken by the AfRSG, the national average annual growth rate of the white rhinoceros population from 1991 to 2012 was 7.1% (with poaching related mortalities accounted for).

A 2015 publication by the AfRSG estimated the total South African wild white rhinoceros population at 17,208 individuals (16,549 – 17,863), indicating a levelling off or possibly a slight decline in the national population (Fig. 4). Emslie and Adcock (2016) predicted that the average estimated number of white rhinoceros in 2020 across three poaching scenarios modelled, will either increase by 1.9% or decrease by 3.9% (Table 2; for details on modelling see Emslie & Adcock, 2016).

**Table 2:** Average results of modelling white rhinoceros numbers in South Africa and Swaziland using only best estimate of long-term underlying growth rate (7.7% per annum) and averaging models based on both arithmetic and exponential changes in poaching levels over different time periods and using averages across all three time periods modelled assuming different detection rates of carcasses in the KNP (Emslie & Adcock, 2016).

| | 100% detection rate in KNP | 80% detection rate in KNP |
|---|---|---|
| Starting number (end 2015) | 18,489 | 18,489 |
| End 2020 based on last 5 years' TTM* poaching trend | 16,277 | 14,775 |
| End 2020 based on last 3 years' TTM poaching trend | 17,485 | 16,124 |
| End 2020 based on last year's TTM poaching trend | 22,776 | 22,102 |

| | | |
|---|---|---|
| End 2020 based on averaging results with poaching modelled over last 5,3 and 1 year TTM periods (best estimates used in assessment) | 18,846 | 17,767 |

*TTM Trailing 12 month period from May of the 1st year to April of the following year.

A number of key developments are thought to have contributed to the increase in the national population of white rhinoceros since the late 1800s. These include (1) the improved ability to capture and translocate white rhinoceros following the first successful translocation of white rhinoceros from iMfolozi Game Reserve in 1961; (2) the improvements in the use of anaesthetic and other drugs to calm rhinoceros during capture; (3) the attribution of (financial) value to white rhinoceros associated with the first sport hunting of the species in 1968; (4) the mass translocation of over 500 white rhinoceros from Hluhluwe and Umfolozi Game Reserves to the KNP in the early 1980s to avoid drought related mortalities; (5) implementation of a policy by the then Natal Parks Board allowing white rhinoceros to be auctioned off and thus establishing a market related value for the species which resulted in an increasing number of white rhinoceros being afforded protection on private land from the late 1980s onwards; and (6) a CITES annotated Appendix II listing in 1995 that allowed for the international trade in live animals in addition to the exports of hunting trophies.

In KwaZulu-Natal, the provincial subpopulation grew at an average rate of 3.9% per annum from 2004 and reached its peak in 2012 (3,543). From 2012 to present, the subpopulation of white rhinoceros has showed an annual decline of 5.8% per annum (Goodman, *et al.*, 2017).

Southern white rhinoceros occurring in the three small National Park subpopulations, in Mokala, Marakele and Mapungubwe, increased from 2011 to 2015 (Ferreira, *et al.*, 2017). In KNP confidence intervals of estimates from 2011 to 2015 overlapped, but point estimates suggest 1% increase to a potential 9% decline (Ferreira, *et al.*, 2017). Between the 2013 and 2014 surveys, the number of southern white rhinoceroses that were born and survived the first year (854 – 992 animals) in KNP exceeded the number that were poached (745 animals) (Ferreira, *et al.*, 2017). However, between the 2014 and 2015 surveys, the number of white rhinoceroses born and surviving the first year (725 – 810 individuals) were similar to that poached (818 individuals). As the white rhinoceros subpopulation in the KNP comprises around half (52%) of the national population, trends in the KNP subpopulation are likely to directly affect the national population trend (Ferreira, *et al.*, 2017).

| | | |
|---|---|---|
| **8. Quality of information:** What type of information is available to describe abundance and trend in the national population? | **Quantitative data, recent** | **1** |
| | Good local knowledge | 2 |
| | Quantitative data, outdated | 3 |
| | Anecdotal information | 4 |
| | None | 5 |

Detailed data exist on white rhinoceros numbers, poaching and population performances for most subpopulations over the past 30 years due to a process of confidential annual white rhinoceros status reporting to the Southern African Development Community (SADC) Rhinoceros Management Group (RMG), as well as regular reporting to IUCN/SSC AfRSG. The size of many white rhinoceros subpopulations, which are monitored using individual identification methods, are known exactly or to within a few individuals. In KNP, where individual based monitoring over the whole area is not feasible, white rhinoceros numbers are monitored using intensive helicopter block counts which have wider confidence levels (Ferreira *et al.*, 2017). In Hluhluwe-iMfolozi Park, white rhinoceros numbers are estimated statistically using distance based line and point transects (Emslie & Adcock, 2016). In addition, a survey of all private reserves keeping white rhinoceros was completed in 2015 and another is planned for 2018. Although the quality of the reporting has varied over time and between the provinces and the private sector, there has been an overall improvement in reporting from both sectors in the past years. Recently the quality of monitoring in some populations has declined as field staff are having to increasingly focus on anti-poaching with less time available for other conservation activities such as monitoring.

| | | |
|---|---|---|
| **9. Major threats:** What major threat is the species facing (underline following: overuse/ habitat loss and alteration/ invasive species/ other: ) and how severe is it? | None | 1 |
| | Limited/Reversible | 2 |
| | **Substantial** | **3** |
| | Severe/Irreversible | 4 |
| | Uncertain | 5 |

The current major threat to South Africa's white rhinoceros population is the continuing loss of individuals to poaching for their horn (Knight, 2017). Since 2007 there has been an upsurge in black market prices for horn and apparent new uses and demand from south-east Asia and especially Vietnam, which has caused an increase in poaching in some range states including South Africa (Thomas, 2010; MacMillan *et al.*, 2017). Compounding this is the threat posed by organized crime. In 2016 approximately 1,009 wild white rhinoceros (approximately 6% of the national population) were lost to poaching with close to half of these in KNP alone. However, poaching has not yet exceeded the intrinsic rate of increase of the species nationally.

The rate of wild rhinoceros poaching increased rapidly since 2007 and then levelled off and started to decline since 2014. The rate of wild white rhinoceros poaching was 0.04 rhinoceroses per day in 2007, increasing to 0.21 per day in 2008, 0.31 in 2009, 0.88 in 2010, 1.13 in 2011, 1.76 in 2012, 2.64 in 2013, to a peak of 3.15 rhinos per day in 2014 before declining to 3.01 in 2015 and 2.76 per day in 2016. A breakdown by species has not yet been released for 2017 but overall recorded rhinoceros poaching (all species; wild and semi-wild) was down by 2.5% from 2016 to 2017. This is likely to indicate a positive response to the anti-poaching interventions employed nationally and specifically in KNP. However, the number of incursions into KNP continue to increase year on year, only declining slightly in 2017. The growth in levels of sophistication of the methods employed by poachers is also a concern. This means that if the current effort to curb poaching is removed, poaching of white rhinoceros in KNP is likely to increase dramatically. In order to continue the current effort, huge financial input from external sources is crucial. The poaching threat is thus currently considered substantial, though reversible, and should the current funding and resources be removed, the severity of the threat will increase substantially. It is important to recognize though that the response to this threat has been disproportionately high, redirecting much needed conservation funding from other species.

Due to rising security costs, private rhinoceros owners are showing an increasing tendency to disinvest in the species, and as a result limited new suitable habitat is becoming available for the establishment of new rhinoceros subpopulations (Rubino & Pienaar, 2017). This not only impacts on range expansion, but also on the strategy of growing rhinoceros numbers as many current subpopulations are near or exceed ecological carrying capacity and thus have a very low growth rate (Balfour, *et al.*, 2015). Auctioning patterns indicate that there may be a decline in interest in keeping rhinoceros on private land, particularly in the provinces of Limpopo and Mpumalanga. In KwaZulu-Natal, both the number of protected areas with white rhinoceros and the number of private and communal game farms and reserves with rhinoceros declined between 2011 and 2015, but has remained constant since then. Poaching of white rhinoceros on private game farms and reserves has increased by more than 45% in the last year from approximately 160 animals in 2016 to 232 animals in 2017. Considering that approximately 28% of the national herd (4,735 animals) is kept on approximately 18,000 km$^2$ of privately owned land (Emslie, *et al.*, 2016), the loss of private sector interest in keeping white rhinoceros is a significant concern for the conservation of the species. In some cases, reserve owners have moved their white rhinoceroses to separate enclosures for security purposes.

Income of the three largest white rhinoceros sellers (SANParks, Ezemvelo KZN Wildlife and Vleissentraal auctioneers) earned from the sale of white rhinoceros has reduced from a total of approximately R100 million in 2009 when 370 rhinoceros were sold, to R20 million in 2014 when only 60 were sold. Between 2009 and 2012 there was a 43% year on year reduction in rhinoceros sales from these sources, with a reduction in the average price from R365 000 per white rhinoceros in 2009 to R258 000 in 2012. This equated to a direct loss to these institutions during this period of approximately R100 million. With the total number of rhinoceros being sold declining from the peak of 370 in 2009 to 60 in 2014, a further loss of revenue of about R273 million is estimated, bringing the total loss to R373 million. Turnover from the 1,750 white rhinoceros sold by SANParks, Ezemvelo KZN Wildlife and Vleissentraal auctioneers over the 2008 – 2014 period totalled R500 million, averaging R63 million per year. Interestingly, in 2012 suggestions that South Africa would consider submitting a proposal to the 17th Conference of the Parties (CoP) to CITES to trade in rhinoceros horn saw the average price for a white rhinoceros increase temporarily back to R305 000 per animal. For security reasons an increasing proportion of rhinoceros are not being sold publicly on auctions. A further constraint for the conservation of the species is the current veterinary moratorium on the translocation of rhinoceros from KNP for the establishment of new subpopulations on the basis that rhinoceroses are potential carriers of tuberculosis.

The loss of revenue and value of rhinoceros to both state and private sector owners generated from the sale of rhinoceros translates into reduced funds for new conservation land and anti-poaching measures. Active involvement of the private sector in the acquisition of rhinoceros since 2005 was estimated to generate R290 million for conservation authorities. A further consequence of the decline in the sale and subsequent introduction of rhinoceros to new areas is the expected decline in the meta-population growth rate. Increased poaching also means there will be fewer surplus rhinoceros that could be sold to maintain productive densities.

Habitat loss is not a threat to the white rhinoceros and the species' range has in fact expanded since the 1960s.

| Harvest management | | |
|---|---|---|
| **10. Illegal off-take or trade:** How significant is the national problem of illegal or unmanaged off-take or trade? | None | 1 |
| | Small | 2 |
| | **Medium** | **3** |
| | Large | 4 |
| | Uncertain | 5 |

Poaching on a continental level in 2015 represented 5.0% of African rhinoceros numbers (5.3% for white rhinoceros). Poaching levels are now approaching the continental average annual growth rates (7.2%) that white rhinoceros achieved between 1995 and 2007. In South Africa, an estimated 6.4% of the national population was lost to poachers in 2015 (Table 3). As a result, the white rhinoceros was listed as Near Threatened (A4ad) on the IUCN regional (South Africa, Swaziland and Lesotho) Red List of Threatened Species (Emslie & Adcock, 2016).

**Table 3:** Estimated white rhinoceros poaching in South Africa over the last seven years.

| Year | Wild population estimate | No. of wild rhinoceros poached | Poaching as % of wild population |
|---|---|---|---|
| 2010 | 18,462 | 321 | 1.7% |
| 2011 | | 414 | |
| 2012 | 18,358 | 643 | 3.5% |
| 2013 | | 962 | |
| 2014 | | 1,151 | |
| 2015 | 17,208 | 1,097 | 6.4% |
| 2016 | | 1,009 | 6.0% |
| **Total** | **17,208** | **4,597** | |

Six percent less net growth in white rhinoceros numbers over a period of 10 years equates to approximately 17,670 fewer white rhinos; animals that could be sold to generate conservation revenue and/or translocated to increase the meta-population and expand the species' range (assuming that there is sufficient land to accommodate these additional animals) (figures based on a starting population size of 18,800 and an intrinsic rate of increase of 8%). This effectively represents a R6 billion loss in asset value for the country and will impact significantly on the generation of revenue for conservation and the expansion of the white rhinoceros range.

A total of 1,009 wild white rhino were poached in 2016, compared to 1,097 in 2015 and 1,151 in 2014, representing declines in poaching rates of 4.7% and 8.0%. Total national rhinoceros poaching (both species and including intensively managed white rhinoceros) also declined by 26 animals or 3.0% from 2016 to 2017. These limited reductions in poaching after a period of significant increases in poaching indicate a positive response to the anti-poaching interventions employed nationally and specifically in KNP. The situation on the ground is however more complex because while the number of rhinoceros poached in KNP has decreased, there is evidence that poaching has increased in other hotspots, particularly in northern KwaZulu-Natal. Overall losses from the KwaZulu-Natal white rhinoceros population from poaching, trophy hunting and live exports from the province have risen from 2% per annum between 2005 and 2009 to 4% per annum between 2010 and 2012. Between 2012 and 2016 the proportion removed varied between 5.1% and 7.6%, but in 2017 rose to an all-time high of 10% (Fig. 5). These losses are primarily due to poaching and live exports from the province. The primary pressure on, and future threat to the KwaZulu-Natal white rhinoceros population is that of poaching. Poaching was generally low prior to 2008, but this situation has changed radically in the last six years indicating an exponential increase in poaching mortality. In 2017, the poaching rate was the highest on record amounting to 7.75% of the population. This was well above 2013 and 2014 levels (Fig. 5) and more than three times the maximum acceptable rate of 2% per annum.

The legal hunting of trophies for the purpose of obtaining rhinoceros horn ("pseudo hunts") was widespread in South Africa until 2012 when it was substantially reduced through legislative intervention. Stricter scrutiny under the new policy has resulted in the refusal of at least 17 hunting applications from the Czech Republic, Ukraine, Vietnam, China, Bulgaria, Canada and Slovakia, and at least 24 other hunts were cancelled (Emslie, *et al.*, 2016). This may have led to increased poaching as the supply of rhinoceros horn shifted from that obtained in pseudo hunts to that obtained from poached animals (Table 3; Fig. 5). It is important to note that while pseudo hunting removed surplus male rhinoceroses, poaching removes individuals of all sexes and ages, thereby impacting the breeding potential of the population. In addition, some private sector rhinoceros owners have reportedly sold horns into the illegal market (Hübschle, 2015).

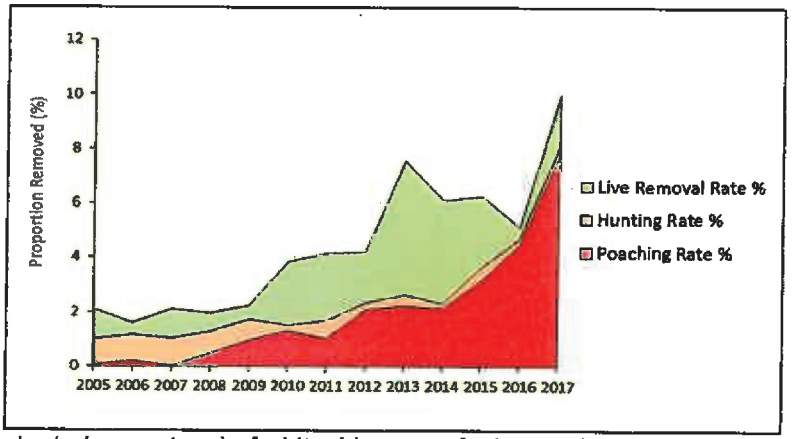


**Figure 5:** Removal rate (percentage) of white rhinoceros for harvesting activities such as live removals, hunting and poaching respectively in KwaZulu-Natal between 2005 and 2017.

| **11. Management history:** What is the history of harvest? | **Managed harvest: ongoing with adaptive framework** | 1 |
|---|---|---|
| | Managed harvest: ongoing but informal | 2 |
| | Managed harvest: new | 3 |
| | Unmanaged harvest: ongoing or new | 4 |
| | Uncertain | 5 |

A high proportion (72%) of the white rhinoceros population is generally well managed within protected areas, with offtakes managed in terms of ecological management plans. The white rhinoceros subpopulation in the KNP (52% of the national population) is managed in accordance with an adaptive management plan. Management of white rhinoceros on private land is undertaken for different purposes and is thus more variable. In KwaZulu-Natal, a management strategy and a status reporting framework currently supports fixed stocking rate management and therefore constant harvest management for some of the subpopulations in the province.

Legal hunting is regulated through a system of permits, mostly on private land and is generally economically motivated. Legal hunting of white rhinoceros commenced in South Africa when the size of the national population was approximately 1,800. Prior to 2005, the number of white rhinoceros hunted annually was generally a function of market forces, with 36 – 70 hunts being permitted. After 2005 the number of rhinoceros hunted annually increased. With an increase in hunts being undertaken by non-traditional hunters ("pseudo hunters"), hunting peaked at 173 in 2011. However, following the introduction of a number of measures to combat pseudo hunting in early 2012, the number of white rhinoceros hunted have dropped down to previous levels, and 64 were hunted in 2015. Greater regulation of the hunting process has resulted in a rapid decline in the number of applications by hunters from non-traditional hunting countries. Despite the translocation of significant numbers of white rhinoceros out of the country to stock protected areas in other African countries, zoos and safari parks

worldwide, the white rhinoceros population in South Africa is approximately 10 times larger since trophy hunting was introduced in 1968; a clear demonstration that this approach is sustainable and provides a positive contribution to conservation (Emslie, *et al.*, 2016; Cooney, *et al.*, 2017) (Fig. 6).

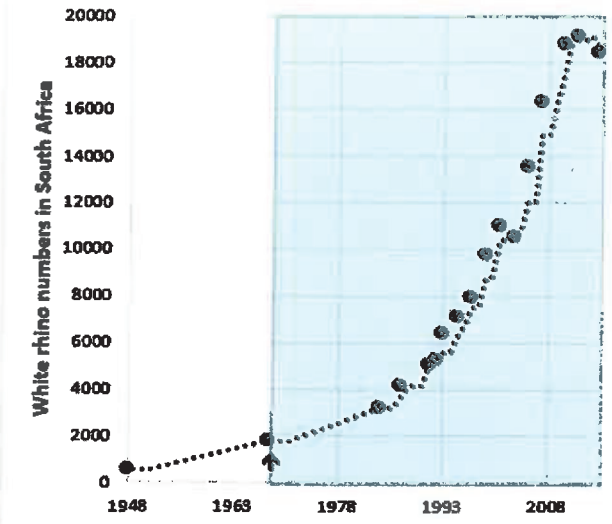


**Figure 6:** Growth of the white rhinoceros population in South Africa before and after trophy hunting started (↑) in 1968 (Emslie, *et al.*, 2016).

In 1976 the CITES Conference of the Parties (CoP) included the entire Rhinocerotidae family in Appendix I. In 1994 the CoP transferred South Africa's population of southern white rhinoceros (*Ceratotherium simum simum*) to Appendix II with an annotation to allow for the international trade in live animals to appropriate and acceptable destinations and the export of hunting trophies. The South African black rhinoceros population remained on Appendix I. There has thus been an international ban on the commercial trade in rhinoceros horn since 1976.

In addition a moratorium on the sale of rhinoceros horn or rhinoceros horn products within the country was implemented on 13 February 2009 (Government Gazette No. 31899, Notice No. 148). The moratorium was a temporary measure to afford the Department of Environmental Affairs (DEA) an opportunity to develop and implement permanent measures aimed at eliminating the illegal international trade in rhinoceros horns. The moratorium was set aside by the High Court of South Africa (Gauteng Division) on 29 November 2015 on the basis that an appropriate public consultation process, as required in terms of section 100 of the National Environmental Management: Biodiversity Act (NEMBA) No. 10 of 2004, had not been followed. The High Court judgment was upheld when the Supreme Court of Appeal and the Constitutional Court did not grant leave for appeal. The implication of the judgment is that the domestic trade in rhinoceros horn within the borders of the country is once again legal, and government is now obliged to consider any permit application received in this regard. To effectively manage the legal domestic trade in rhinoceros horn, the DEA published draft regulatory measures for the domestic trade in rhinoceros horn, or a part, product or derivative of rhinoceros horn for public comment, in February 2017 (Gazette No. 40601). These measures will be implemented only once the regulations are finalised.

In 2017, the CITES Scientific Authority of South Africa, considering CITES Resolution Conf. 11.2 (Rev CoP) on the definition of appropriate and acceptable destinations, made the following recommendations with regards to the export of white rhinoceros from South Africa (SA 2017-03):

1. A maximum of five rhinoceroses (either one male and between two and four females, or five males) may be exported for zoological purposes as the education and awareness associated with zoos and exhibition facilities can promote *in situ* conservation, and the sale of rhinoceroses

to zoos further generates funds essential for habitat management and for securing rhinoceros populations against poaching (SA 2017-03).

2. Unless as part of a formal *ex-situ* programme that (a) is supported by the authorities in both the import and export State and that (b) forms part of a conservation strategy or BMP (Biodiversity Management Plan), export of any number of rhinoceroses for breeding purposes to outside the species' natural distribution range should not be allowed as these exports cannot be deemed to promote the *in situ* conservation of the species.

As an indication of government's commitment to combat poaching at the highest level, South Africa's Cabinet adopted an integrated four-pronged approach to stop poaching (Department of Environmental Affairs 2014). The four elements of this approach are: (1) compulsory interventions to protect rhinoceros by implementing widespread and intensive anti-poaching programmes as well as creating particular zones of management using technology and intelligence, (2) game-changing interventions, targeted simultaneously at disrupting organised crime and creating opportunities for more equitable benefit-sharing of ecosystem services with all South Africans, (3) long-term sustainability interventions to explore the development of a legal and sustainable rhinoceros trade system and (4) biological management interventions that focus on strategic removals from areas of high poaching risk to create rhinoceros strongholds elsewhere (Ferreira, *et al.*, 2017).

Since 2010, the South African government has launched a variety of initiatives in collaboration with various stakeholders to address the poaching threat to rhinoceros and ensure the long term conservation of the species (Fig. 7). The Rhinoceros Conservation Lab in 2016 identified challenges and developed detailed action plans and budgets to implement the Committee of Inquiry recommendations. The total budget required to implement the Lab's initiatives is approximately R473 million per year (R379 million for the South African Police initiatives and R94 million for all others). In 2017, a process to develop a rhinoceros research strategy was initiated.

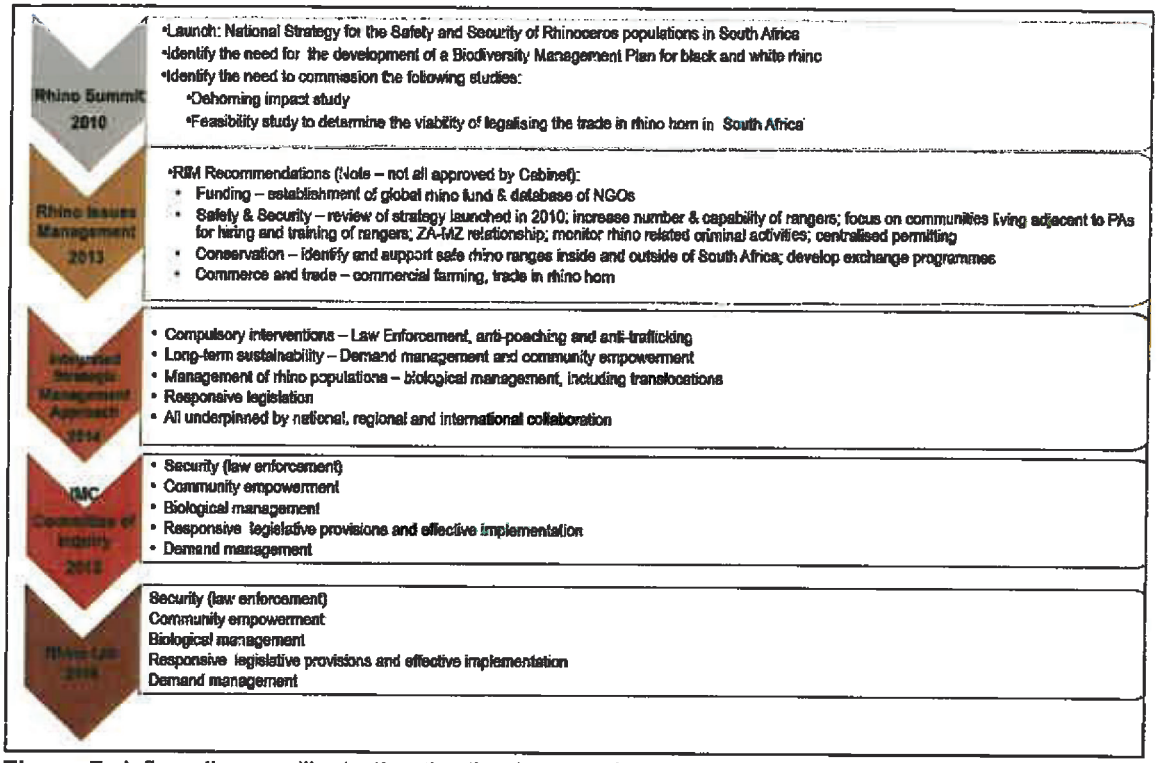


**Figure 7**: A flow diagram illustrating the timelines and main outcomes of initiatives taken by the South African government in collaboration with various stakeholders to address the poaching threat to rhinoceros and ensure the long term conservation of the species (Source: presentation by T. Carroll (DEA), October 2017).

In March 2018, the Private Rhino Owners Association (PROA) launched Rhino Horn Trade Africa (RHTA), an initiative that will facilitate the legal trade of rhinoceros horn via an online trade desk, which aims to provide a managed, efficient platform from which genuine buyers and sellers can trade in legal, humanely acquired rhinoceros horn.

| | | |
|---|---|---|
| **12. Management plan or equivalent:** Is there a management plan related to the harvest of the species? | **Approved and co-ordinated local and national management plans** | 1 |
| | Approved national/state/provincial management plan(s) | 2 |
| | Approved local management plan | 3 |
| | No approved plan: informal unplanned management | 4 |
| | Uncertain | 5 |

A national white rhinoceros strategy was approved in 2000 and in December 2015 a national Biodiversity Management Plan (BMP) for white rhinoceros was gazetted for implementation (Government Gazette No. 39469) in terms of section 43 of the NEMBA. This plan, which was developed by the SADC RMG, is informed by the National Strategy for the Safety and Security of Rhino Populations in South Africa (DEA 2011) as well as the Rhinoceros Issues Management Report (DEA 2013) and will form the basis for greater coordination between existing and future plans. The primary objective of the plan is a national white rhinoceros net average population growth rate of 2% per annum, with at least 20,400 southern white rhinoceros in South Africa by the end of 2020. The BMP advocates the use of set percentage harvesting to retain populations at productive densities.

SANParks has an institutional plan for white rhinoceros (last updated in 2014) and Ezemvelo KZN-Wildlife implements a provincial level management strategy for white rhinoceros on state, private and communal land.

A SADC Regional Rhinoceros Conservation Strategy for white rhinoceros (as well as black rhinoceros) was adopted in 2005. The strategy sets out a long-term goal of maintaining "Southern African rhinoceros [...] as flagship species for biodiversity conservation and wildlife-based economic development, within viable and well distributed populations" (Janssens & Trouwborst 2018). In addition to this, the 2016 African rhino Range States' conservation plan was developed and endorsed by almost all African rhinoceros range states including South Africa.

| | | |
|---|---|---|
| **13. Aim of harvest regime in management planning:** What is harvest aiming to achieve? | **Generate conservation benefit** | 1 |
| | Population management/control | 2 |
| | Maximize economic yield | 3 |
| | Opportunistic, unselective harvest, or none | 4 |
| | Uncertain | 5 |

The white rhinoceros subpopulations in South Africa are potentially subjected to a number of types of legal offtake. These include management removal for ecological or biodiversity reasons as well as offtakes for trophy hunting and revenue generation on live sales. The majority of these offtakes (excluding international exports of live animals and trophy hunts) do not result in the permanent removal of animals from the national population. These offtakes generate a conservation benefit through enabling effective conservation management (including rapid growth in numbers and expansion of the species' range), while at the same time generating conservation revenue. Since 1986 more than 3,000 white rhinoceros have been sold by the state to the private sector. More recently, removals of white rhinoceros from KNP have been undertaken to translocate animals to safer habitats. However, this is now prevented by a veterinary moratorium on the translocation of white rhinoceros from KNP due to current concerns that white rhinoceros may be carriers of tuberculosis.

A total of 774 live white rhinoceros (source codes W, R, and F) were exported from South Africa between 2005 and 2016, constituting approximately 22% of the total exports of this species from South Africa during this time period (CITES Trade Database, UNEP World Conservation Monitoring Centre, Cambridge, UK). Live animals were exported primarily for re-introduction purposes (33%), to zoos (27% of exports) and breeding facilities (26% of exports). The main destination countries were Namibia (38% of exports), China (32% of exports), and Botswana (7% of exports), with Namibia and Botswana importing live white rhinoceros mainly for re-introduction purposes, and China mainly for zoos and breeding facilities. Between 2010 and 2016, 535 live white rhinoceros were exported from South Africa. The main destinations were Namibia (>200) (range State), China (135), Botswana (39) (range State), Spain (24) and Vietnam (17).

Permanent removal of white rhinoceros from the national population through legal hunting is predominantly economically motivated, although it does provide additional conservation benefits (demographic, genetic and security). Legal hunting removed about 0.59% of the national population during the period 2005 – 2015 and 0.43% since 2012 when measures to prevent pseudo hunting were implemented. It is a national policy that sustainable hunting aims to generate a conservation benefit through incentivizing the private sector to keep rhinoceros and to purchase land in order to stock rhinoceros. Trophy hunting removes surplus adult males, whilst generating important revenue for private and state conservation, this in contrast to poaching which removes a wider range of ages and sexes. Thus poaching is likely to have a greater impact on rhinoceros population growth rates. It has been demonstrated that trophy hunting can be sustainably managed in South Africa (see Figs 6 & 8) (Cooney *et al.*, 2017; Emslie, *et al.*, 2016). Seventy-seven percent of the total exports of white rhinoceros specimens between 2005 and 2015 were hunting trophies (CITES Trade Database, UNEP World Conservation Monitoring Centre, Cambridge, UK); 1,115 trophies in total (although this figure is likely to be an overestimate due to the intricacies of data capture). Since South Africa clamped down on pseudo hunting in 2012, on average only 70 white rhinoceros were legally hunted annually (0.43% of the national population) (Fig. 8). The main destination countries for trophy hunting between 2013 and 2015 included the United States of America (40%), China (10%), Poland (8%) and the Russian Federation (8%). Even in the year of peak pseudo hunting (2011), only 0.94% of the population was hunted (Fig. 8) (Emslie, *et al.*, 2016).

Regulated legal hunting in KwaZulu-Natal is also minimal. Data available for the period 2005 to 2017 indicate an average harvest rate of 18 white rhinoceros per annum, with 2010 and 2012, 2013, 2014 and 2016 falling well below this figure. This harvest has declined since its peak in 2007 and is easily sustained by the current population. In 2016, the number hunted was equivalent to 0.35% of the population which again is easily sustainable, especially given that the revenue generated from trophy hunting is put back into rhinoceros protection and habitat management.

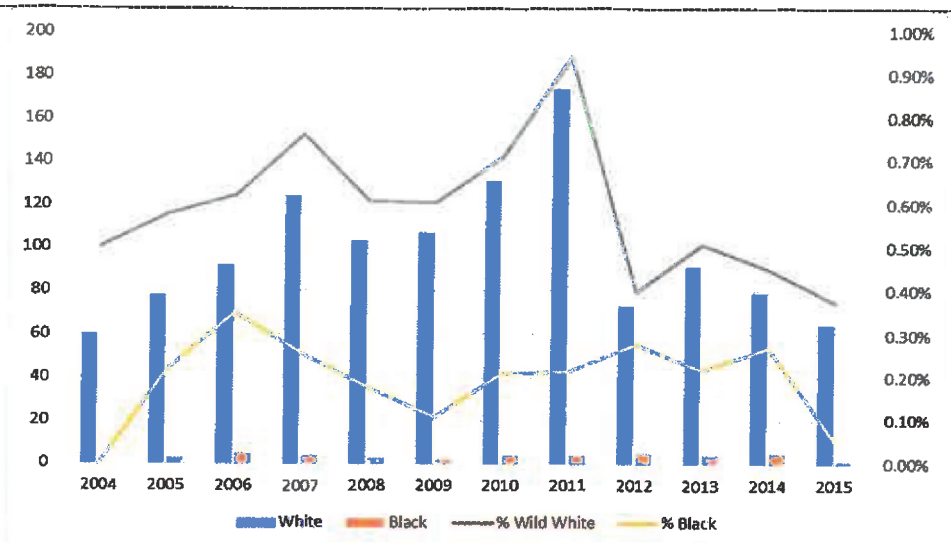


**Figure 8:** Number of white and black rhinoceros hunted and the percentage of the estimated wild rhinoceros population hunted (Source: IUCN SSC AfRSG).

| | | |
|---|---|---|
| **14. Quotas:** Is the harvest based on a system of quotas? | Ongoing national quota: based on biologically derived local quotas | 1 |
| | Ongoing quotas: "cautious" national or local | 2 |
| | Untried quota: recent and based on biologically derived local quotas | 3 |
| | **Market-driven quota(s), arbitrary quota(s), or no quotas** | **4** |
| | Uncertain | 5 |

The number of white rhinoceros legally hunted annually is market driven but well below a level that would threaten the long-term viability of the national herd. For this reason, setting a quota has been unnecessary to date and the white rhinoceros BMP stipulates that the implementation of a hunting quota will be reviewed if trophy hunting increases to above 1% of the national population. Since 2012, on average 70 white rhinoceros are legally hunted annually (0.43% of the national population). There is currently no quota for the export of rhinoceros horn for non-commercial purposes and no national quota for the export of live white rhinoceros.

**Control of harvest**

| | | |
|---|---|---|
| **15. Harvesting in Protected Areas:** What percentage of the legal national harvest occurs in State-controlled Protected Areas? | High | 1 |
| | Medium | 2 |
| | **Low** | **3** |
| | None | 4 |
| | Uncertain | 5 |

Less than 2% of the national herd is translocated from state protected areas annually. The removal of live animals for local translocation purposes is not considered to be a form of harvest in terms of this NDF as these animals are not permanently removed from the national population. Individuals that are removed (translocated) from established subpopulations that are approaching or exceed carrying capacity are routinely being invested in new areas with suitable habitat and protection, where populations can grow rapidly. Biological management has played a significant role in the expansion of range and numbers of white rhinoceros. Since 2012, on average 70 white rhinoceros are legally hunted annually (0.43% of the national population). Of these less than 10 are hunted from state controlled protected areas.

| | | |
|---|---|---|
| | **High** | **1** |

| | | |
|---|---|---|
| **16. Harvesting in areas with strong resource tenure or ownership:** What percentage of the legal national harvest occurs outside Protected Areas, in areas with strong local control over resource use? | Medium | 2 |
| | Low | 3 |
| | None | 4 |
| | Uncertain | 5 |
| On average about 70 white rhinoceros are legally hunted annually outside of state protected areas. Most of these animals are hunted on private land, where there is strong local control over resource use. | | |
| **17. Harvesting in areas with open access:** What percentage of the legal national harvest occurs in areas where there is no strong local control, giving *de facto* or actual open access? | **None** | **1** |
| | Low | 2 |
| | Medium | 3 |
| | High | 4 |
| | Uncertain | 5 |
| White rhinoceros occur solely in protected areas and on game farms and reserves. | | |
| **18. Confidence in harvest management:** Do budgetary and other factors allow effective implementation of management plan(s) and harvest controls? | High confidence | 1 |
| | **Medium confidence** | **2** |
| | Low confidence | 3 |
| | No confidence | 4 |
| | Uncertain | 5 |
| Since the introduction of the amended Norms and Standards for the Marking of Rhinoceros and Rhinoceros Horn and for the Hunting of Rhinoceros for Trophy Hunting Purposes (Government Gazette No. 35248; April 2012), trophy hunts are attended by conservation officials, a legal requirement of the norms and standards. Through better regulation, the occurrence of "pseudo hunts" has ceased.<br><br>While previously problems with reporting and monitoring were experienced, policing, record keeping and the implementation of regulations have much improved. A suite of decision-making mechanisms and a robust permitting system are currently in place to manage and monitor harvest of white rhinoceros. | | |
| **Monitoring of harvest** | | |
| **19. Methods used to monitor the harvest:** What is the principal method used to monitor the effects of the harvest? | **Direct population estimates** | **1** |
| | Quantitative indices | 2 |
| | Qualitative indices | 3 |
| | National monitoring of exports | 4 |
| | No monitoring or uncertain | 5 |
| The monitoring method employed in the KNP is primarily one of conducting block counts. Formal distance sampling using line and point transects is employed in the Hluhluwe iMfolozi Park in KwaZulu-Natal. The quality of monitoring of the remainder of the national herd is variable, with rhinoceroses closely monitored at many sites. Many larger subpopulations are monitored through aerial counts, while smaller subpopulations are monitored using ranger sightings of ear notched individuals. Due to security concerns, there is however mistrust among parties and access to information is a challenge.<br><br>The amended Norms and Standards for the Marking of Rhinoceros and Rhinoceros Horn and for the Hunting of Rhinoceros for Trophy Hunting Purposes (Government Gazette No. 35248; April 2012) require that all hunts are monitored by conservation officials. In addition, all dehorning activities are monitored by conservation officials. The main purpose of dehorning at present is to reduce the incentive to poach rhinoceros. In small subpopulations dehorning is cost effective, and all rhinoceros have | | |

therefore been dehorned in many of the smaller subpopulations. However, dehorning is less common in larger subpopulations. The norms and standards require that a DNA sample be collected at the time of dehorning for genetic profiling purposes, as well as from each live animal and from both horns of the live animal in cases where the animals are sold and translocated. DNA samples of all detached horns must also be collected. A possession permit as well as a DNA certificate is issued to the owner of the rhinoceros horn and all DNA samples are stored on the RHODIS database to ensure traceability. The system is well managed and rhinoceros horn stock piles are regularly audited.

Reporting of rhinoceros horn stocks within the private sector continues to increase in part due to improved declaration and reporting. A 2014 survey of white rhinoceros owners in South Africa found that privately-held stocks totalled 1,697 pieces (6,256 kg) (Balfour *et al.*, 2015), accounting for approximately 80 – 85% of the potential estimated weight of stocks expected from natural mortalities (i.e. 7,690 kg). Fear of reporting stockpiles to authorities in some provinces where such information could be leaked to criminals is a factor in under-reporting (Emslie *et al.*, 2016).

| | | |
|---|---|---|
| **20. Confidence in harvest monitoring:** Do budgetary and other factors allow effective harvest monitoring? | **High confidence** | 1 |
| | Medium confidence | 2 |
| | Low confidence | 3 |
| | No confidence | 4 |
| | Uncertain | 5 |

Monitoring of the rates of harvest (both illegal and legal) of white rhinoceros in state protected areas, which constitute 72% of the national herd, are conducted with a high level of confidence. KNP has an approximate 80% detection rate for white rhinoceros carcasses. For KZN there is a 10% confidence limit around the provincial population estimate and a 100% confidence in the monitoring of legal harvest. Rhinoceroses are individually known on smaller properties where there is also a high confidence in carcass detection rates. Even though there are some concerns with regards to adequate budgets to conduct regular counts and implement intensive monitoring on the ground, and though there has been a decline in the quality of monitoring information captured in recent years in some reserves due to the redeployment of rangers to anti-poaching activities, very good population estimates exist and in most cases direct population estimates are used to monitor the effects of harvest.

The amended Norms and Standards for the Marking of Rhinoceros and Rhinoceros Horn and for the Hunting of Rhinoceros for Trophy Hunting Purposes require that all rhinoceros hunts are attended by conservation officials. Provincial conservation agencies indicate that these legal requirements are being complied with in full.

**Incentives and benefits from harvesting**

| | | |
|---|---|---|
| **21. Utilization compared to other threats:** What is the effect of the harvest when taken together with the major threat that has been identified for this species? | **Beneficial** | 1 |
| | Neutral | 2 |
| | Harmful | 3 |
| | Highly negative | 4 |
| | Uncertain | 5 |

Legal hunting of white rhinoceros has been beneficial to the conservation of the species. Due to the significant economic benefits of hunting to game farmers (worth approximately $19 million over the period 2004 – 2008), together with live sales and ecotourism, the private sector has increasingly stocked these animals. This has contributed to the expansion of the species' range and has maintained a rapid population growth of the national population. However, the current prohibition on the commercial international trade in rhinoceros horn can be viewed as a missed opportunity for beneficiation associated with owning and protecting rhinoceros.

Live sales of surplus animals to the private sector have been highly beneficial to conservation agencies, generating vital conservation revenue (e.g. sales by SANParks, and Ezemvelo KZN Wildlife as well as

Vleissentraal from 2007 to end 2014 totalled R507 million) and preventing overstocking in established subpopulations. However, the increased poaching rate has limited this positive impact as private sector interest in buying and keeping rhinoceros has declined due to the rising costs of security. Due to the increased poaching losses there will be no legal offtakes from Hluhluwe iMfolozi Park this year (2018), which would otherwise have been sold on auction – this foregone revenue source is a loss to conservation.

| | | |
|---|---|---|
| **22. Incentives for species conservation:** At the national level, how much conservation benefit to this species accrues from harvesting? | High | 1 |
| | **Medium** | **2** |
| | Low | 3 |
| | None | 4 |
| | Uncertain | 5 |

The ability of the state and the private sector to gain financially from owning, selling, translocating, viewing (via ecotourism) and hunting white rhinoceros has contributed significantly to the conservation of this species in South Africa through expansion of its range and the maintenance of a rapid population growth. Recent research suggests that the photographic tourism revenues generated by Kruger National Park's rhinoceros population between 2011 and 2013 ranged from 5.9 to 14.9 million US$ per year (Saayman & Saayman, 2017).

Privately owned game farms and reserves have contributed significantly to white rhinoceros conservation (Fig. 9), with 28% of the national herd (approximately 4,735 animals) kept on approximately 18,000 km² of privately-owned land. The private sector in South Africa now conserves more rhinoceros than there are black and white rhinoceros in the whole of the rest of Africa (Emslie & Adcock, 2016). However, increased poaching, increased security costs, increasing numbers of incidents deemed threatening to human life, and perceived reduced incentives for their conservation, have resulted in reduced white rhinoceros live sale prices (to a low of R255 000 per animal in 2011) and an increasing number of owners seeking to remove their rhinoceroses. (Interestingly, speculation that South Africa could submit a proposal to the 17th CoP to CITES to trade in rhinoceros horn saw the average price paid for white rhinoceros increase temporarily to R305 000 in 2013.) Since 2011, approximately 12 reserves within KZN removed all their rhinoceroses, though many of these reserves had only a few animals. This worrying trend threatens to reverse the expansion of range and has the potential to significantly reduce conservation budgets (due to declining live sales), and possibly negatively affect meta-population growth rates in future. Where there is a diverse conservation income (inclusive of ecotourism), there is still some benefit of keeping rhinoceroses, but the cost benefit of keeping them is vulnerable (benefits are becoming marginal).

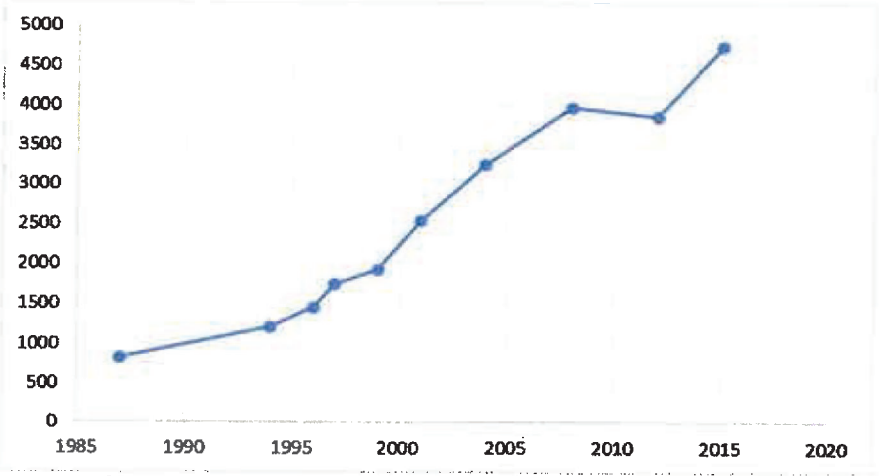


**Figure 9:** Numbers of white rhinoceros on private and community land from 1985 to 2015 (Source IUCN SSC AfRSG).

Poaching of rhinoceroses thus hampers several conservation objectives (Ferreira, Botha & Emmett, 2012). Population restoration opportunities as well revenue generating opportunities to enhance protected areas are lost when animals are poached. Importantly, rhinoceros horn profits are currently reaped largely by poachers and criminal traders on the black market, rather than by local communities or the public administrators or private owners of land hosting rhinoceroses who currently bear the prohibitive financial and security costs of protecting and conserving the species (Rubino & Pienaar, 2017).

It has been suggested that a legal trade in rhinoceros horn would attract buyers away from the illegal market and provide much needed additional income to bolster security by investing a percentage of the revenue obtained from trade back into conservation (Biggs *et al.*, 2013; Di Minin *et al.*, 2015). This would be especially pertinent for private owners of white rhinoceros, who would be able to recuperate some of their anti-poaching costs through the sale of horn. At present, some private owners are selling their rhinoceros due to the prohibitive financial and security pressures resulting from the poaching, while others are moving their animals to neighbouring countries (Emslie *et al.*, 2016; Knight, 2016; Rubino & Pienaar, 2017). A 2015 survey of 171 private rhinoceros owners conducted under the auspices of the SADC RMG and funded by the DEA, showed that 85% of the private rhinoceros owners supported legal international trade in horn, 10% were undecided and only 5% were against a legal trade in rhinoceros horn. The survey also showed that 80% of private rhinoceros owners would sell horn if it was legal to do so, while 44% would conduct intensive husbandry of rhinoceros in order to trade horn (Knight, 2016).

Based on recent white rhinoceros population estimates and feedback from private rhinoceros owners, Taylor, *et al.*, (2017) estimated the annual potential supply of horn that could be obtained within South Africa from four sources: natural mortalities, dehorning, trophy hunting and stockpiled horn. Using different scenarios of horn production they showed that the mass of horn that could be obtained varies from 5,319 to 13,356 kg per year (Taylor, *et al.*, 2017). The mass of horn currently lost to poachers per year is approximately 5,718 kg (3,781-5,933 kg for the period 2012-2016, assuming an average horn mass of 5.88kg per horn set) (Taylor, *et al.*, 2017).

| | | |
|---|---|---|
| **23. Incentives for habitat conservation:** At the national level, how much habitat conservation benefit is derived from harvesting? | High | 1 |
| | Medium | 2 |
| | **Low** | 3 |
| | None | 4 |
| | Uncertain | 5 |

Private game farms and reserves contribute significantly to the conservation estate in South Africa. It is estimated that private game farms and reserves with white rhinoceros have added a further approximate 18,000 km$^2$ to the conservation footprint. However, due to the prohibitive financial and security pressures resulting from poaching, private landowners are disinvesting in rhinoceros and new suitable habitat is no longer becoming available to establish new rhinoceros populations. This does not only impact on range expansion, but also on current subpopulations that are near carrying capacity by reducing their population growth rates. The ecotourism incentive is still high, but incentives for the harvesting of white rhinoceros have likely decreased. At present benefits and revenue gained from harvesting are mostly financing the protection of rhinoceroses rather than habitat management and range expansion. Other factors reducing the benefit to habitat conservation include the veterinary moratorium on the translocation of rhinoceros from KNP, the cessation of live sales from Hluhluwe iMfolozi Park, a decline in the number of rhinoceroses sport hunted and higher security costs. There is however a potential for rhinoceros horn sales to increase incentives for the keeping of white rhinoceros and thus contribute to habitat conservation.

| **Protection from harvest** | | |
|---|---|---|
| **24. Proportion strictly protected:** What percentage of the species' | **>15%** | 1 |
| | 5-15% | 2 |

| | | |
|---|---|---|
| natural range or population is legally excluded from harvest? | <5% | 3 |
| | None | 4 |
| | Uncertain | 5 |
| In this NDF, strict protection is considered to be provided by state owned protected areas managed by provincial or national conservation agencies where legal hunting is negligible (<10 per year). Seventy-two percent of the national population is conserved within state protected areas (12,473 individuals). National parks, under the management of South African National Parks (SANParks), are custodian to more than 52% of South Africa's white rhinoceroses.<br><br>The CITES prohibition on the international trade in rhinoceros horn for commercial purposes, in existence since 1977 and implemented in an attempt to reduce poaching and the illegal sales of rhinoceros products, is also considered to be a mechanism that affords strict protection to the species. | | |

| | | |
|---|---|---|
| **25. Effectiveness of strict protection measures:** Do budgetary and other factors give confidence in the effectiveness of measures taken to afford strict protection? | High confidence | 1 |
| | Medium confidence | 2 |
| | **Low confidence** | 3 |
| | No confidence | 4 |
| | Uncertain | 5 |

There is a low confidence in the long-term effectiveness of the state protected area system to protect the white rhinoceros. Poaching has occurred in most state owned protected areas, and some protected areas are struggling to combat these illegal activities. For the KNP, this is primarily due to the long permeable border with Mozambique, and that country's inadequate legal and wildlife protection systems. More recently, removals of white rhinoceros from KNP to translocate animals to safer areas are prevented by a veterinary moratorium due to current concerns that white rhinoceros may be carriers of tuberculosis. Budgets and resources are also constrained and the strong emphasis on rhinoceros protection detracts from other important conservation issues as funding and resources are redeployed to rhinoceros protection and management.

The international ban on the commercial trade in rhinoceros horn, in place now for more than 40 years (Emslie, 2012), has also failed to effectively provide strict protection to the species, despite the numerous anti-poaching measures implemented in South Africa (Emslie, 2013; Emslie *et al.*, 2013; Knight, 2016; Rademeyer, 2016). It does appear from the latest poaching figures that the number of rhinoceroses poached per annum is on the decline, though while the number of rhinoceroses poached in KNP has decreased, there is evidence that poaching has increased in other hotspots, particularly in northern KwaZulu-Natal. Poaching from a national perspective has not yet resulted in a significant population decline of the white rhinoceros, as the number of births recorded per year still exceeds the number of deaths recorded. However, a number of key subpopulations are beginning to show signs of decline, which means that despite the significant resources that have been deployed towards gaining control over illegal activities, current protection measures are insufficient in the long term. These measures importantly fail to address the cause of the escalating poaching levels (high demand for black market horn at high prices, i.e. the low supply to demand ratio, coupled with poverty and unemployment in rural communities). Local South African and Mozambican men are contracted by crime syndicates to poach rhinoceroses. These poachers usually receive 1000 to 9000 US$ per kg of horn (whereas end users pay an estimated 65 000 US$ per kg) (Hübschle, 2016). Ground-level poachers are generally poor, and they rarely have access to job opportunities that provide comparable earnings (Lunstrum, 2014); understandably there are always local people willing to poach (Rubino & Pienaar, 2017).

Most importantly, there is a concern that the current protection measures are financially unsustainable. Based on a recommended one ranger per 10 km$^2$ (at a cost of approximately R50,218 per km$^2$) for protected areas <100,000 ha, and a recommended one ranger per 15 – 30 km$^2$ (at a cost of approximately R16 739 – R33 479 per km$^2$) for protected areas >100,000 ha (Conway, pers. com.), it is estimated that between R0.87 billion and R1.29 billon per annum is required to secure rhinoceroses in the state owned protected area system. KNP currently spends approximately R3 million per annum primarily on rhinoceros protection. Between 2009 and 2017 private game farms and reserves have spent collectively approximately R2 billion on the management and specifically the protection of rhinoceroses. Furthermore, a large portion of the rhinoceros security and enforcement budgets in a number of provinces are funded by international donors and are thus at risk of donor fatigue. It is unlikely that the current investment in the protection of rhinoceroses from current sources (government and donors) can be sustained in the long term. It is thus important that alternative sources of revenue be explored to protect rhinoceroses. Di Minin, *et al.*, (2015) argue that there is a certain economic value that could be derived from rhinoceros horn that could be allocated to the protection of the species. At present, the majority of private reserves have to fund their own security measures (Rubino & Pienaar, 2017). Income derived from the sale of rhinoceros horn could assist both government and the private sector to continue funding the current investment in rhinoceros protection.

As a result of the continuing illegal trade in rhinoceros horn and the apparent failure of the CITES trade ban, there have been calls from some segments of the conservation community to reconsider current policies, including the 40-year ban on the international trade in rhinoceros products, and to establish a legal, well-regulated international market for trading rhinoceros horn (Biggs *et al.*, 2013; Conrad, 2012; Di Minin *et al.*, 2015; Ferreira, Pfab & Knight, 2014). Ayling (2013) further argues that "where the knowledge base is poor and existing strategies seemingly ineffectual, one can certainly argue under a precautionary approach that any action that could reduce poaching and quash the illegal trade ought to be tried." Janssens and Trouwborst (2018) agree and recommend that the CITES CoP seriously explore the merits of alternative regimes for rhinoceros horn trade, which involve more scope for legal trade than allowed under the presently applicable regime.

There are at least four concerns relating to the potential effects of legalisation (Fischer, 2004). In relation to potential 'destigmatization' of rhinoceros horn use in consumer markets, Moyle (2018) however argues that there is no strong empirical or theoretical evidence that stigmatizing demand would be at a sufficient scale that it can compensate for the lack of legal competition. MacMillan *et al.* (2017), after interviewing 1,000 animal traditional medicine (ATM) users in Vietnam concluded that there is no evidence of social 'stigma' from rhinoceros horn consumption, and that the introduction of a legal supply of rhinoceros horn has the potential to 'crowd out' rhinoceros horns sourced from poachers for two reasons, namely, consumers' strong preference for non-lethal harvesting, and an anticipated overall fall in price due to the loss of prestige and exclusivity of rhinoceros horn within a legal and regulated trade. The study also found that there is likely to be a small increase in the number of people who might consume more rhinoceros horn due to legalization, and thus recommended that sufficient supplies of legal stock be available to meet demand. In relation to the concern that illegally obtained rhinoceros horn will be laundered into the legal trade, Moyle (2018) argues that where sales are occurring largely outside the legal market (i.e. illegally), trade bans have limited effect. He further argues that trade bans only achieve the objective of reducing laundering to zero, at the cost of giving up all competition with illegal sellers and possibly increasing illegal sales to above acceptable levels. The size of the legal market thus involves a trade-off between laundering and competition. Two further concerns around the potential effects of legalisation relate to whether legalised trade competes with existing illegal markets or simply creates new parallel ones, and whether legalised trade leads to reduced enforcement against illegal traders.

Irrespective of whether trade is legalised or not, Haas and Ferreira (2016) further suggest that in order to maintain rhinoceros subpopulations, a transnational policing effort aimed at dismantling criminal networks involved in rhinoceros horn trafficking, coupled with increases in legal economic opportunities for people living adjacent to protected areas, is required. It is further argued that providing legal job opportunities for young men in rural communities would further improve the protection of rhinoceros and reduce the poaching risk (Haas & Ferreira, unpubl; Jewkes, *et al.*, 2012).

| **26. Regulation of harvest effort:** How effective are any restrictions on harvesting (such as age or size, season or equipment) for preventing overuse? | **Very effective** | 1 |
|---|---|---|
| | Effective | 2 |
| | Ineffective | 3 |
| | None | 4 |
| | Uncertain | 5 |

White rhinoceroses are utilised for trophy hunting, photographic tourism and recreation in accordance with the sustainable use principle that is enshrined in the Constitution of the Republic of South Africa and embedded in NEMBA. The species is listed as protected in terms of section 56 of NEMBA and various provincial ordinances and acts provide further legislative protection. Permits are therefore required to undertake a variety of activities, e.g. hunting, keeping, selling and other forms of direct use. Hunting affects only a very small proportion (0.43%) of the national population. Provinces have indicated that the amended norms and standards for the marking of rhinoceros and rhinoceros horn and for the hunting of rhinoceros for trophy hunting purposes (Government Gazette No. 35248; April

2012) are being implemented effectively. Trophy hunting of white rhinoceros is well-managed, and it is unlikely to have a deleterious effect on the population as a whole.

**List of participants**

1. Keryn Adcock – IUCN SSC AfRSG and SADC RMG
2. Dave Balfour – IUCN SSC AfRSG and SADC RMG
3. Willem Boshoff - North West Department of Agriculture, Environment & Tourism
4. Brent Coverdale - Ezemvelo Kwazulu-Natal Wildlife
5. Harriet Davies-Mostert – Endangered Wildlife Trust
6. Dean Peinke – Eastern Cape Parks and Tourism Agency
7. Enrico Di Minin – University of Helsinki, and School of Life Sciences, UKZN
8. Johan Eksteen - Mpumalanga Tourism and Parks Agency and SADC RMG
9. Richard Emslie – IUCN SSC AfRSG, SADC RMG and RESG
10. Pete Goodman – KZN Rhino Management Group
11. Ricky Hannah - Eastern Cape Department of Economic Development and Environmental Affairs
12. Pelham Jones – Private Rhino Owners Association, SADC RMG and IUCN SSC AfRSG
13. Johan Kruger - Limpopo Department of Economic Development, Environment and Tourism and SADC RMG
14. Tebogo Mashua – Department of Environmental Affairs
15. Pieter Nel – North West Parks and Tourism Board and SADC RMG
16. Michelle Otto – Buffalo Dream Ranch
17. Michele Pfab - South African National Biodiversity Institute
18. Jeanetta Selier – South African National Biodiversity Institute
19. Jo Shaw – World Wildlife Fund, and IUCN SSC AfSRG
20. Rob Slotow – School of Life Sciences, University of KwaZulu-Natal
21. Michael 't Sas Rolfes – University of Oxford, and IUCN SSC AfRSG

**References**


1. **AfSRG (IUCN SSC African Rhino Specialist Group) 2018 (In. prep).** (Adcock, Otto, Anderson, Clegg, van Royan, Els, van Dyk and several additional contributors): Reproductive and performance parameters in *in-situ* populations of White Rhino (*Ceratotherium simum*).
2. **Ayling, J., 2013.** What sustains wildlife crime? Rhinoceros horn trading and the resilience of criminal networks. *Journal of International Wildlife Law & Policy, 16*(1), pp.57-80.
3. **Badenhorst, M., Otto, M., van der Goot, A.C., & Ganswindt, A., 2016.** Stress steroid levels and the short-term impact of routine dehorning in female southern white rhinoceros (*Ceratotherium simum simum*). *African Zoology* 51(4); 211-215.
4. **Balfour, D.A., Knight, M. and Jones, P., 2015.** Status of White Rhinoceros on Private and Communal Land in South Africa: 2012 – 2014. Department of Environmental Affairs. Pretoria.
5. **Biggs, D., Courchamp, F., Martin, R., & Possingham, H.P., 2013.** Legal trade of Africa's rhinoceros horns. *Science* 339:1038–1039.
6. **Conrad, K., 2012.** Trade bans: a perfect storm for poaching. *Tropical Conservation Science* 5(3): 245-254.
7. **Cooney, R., Freese, C., Dublin, H., Roe, D., Mallon, D., Knight, M., Emslie, R., Pani, M., Booth, V., Mahoney, S. and Buyanaa, C., 2017.** The baby and the bathwater: trophy hunting, conservation and rural livelihoods. *Unasylva, 68*(1), p.249.
8. **Di Minin, E., Laitila, J., Montesino-Pouzols, F., Leader-Williams, N., Slotow, R., Goodman, P.S., Conway, A.J. and Moilanen, A., 2015.** Identification of policies for a sustainable legal trade in rhinoceros horn based on population projection and socioeconomic models. *Conservation Biology*, 29:545–555.
9. **Emslie, R.H., 2013.** African Rhinoceros – Latest Trends in Rhinoceros Numbers and Poaching (No. CoP16 Inf. 51). CITES Secretariat, Geneva, Switzerland.
10. **Emslie R, & Adcock K. 2016.** A conservation assessment of *Ceratotherium simum simum*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South

Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.
11. **Emslie, R.H. & Knight, M.H., 2012.** Background: Rhinoceros Conservation & South Africa. Presentation at first national rhinoceros dialogue meeting organised by South Africa's Department of Environmental Affairs on May 30 2012.
12. **Emslie, R.H., Milliken,** T., **Talukdar, B., Ellis, S., Adcock, K., & Knight, M.H., 2016.** African and Asian Rhinoceros - Status, Conservation and Trade. CITES CoP17 Doc 68 Annex 5. A report from the IUCN Species Survival Commission (IUCN SSC) African and Asian Rhinoceros Specialist Groups and TRAFFIC to the CITES Secretariat pursuant to Resolution Conf.9.14 (Rev. CoP15).
13. **Estes, R., 1991.** *The behavior guide to African mammals* (Vol. 64). Berkeley: University of California Press.
14. **Ferreira, S.M., Botha, J.M. & Emmett, M., 2012.** Anthropogenic influences on conservation values of white rhinoceros. *PLOS ONE* 7(9), e45989. http://dx.doi. org/10.1371/journal.pone.
15. **Ferreira, S.M., & Okita-Ouma, B., 2012.** A proposed framework for short-, medium- and long-term responses by range states to curb poaching for African rhinoceros horns. *Pachyderm*, 51:52–59.
16. **Ferreira, S., Pfab, M. & Knight, M.H., 2014.** Management strategies to curb rhinoceros poaching: Alternative options using a cost-benefit approach. *South African Journal of Science*, 110:1-8.
17. **Ferreira, S.M., Pfab, M., & Knight, M., 2014.** Management strategies to curb rhinoceros poaching: alternative options using a cost-benefit approach. *South African Journal of Science* 110:01–08.
18. **Ferreira, S.M., Botha, J.M., & Emmett, M.C., 2012.** Anthropogenic Influences on Conservation Values of White Rhinoceros. *PLoS ONE* 7(9): e45989. doi:10.1371/journal.pone.0045989
19. **Ferreira, S.M., Bissett, C., Cowell, C.R., Gaylard, A., Greaver, C., Hayes, J., Hofmeyr, M., Moolman-van der Vyver, L. & Zimmermann, D., 2017.** The status of rhinoceros in South African National Parks. *Koedoe*, 59(1), pp.11-pages.
20. **Fischer, C., 2004.** The complex interactions of markets for endangered species products. *Journal of Environmental Economics and Management.* 48; 926-953.
21. **Goodman, P.S, Craigie, J. & Conway, A.J., May 2012.** Draft KZN Biodiversity Status Assessment Report – 2011. Biodiversity Asset: White Rhinoceros (*Ceratotherium simum simum*).
22. **Goodman, P.S, Craigie, J. & Conway, A.J., 2018.** Draft KZN Biodiversity Status Assessment Report – 2017. Biodiversity Asset: White Rhinoceros (*Ceratotherium simum simum*).
23. **Hübschle, A.R., 2015.** Game of horns: transnational flows of rhinoceros horn. Dissertation published in Cologne, IMPRS-SPCE (Studies on the Social and Political Constitution of the Economy), Universität zu Köln; 2015 Sep 30; pp. 1-424.
24. **IUCN SSC African Rhinoceros Specialist group, 2013**. African Rhinoceros – latest trends in rhinoceros numbers and poaching. CoP16 Inf 51.
25. **Janssens & Trouwborst, 2018.** Rhinoceros conservation and international law: The role of Wildlife treaties in averting megaherbivore extinction.
26. **Jewkes R, Morrell R, Sikweyiya Y, Dunkle K, & Penn-Kekana** L., **2012.** Men, Prostitution and the Provider Role: Understanding the Intersections of Economic Exchange, Sex, Crime and Violence in South Africa. PLoS ONE 7(7): e40821. doi:10.1371/journal.pone.0040821
27. **Knight, M.H., 2016.** African rhinoceros specialist group report. Pachyderm 57, 12–42.
28. **Knight, M.H., Emslie, R. H., Smart, R. & Balfour, D., 2015.** Biodiversity Management Plan for The White Rhinoceros (*Ceratotherium simum*) in South Africa 2015-2020. Department of Environmental Affairs, Pretoria, South Africa.
29. **Lunstrum, E., 2014.** Green militarization: anti-poaching efforts and the spatial contours of Kruger National Park. *Ann Assoc Am Geogr.* 104; 816-832.
30. **MacMillan, D., Bozzola, M., Hanley, N., Kasterine, A. & Sheremet, O., 2017.** Demand in Viet Nam for rhinoceros horn used in traditional medicine, International Trade Centre, Geneva, Switzerland.
31. **Moyle, B., 2018.** Wildlife markets in the presence of laundering: a comment. *Biodiversity & Conservation* 26: 2979-2985.
32. **Owen-Smith, R.N., 1988.** Megaherbivores. The influence of very large body size on ecology. Cambridge University Press, Cambridge.

33. **Rademeyer, J., 2016.** Tipping point: Transnational organised crime and the war on poaching. Part 1 of a 2-part investigation into rhinoceros horn trafficking in southern Africa. In: The Global Initiative Against Transnational Organized Crime.
34. **Reed, D.H., O'Grady, J.J., Brook, B.W., Ballou, J.D. & Frankham, R., 2003.** Estimates of minimum viable population sizes for vertebrates and factors influencing those estimates. *Biological Conservation*, 113(1), 23–34. https://doi.org/10.1016/ S0006-3207(02)00346-4
35. **Rubino, E.C. and Pienaar, E.F., 2017.** Applying a conceptual framework to rhinocerosceros conservation on private lands in South Africa. *Endangered Species Research*, *34*, pp.89-102.
36. **Saayman, M. & Saayman, A., 2017.** Is the rhino worth saving? A sustainable tourism perspective. *Journal of Sustainable Tourism*, 25(2); 251-264.
37. **SANBI, 2018.** Criteria for the captive breeding of white rhinoceros (*Ceratotherium simum simum*) in South Africa. Report to the Scientific Authority of South Africa.
38. **Shrader, A.M., 2003.** Use of food and space by white rhinoceros. PhD thesis, University of the Witwatersrand, Johannesburg.
39. **Shrader, A.M., & Owen-Smith, N., 2002.** The role of companionship in the dispersal of white rhinoceros (*Ceratotherium simum*). *Behav. Ecol. Sociobiol.* 52: 255-261.
40. **Shrader, A.M., Owen-Smith, N. and Ogutu, J.O., 2006.** How a mega-grazer copes with the dry season: food and nutrient intake rates by white rhinoceros in the wild. *Functional ecology*, *20*(2), pp.376-384.
41. **Skinner, J.D., & Chimimba, C.T., 2005.** The Mammals of the Southern African Subregion. Cambridge University Press, Cambridge, England.
42. **Taylor, A., Balfour, D., Brebner, D.K., Coetzee, R., Davies-Mostert, H., Lindsey, P.A. & Shaw, J., 2017.** Sustainable rhinoceros horn production at the pointy end of the rhinoceros horn trade debate. *Biological Conservation*, *216*, pp.60-68.
43. **Thomas R. 2010.** Surge in rhinoceros poaching in South Africa. *TRAFFIC Bulletin* 23:3.
44. **Turton, C., 2009.** Review of the Trade in Rhinoceros Horn in Viet Nam. TRAFFIC Southeast Asia: Viet Nam.
45. **'t Sas Rolfes, M., 1990.** The economics of rhinoceros extinction. *Endangered Wildlife* 2:4-9.
46. **Ververs, C., van Zijll Langhout, M., Hostens, M., Otto, M., Govaere, J., Durrant, B., & Van Soom, A. 2017**. Reproductive performance parameters in a large population of game-ranched white rhinoceros (*Ceratotherium simum simum*). *PLoS One* 12(12): e0187751. https://doi.org/10.1371/journal.pone.0187751.

**DEPARTMENT OF ENVIRONMENTAL AFFAIRS**

**NO. 1106** **22 AUGUST 2019**

## NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT NO. 10 OF 2004)

## NON-DETRIMENT FINDINGS

## CONSULTATION IN TERMS OF SECTION 62(3) OF THE NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT NO. 10 OF 2004)

I, Barbara Dallas Creecy, Minister of Environment, Forestry and Fisheries hereby, under section 62(3) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), give notice of my intention to publish non-detriment findings for *Aloe ferox* (Bitter aloe) made by the Scientific Authority in the Schedule hereto.

Members of the public are invited to submit to the Scientific Authority, within 30 days from the date of the publication of the notice in the *Gazette*, written scientific information relating to the non-detriment findings to the following addresses:

By post to: Chair: Scientific Authority
South African National Biodiversity Institute
Attention: Ms M Pfab
Private Bag X101
**PRETORIA**
0001

By hand at: 2 Cussonia Avenue, Brummeria, Pretoria, 0001
By email: m.pfab@sanbi.org.za
By fax: 086 555 9863

Comments received after the closing date may not be considered.

**MS B D CREECY, MP**
**MINISTER OF ENVIRONMENT, FORESTRY AND FISHERIES**

## SCHEDULE

**Non-detriment finding assessment for *Aloe ferox* (bitter aloe)**
Reference Number: Alo_fer_Sep2018
Date: 31 August 2018
Issued by the Scientific Authority of South Africa

### Summary of findings

*Aloe ferox* (bitter aloe) is included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In terms of Article IV of the Convention, an export permit shall only be granted for an Appendix II species when a Scientific Authority of the State of export has advised that such an export will not be detrimental to the survival of that species in the wild. This document details the undertaking of a Non-Detriment Finding (NDF) assessment (Figure 1) for *A. ferox* and is based on the best available information, current as of September 2018.

*Aloe ferox* is a long-lived, single-stemmed succulent plant that can grow to heights of up to 6 m. The species is adapted to withstand a wide range of climatic conditions and can be found growing on rocky hill slopes and in flat open areas across a range of habitat types including fynbos, grassland, Karoo vegetation and valley bushveld. Flowering usually occurs between May and August when mature plants produce a single, branched inflorescence with 5-12 erect, dense racemes with orange-red flowers and large quantities of seed. The species is considered to be relatively easily propagated by seed although sufficient empirical data regarding the regeneration potential of the species has not yet been developed. *Aloe ferox* has a weed like ecology and is believed to be a pioneer plant due to its ability to thrive in degraded areas. The relatively large distribution range of *A. ferox* generally implies that the species has good dispersal efficiency (wind-dispersed). Young populations form clumps that act as nuclei from which new plants spread slowly over time with mature individuals forming the centre of the densest stands.

*Aloe ferox* occurs primarily in the Eastern Cape extending down to the Western Cape Province, and up into the south-eastern Free State. The species also occurs in southern Lesotho. It has been previously documented to occur in the KwaZulu-Natal Province, however previous records of *A. ferox* for the province have been confirmed to be records of the similar looking *Aloe candelabrum*. Up-to-date population size estimates for *A. ferox* are lacking; although the species is considered to be common throughout its national distribution range which is estimated to be around 168 000 km$^2$. The national population trend is currently unknown, however anecdotal information suggests that there has been an overall increase in the population size with limited local extirpations being reported in communal areas in the Eastern Cape. High number of recruits and improved growth rates have been observed in harvested populations compared to unharvested populations.

The major threats to *A. ferox* include over-utilisation and habitat loss resulting from land use changes; however, both these threats are considered to be limited and reversible. Research suggests that a higher density of *A. ferox* in some parts of the Eastern Cape is attributable to the historical decline of large herbivores such as elephants, rhinoceroses and kudu in the landscape. The return of these herbivores may be creating a demographic bottleneck for *A. ferox*, and observations are already showing that the 0.25 – 1 m height class is absent from grazed populations. There is also evidence of a demographic bottleneck in livestock farms, where the 0.25 – 0.5 m height class is disappearing and it is suspected that this is due to cattle trampling. However, these observations require further investigation. Climate change has been identified as a potential threat to the species as cases of severe frost, drought, higher fire intensities and very high temperatures are often associated with plant mortality, as well as lower seed production and recruitment in affected areas.

*Aloe ferox* is an economically important plant in South Africa, generating financial benefits for local communities and businesses involved in the collection, processing and sale of natural aloe resources for commercial use in

the pharmaceutical and cosmetic industries. Whilst the trade in live plants is negligible, large volumes of *A. ferox* leaves, derivatives and extracts are exported annually to countries including Germany, the United Kingdom and the United States of America. The majority of the material used in marketable *A. ferox* products is obtained from wild sources; hence the species remains one of South Africa's leading wild-harvested commercially traded plants. It is nevertheless challenging to ascertain the amount of plants being impacted by the trade and further comprehensive analyses of field harvests and trade records are needed.

The industry is slowly adapting to regulations on Bioprospecting Access and Benefit Sharing (BABS), which provides for the fair and legal acquisition and sustainable trade of resources governed by an adaptive management framework through permitting systems. The principal method of monitoring harvest presently is through reported exports and imports of *A. ferox* captured within the CITES Trade Database. The national monitoring of exports of the species (from South Africa) is effectively managed by South Africa's Scientific Authority, although the quality of the data is not as reliable as it should be, owing to errors in reporting. There is currently no field monitoring programme for the species and the direct effects of harvest on wild populations need to be elucidated. The local use of, and trade in, *A. ferox* plants and products within South Africa also remains under-evaluated.

It is difficult to ascertain the scale of illegal harvest but earlier research suggest a high likelihood of an illegal trade in *A. ferox* extracts, almost equivalent in scale to that of the legal trade. Whilst this may be an overestimate and is in need of updating, it is possible that an illegal trade is ongoing due to a lack of proactive management in the aloe industry. Furthermore, differing land tenure systems between the Eastern Cape and Western Cape present contrasting findings regarding illegal off-take of the species. *Aloe ferox* harvesting in the Western Cape is better managed as plants mostly occur on private lands where landowners have control over their properties. There is also evidence that traditional harvesting practices which promote sustainable use and that have been passed down over generations are applied across the province. In communal lands of the Eastern Cape however, there have been some reports of illegal harvesting or poorly monitored unsustainable harvesting. This is in part due to the difficulty in implementing harvest control strategies as natural resources are viewed as public goods within and around these shared areas. Illegal harvesting events are nonetheless currently considered to be insignificant at this time.

Less than 10% of the species population falls within strictly protected areas, however, owing to the abundance of *A. ferox* plants occurring outside of protected areas, there is no harvesting pressure or demand to harvest on protected areas. The majority of harvesting (70%) occurs on private land while 30% occurs on communal or state-owned land. Responsible industry stakeholders ensure that their tappers are trained and practice sustainable harvesting methods across these areas where possible. Many tappers have self-imposed restrictions on their harvests in that they will only harvest a certain number and size of leaves (from mature plants) to ensure maximum product yield as well as sustained plant regeneration potential. It is also a common practise to ensure that harvesting cycles within an area are no shorter than 12 months to allow harvested plants to recover and produce good quality, harvestable leaves once more. It has been established that the primary purpose for harvesting *A. ferox* is to maximise economic value whilst allowing for appropriate regrowth. *Aloe ferox* cultivation occurs mainly in the Western Cape, however, it only accounts for a very limited portion of the production. This shows how important it is to ensure that wild populations are well managed.

There is currently no management plan for *A. ferox* but the Department of Environmental Affairs has recently initiated a process to develop a Biodiversity Management Plan (BMP) for the species, which should further contribute to sustainable harvesting practices and monitoring of the resource base. However, it should be mentioned that in many areas, particularly in the Western Cape, there is informal management in place which has been informed by ancient indigenous harvesting practices. These are based on knowledge that has been passed down over generations without having changed substantially. Communal harvesting remains problematic in the Eastern Cape and as a result, there is an urgent need for effective management plans in this area.

This NDF indicates that the harvest and international trade in *A. ferox* is non-detrimental and poses a low to moderate risk to the population in the wild (Figure 1 and 2). Since the national population trend is largely unknown, especially in relation to harvesting impacts, a scientifically robust resource assessment is required to assess the size of the resource base and to inform a programme for the monitoring of *A. ferox* subpopulations at key sites. This monitoring programme should form part of the BMP that is in the development process. The BMP should also seek to standardize as far as possible management and control measures for the species across both the Eastern and Western Cape Provinces. The management of *A. ferox* in the Eastern Cape in particular, could be improved.

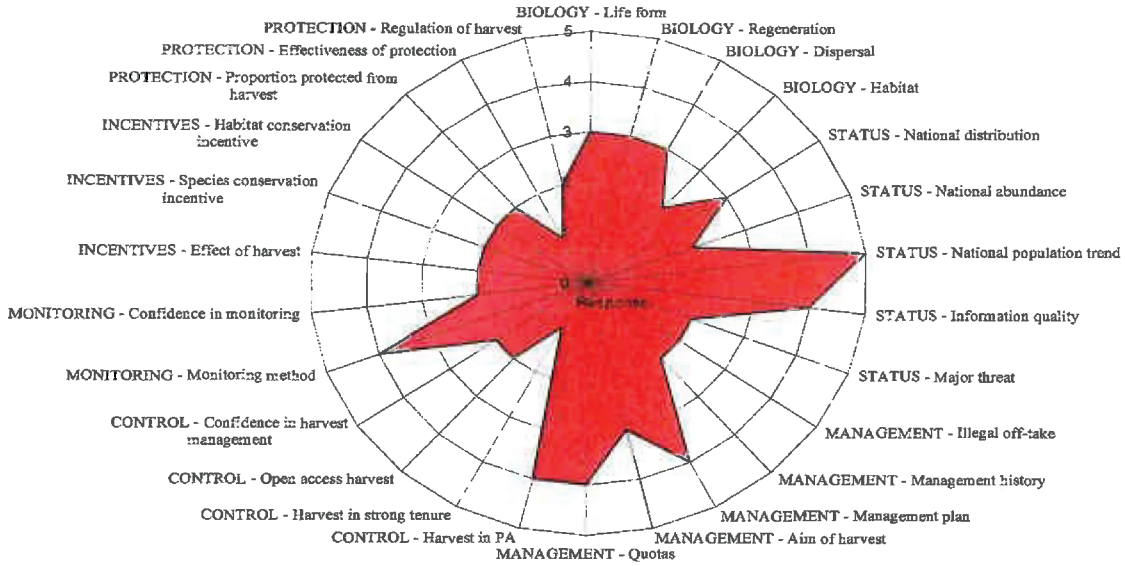


**Figure 1:** Radar chart summarizing the non-detriment finding assessment for *A. ferox* in accordance with the CITES NDF checklist. Explanations of scores given are detailed in Table 1. Higher scores are indicative of higher risks to the species. The area shaded in the radar chart indicates an overall low to moderate risk to the species.

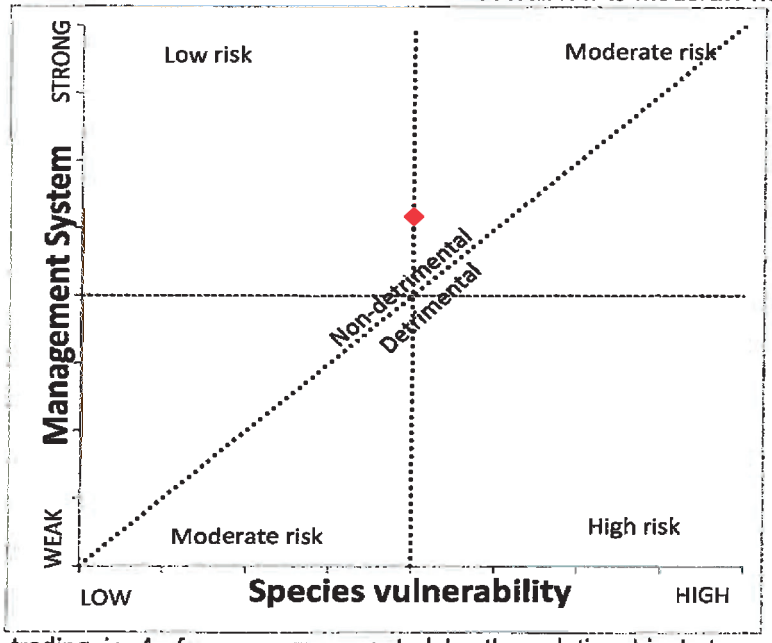


**Figure 2:** The risk of trading in *A. ferox*, as represented by the relationship between species vulnerability (biology and status) and the management system to which the species is subjected (management, control, monitoring, incentives and protection). The figure shows that the species is currently at a low to moderate risk and trade is non detrimental.

**Table 1:** Detailed NDF assessment for *Aloe ferox* undertaken in accordance with the CITES NDF checklist. Scores assigned to each question are indicated (bold text and shaded blocks) along with detailed explanations/justifications where relevant. Higher scores are indicative of higher risks.

| Biological characteristics | | |
|---|---|---|
| 1. Life form: What is the life form of the species? | Annual | 1 |
| | Biennial | 2 |
| | Perennials (herbs) | 3 |
| | Shrub and small trees (max. 12m.) | 4 |
| | Trees | 5 |
| Aloe ferox *is a long-lived, single stemmed, succulent plant between 2 to 3 m tall, sometimes reaching heights of up to 6 m (Knapp, 2006; Van Wyk and Smith, 1996). The apex of the main stem is covered in a dense rosette of large, succulent leaves that are dull green to blue-green in colour with reddish teeth along the margins (Reynolds, 1950; Boon, 2010; Van Wyk and Van Wyk, 2013). The plants rarely branch from above the base, with the growing stems characteristically clothed in a persistent skirt of old, dry leaves that insulate the stem against bush fires (Bond, 1983; Van Wyk and Smith, 1996).*<br><br>*According to harvesters and landowners, the time taken from seed germination to the first harvest of aloe leaves is 3 – 4 years. This is a relatively short period of time indicating that* A. ferox *exhibits fairly fast growth compared to plant species such as* Encephalartos. *There is however a lack of consensus and sufficient empirical information regarding the growth rate of the species. Work done by Holland and Fuggle (1982) indirectly estimated that the age of a mature 5 – 6 m individual is 150 years, i.e. an average annual height increment of 3.3 – 4 cm. Newton and Vaughan (1996) reported that* A. ferox *plants of 4 – 6 years are 1 m tall, thus averaging a 16.7 – 25 cm height increment per annum. Shackleton and Gambiza (2007) estimated an annual height increment of 1.7 – 4.6 cm. These differences could be attributed to site conditions such as differences in climate as well as the physical and chemical properties of the soil. Furthermore, the annual increments do not consider differential growth rates during the life of the plant.* | | |
| 2. Regeneration potential: What is the regenerative potential of the species concerned? | Fast vegetatively | 1 |
| | Slow vegetatively | 2 |
| | Fast from seeds | 3 |
| | Slow or irregular from seeds or spores | 4 |
| | Uncertain | 5 |
| Aloe ferox *flowers from May to August, but at higher altitudes, flowering may be delayed until September (Holland* et al., *1978). The plants produce a single, branched inflorescence with 5 – 12 erect, dense racemes with orange-red flowers. Pollination is facilitated by birds and insects (Hoffman, 1988). Large quantities of broadly winged seeds are produced by individual plants (Holland 1978; Newton and Vaughan 1996).* Aloe ferox *is considered to be relatively easily propagated by seed (Holland* et al., *1977; Bosch, 2006; Bairu* et al., *2009) but can also reproduce vegetatively by means of cuttings, although this rarely happens in the wild and the use of cuttings for cultivation is limited by the single stem characteristic of these plants (DAFF 2015). In the wild, seeds of* A. ferox *typically germinate within three weeks of release, with their viability considerably reduced within a year after dispersal (Cousins and Witkowski, 2012).* | | |
| 3. Dispersal efficiency: How efficient is the species' dispersal mechanism? | Very good | 1 |
| | Good | 2 |
| | Medium | 3 |
| | Poor | 4 |
| | Uncertain | 5 |
| Aloe ferox *seeds are wind-dispersed (Holland, 1978). Dispersal is thought to be limited at a small scale, but is medially efficient at a large scale as is evident in the relatively large distribution range of the species. Dispersal distance is dependent on plant height and wind speed (Stokes and Yeaton 1995). There is little or no empirical evidence on* A. ferox *wind dispersal distance. However, Stokes and Yeaton (1995) suggest* | | |

*that selection for limited seed dispersal occurs in the closely related* Aloe candelabrum, *a direct consequence of which the spatial distributions of young populations are usually clumped. These clumps act as nuclei from which new plants spread slowly over time, with mature individuals forming the center of the densest stands (Stokes and Yeaton, 1995). At a wind speed of 20 km/hour, seeds can be dispersed over 30 m from individuals that are 3 m tall. During spring winds (40 km/hour), the dispersal distance may exceed 50 m from plants that are taller than 5 m (Stokes and Yeaton, 1995). The relatively large distribution range of* A. ferox *generally implies that the species has a 'good' or high dispersal efficiency; medium is selected here as a compromise.*

| | | |
|---|---|---|
| 4. Habitat: What is the habitat preference of the species? | Disturbed open | 1 |
| | Undisturbed open | 2 |
| | Pioneer | 3 |
| | Disturbed forest | 4 |
| | Climax | 5 |

Aloe ferox *grows under a wide range of climatic conditions in a broad range of habitats, such as fynbos, grassland, Karoo vegetation and valley bushveld, typically on rocky hill slopes or across flat open areas (Newton and Vaughan, 1996; Van Wyk and Van Wyk, 2013; DEA, 2014). It is generally more abundant on arid, rocky hillsides up to 1000 m a.s.l. (Anjarwalla* et al., *2013). The plants are able to grow in a variety of soil types, including sandy, loamy sands and silty loams that are moderately fertile and well drained. The species flourishes in extremely dry areas of the Karoo but also in moister areas in the eastern parts of its distribution (Van Wyk and Smith, 1996). The shallow, adventitious root systems that grow only a few centimeters below the soil surface, as well as the ability to store considerably large amounts of water in the leaves and roots (Holland* et al., *1977) allow these plants to benefit from relatively low amounts of precipitation (DAFF, 2015).*

*The species is able to establish healthy populations within disturbed areas quite well. Field observations at a cultivated site in Albertinia established in 2011 suggested substantial recruitment of young plants where livestock had been excluded. Furthermore, observations suggest that* A. ferox *are pioneer plants, and that these plants are the first to emerge when livestock are removed from heavily overgrazed land. Raimondo* et al. *(2012) also suggested that* A. ferox *has a weed like ecology and is a pioneer plant due to its ability to thrive in degraded areas.*

National status

| | | |
|---|---|---|
| 5. National distribution: How is the species distributed nationally? | Widespread, contiguous in country | 1 |
| | Widespread, fragmented in country | 2 |
| | Restricted and fragmented | 3 |
| | Localized | 4 |
| | Uncertain | 5 |

Aloe ferox *has a restricted distribution within South Africa (Figure 3) extending from the Western Cape Province, intermittently throughout the Eastern Cape, and up into south-eastern Free State (Smith* et al., *2016). The species also occurs in southern Lesotho (Smith* et al., *2016). Previous records of* A. ferox *in the KwaZulu-Natal Province (e.g., Shackleton and Gambiza 2007), have been confirmed to be records of the similar looking* Aloe candelabrum, *a species which was recently resurrected from the synonymy with* Aloe ferox *(Smith* et al., *2016).*

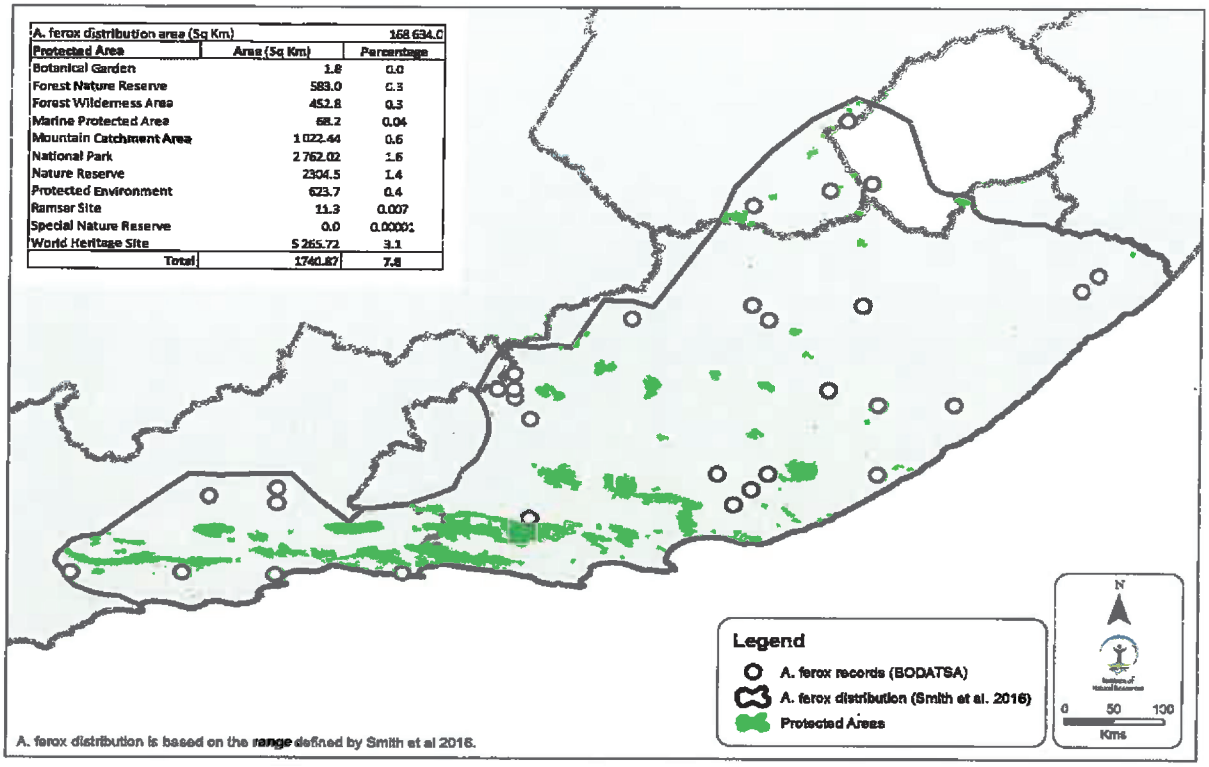


*Figure 3: National distribution range of* Aloe ferox *(generated using information from the Smith* et al., *2016 distribution map and SANBI BODATSA Data)*

| | | |
|---|---|---|
| 6. National abundance: What is the abundance nationally? | Very abundant | 1 |
| | Common | 2 |
| | Uncommon | 3 |
| | Rare | 4 |
| | Uncertain | 5 |

*In 2003, Donaldson estimated the population size of* A. ferox *to be in excess of 100 000 individuals. Prior to this, Newton and Vaughan (1996) estimated that during the 1990's, 400 tonnes of dried leaf exudate was obtained from the leaves of around 10 million plants, suggesting that the population could be in orders of magnitude greater than that indicated by Donaldson (2003). Parker and Bernard (2008) suggested that the species has become synonymous with the Eastern Cape, having observed large stands of* Aloe ferox *reaching densities of more than 10 plants/km². A more recent study conducted in the province, recorded higher densities of between 4.3 and 7.3 individuals/m² in the communal area near Seymour Town (Melin* et al. *(2017). These numbers however, cannot be extrapolated to the entire range of the species owing to the differences observed in plant numbers within and between subpopulations (DEA, 2014). A resource assessment conducted in 2014 failed to accurately estimate the size of the* A. ferox *population in South Africa (DEA, 2014). Nevertheless, the species is considered to be common throughout its national distribution range which is estimated to be around 168 000km² (Figure 3).*

| | | |
|---|---|---|
| 7. National population trend: What is the recent national population trend? | Increasing | 1 |
| | Stable | 2 |
| | Reduced, but stable | 3 |
| | Reduced and still decreasing | 4 |
| | Uncertain | 5 |

*Aloe ferox is believed to be an extremely common and abundant species, occurring as large stands in suitable habitat. Due to its weed-like nature and being a pioneer species in disturbed vegetation, its population has been observed to thrive in areas with land degradation. It is therefore speculated that the population size has increased over the past 30 years (Raimondo et al., 2012). Aloe harvesters, industry stakeholders and management authorities in the Eastern Cape and Western Cape however, have differing views regarding the national population trend of the species.*

*In the Eastern Cape, members of the A. ferox industry believe that the population of A. ferox is increasing while other stakeholders (e.g. conservation officials and community harvesters) argue that the population is in fact decreasing. Some subpopulations have been extirpated in certain communal areas of the Eastern Cape. Aloe harvesters (commonly referred to as tappers, i.e. those who 'tap' the plants) have observed a substantial decrease of the A. ferox population in the shared lands surrounding King Williams Town in particular, whilst members of the A. ferox industry report that stable populations still occur in some formally protected areas (around Grahamstown). Tappers in the communal areas report having to walk long distances (about two hours) to harvest aloes in dense thickets where their safety and security is compromised. Due to the extirpation of accessible populations, tappers have expressed a desire to cultivate A. ferox but lack resources such as nursery infrastructure and land for cultivation. The declines observed in these populations around communal areas have been credited to the activities of untrained harvesters with inadequate knowledge of tapping. An increase in human population densities, coupled with an increase in the rate of unemployment, is likely the main underlying factor behind the influx of opportunistic harvesters and the subsequent pressure on A. ferox populations that occur on communal land.*

*In the Western Cape, both tappers and landowners are of the view that A. ferox populations are increasing. They have observed a high number of recruits in areas where they harvest and believe that harvested populations have improved growth rates compared to unharvested populations. Harvesting reportedly has no impact on flowering, with observations indicating that the harvested plants flower at the same time and to the same extent as plants that are not harvested. This anecdotal information however contradicts the findings of the 2014 resource assessment, which found that none of the A. ferox plants at harvesting sites in the Eastern Cape were flowering at the time of the assessment during the flowering season (DEA 2014).*

| | | |
|---|---|---|
| 8. Quality of information: What type of information is available to describe abundance and trend in the national population? | Quantitative data, recent | 1 |
| | Good local knowledge | 2 |
| | Quantitative data, outdated | 3 |
| | Anecdotal information | 4 |
| | None | 5 |

*There is a lack of robust data on the population size and trends of the Aloe ferox population. Current information on abundance and trends is largely anecdotal and is considered to be outdated and in need of further verification. The recent resource assessment report for the species (DEA 2014) failed to present accurate, quantitative estimates on the national status of the A. ferox population.*

| | | |
|---|---|---|
| 9. Major threats: What major threat is the species facing (underline following: overuse/ habitat loss and alteration/ invasive species/ other) and how severe is it? | None | 1 |
| | Limited/Reversible | 2 |
| | Substantial | 3 |
| | Severe/Irreversible | 4 |
| | Uncertain | 5 |

*The major threats facing the species are overutilisation and habitat loss, although the extent of these pressures is considered to be limited or reversible.*

*Tappers from the Eastern Cape believe that the overharvesting of aloe leaves by untrained harvesters, who leave only one to three leaves remaining on a plant, is a major threat to the species. This is a growing risk in some areas of the province as socioeconomic challenges such as poverty and unemployment are encouraging locals to attempt tapping, as they perceive it as a means of safeguarding their livelihood security (e.g. Chen* et al., *2012). Many of these new tappers are not trained and tend to neglect issues of sustainability. Whilst Newton and Vaughan (1996) noted low mortality rates associated with heavy leaf harvesting, officials from the Department of Economic Development, Environmental Affairs and Tourism in Eastern Cape (DEDEAT) have observed plants dying due to overharvesting (e.g. Booysen Park) and disease. Localised damage to harvested plants and low flowering occurrences in over-harvested areas in the Eastern Cape were also observed during the 2014 resource assessment (DEA, 2014). The long-term impacts of high levels of harvesting on populations remains unknown (Melin* et al., *2017).*

*A higher population density of* A. ferox *in other areas of the Eastern Cape has been attributed to a historical decline of large herbivores such as elephants, rhinoceroses and kudu. Livestock farms are increasingly converted to game farms in the Eastern Cape because game farming is viewed as a more lucrative alternative to cattle farming (Smith and Wilson, 2002; Carruthers, 2008). As a result, the return of large herbivores such as kudu (*Tragelaphus strepsiceros*), is causing a demographic bottleneck for* A. ferox, *where the 0.25 – 1 m tall height class is absent from grazed populations, and it is suggested that this may lead to local extirpations of* A. ferox *subpopulations in the next 70 – 100 years (Van As* et al., *2016), except from areas with steep slopes that limit herbivory (Cowling* et al., *2009). In livestock farms on the other hand, a demographic bottleneck is starting to be observed in the 0.25 – 0.5 m height class, but this is suspected to be due to cattle trampling and requires further investigation (Van As* et al., *2016). At Rooderdraay farm in the KwaZulu-Natal Province, Breebaart* et al., *(2002) found that extensive browsing of* A. ferox *by Boer goats was detrimental to the plants. (Since* A. ferox *does not occur in KwaZulu-Natal, it is likely that the study species was in fact* A. candelabrum*).*

*Land use change associated with ploughing lands for crops has become a trend in the Western Cape. In addition, the establishment of game farms is also considered a problem in this province as wild animals often eat through the entire leaves of the plants, severely impacting plant growth. Farmed ostriches will eat the highly nutritious seed when there is a drought or grazing shortage, which can negatively affect recruitment.*

*Recruitment is also affected in areas where aloe is harvested on steeper land, as trampling reportedly removes valuable groundcover that provides protection for young plants through moisture retention and the provision of shade. Loss of groundcover results in bare and hard surfaces, which limits new plant growth and exacerbates erosion by rainfall. Seedlings and younger plants (~10 years old) are furthermore vulnerable to fires (Holland and Fuggle, 1982), as are older plants without a protective skirt of old leaves. Harvested plants may therefore be easily killed by a blaze (Bond, 1983), though high intensity fires can also kill plants with a protective skirt of old leaves. Shackleton and Gambiza (2007) recorded a 32% mortality following an intense fire, on a site with 50 individuals with the protective skirt of leaves intact.*

Aloe ferox *is fairly resistant to diseases (Van Jaarsveld, 1996) and insect pests (Newton and Vaughan, 1996; Sachedina and Bodeker, 1999). Climate change has been suggested as a potential threat to the species, with one stakeholder suggesting that a severe frost that killed many aloe plants in higher lying*

*areas around Uniondale and Albertinia is evidence of the impact of changing conditions. Landowners in some parts of the Western Cape are observing fewer flowers and seeds being produced (speculated to be due to a drying climate), and consequently less seedlings and juvenile plants. Reduction in recruitment has also been observed in association with veld degradation.*

| Harvest management | | |
|---|---|---|
| 10. Illegal off-take or trade: How significant is the national problem of illegal or unmanaged off-take or trade? | None | 1 |
| | Small | 2 |
| | Medium | 3 |
| | Large | 4 |
| | Uncertain | 5 |

*In the Western Cape, Cape Nature seldom receives reports of illegal* A. ferox *harvest because most of the harvesting occurs on small areas of private land, and landowners control activities on their properties. Even when some companies bring their own workers in to harvest an area, harvesting is still undertaken with the permission of the landowner. The tappers and landowners in this region confirm that there have never been any incidents of illegal harvesting.*

*In the Eastern Cape however, (where harvesting largely occurs on communal land in accordance with an agreement from the Traditional authority), tappers are concerned about illegal activities. Unskilled tappers (who do not obtain permission to harvest) reportedly follow the compliant tappers into the fields and harvest the remaining leaves from already harvested plants in the region. Sometimes plants are left with only 3 – 5 or fewer leaves (DEA, 2014).*

*It is difficult to ascertain the scale of illegal harvest but an earlier study by Newton and Vaughan (1996) reported a high likelihood of an illegal trade in* A. ferox *extracts, almost equivalent in scale to that of the legal trade and involving the harvest of some 7 million plants per year. Whilst this may be an overestimate and is in need of updating, it is possible that an illegal trade is ongoing (Knapp, 2006; Melin et al., 2017) due to a lack of proactive management in the aloe industry (Knapp, 2006). The current illegal off-take and trade is nevertheless considered to be negligible at this time.*

| | | |
|---|---|---|
| 11. Management history: What is the history of harvest? | Managed harvest: ongoing with adaptive framework | 1 |
| | Managed harvest: ongoing but informal | 2 |
| | Managed harvest: new | 3 |
| | Unmanaged harvest: ongoing or new | 4 |
| | Uncertain | 5 |

Aloe ferox *is tapped on private and communal land, especially on land closer to roads (Newton and Vaughan, 1996; Melin, 2009). Most* A. ferox *products (95%) are harvested from wild populations, and a smaller percentage (5%) is harvested from cultivated stands. One farmer in the Western Cape indicated that his cultivated* A. ferox *stock accounts for only 2% of his production, with the remaining volumes sourced from the wild. Harvesting knowledge and skills have been passed down over generations as a family custom, and the harvesting practice (commonly referred to as tapping) hasn't changed much over the past two centuries (Newton and Vaughan, 1996).*

*In the Western Cape where harvesting occurs predominantly on privately owned land, the harvesters usually pay a fee to the landowners for access to the plants (O'Brien, 2005; Bosch, 2006) and are permitted to harvest no more than 10 – 12 leaves per plant over a six week period with a harvesting cycle of between 18 and 36 months, depending on the plant condition and season (Newton and Vaughan, 1996; DEA, 2014). Harvest control strategies like these are more difficult to implement in the communal lands of the Eastern Cape, because natural resources are viewed as public goods for all to share.*

*In general, the Western Cape populations are reportedly better managed for sustainable utilisation than the Eastern Cape populations owing largely to the different land tenure arrangements and informal local control*

*plans among industry members and trained harvesters.*

*The* Aloe ferox *industry is slowly adapting to new utilization regulations such as the Bioprospecting Access and Benefit Sharing (BABS) principles, which provides for the fair and legal acquisition and sustainable trade of resources governed by an adaptive management framework through permitting systems.*

| | | |
|---|---|---|
| 12. Management plan or equivalent: Is there a management plan related to the harvest of the species? | Approved and co-ordinated local and national management plans | 1 |
| | Approved national/state/provincial management plan(s) | 2 |
| | Approved local management plan | 3 |
| | No approved plan: informal unplanned management | 4 |
| | Uncertain | 5 |

*There is currently no formal management plan in place for the harvesting of* A. ferox *but the Department of Environmental Affairs (DEA) is currently in the process of developing a Biodiversity Management Plan for the species.*

*In many areas, particularly in the Western Cape, it has been reported that informal unplanned management in the form of indigenous harvesting practices (based on knowledge that has been passed down over generations without having changed substantially) takes place on privately-owned lands.*

*Before the tappers decide to harvest the following factors are considered:*

- *There must be sufficient leaves on the plant.*
- *Only a fraction of the lower leaves can be cut from each plant so that the growth point is not injured, and only the leaves that would die naturally at the end of the season should be taken.*
- *Leaves must be fat / thick. Thin leaves indicate that if harvested, the plant is less likely to survive the dry period. In addition, thin leaves result in lower product yields, which acts as an economic deterrent to harvesting (i.e. low return per unit effort).*
- *In winter rainfall areas, winter is the better season for harvesting (cooler and wetter); harvesting leaves in summer is not favored as cut leaves develop a skin very quickly, which reduces the bitter yield.*

*Tappers reported that regular harvesting of leaves keeps the bitters and sap content high. Often tappers will 'bleed' a new aloe of harvestable size in the year prior to first harvest by cutting off one leaf. Individual plants are generally only harvested once every 18 – 24 months to ensure healthy regrowth for future harvest.*

*Harvesting on communal and state-owned land in the Eastern Cape unfortunately lacks even these controls.*

| | | |
|---|---|---|
| 13. Aim of harvest regime in management planning: What is harvest aiming to achieve? | Generate conservation benefit | 1 |
| | Population management/control | 2 |
| | Maximize economic yield | 3 |
| | Opportunistic, unselective harvest, or none | 4 |
| | Uncertain | 5 |

*Industry stakeholders strongly believe that the species has an important economic value and* A. ferox *is harvested with an aim of maximizing economic yield, whilst allowing for appropriate regrowth. Tappers though generally harvest to meet their livelihood needs and are not necessarily profit driven. In cases where prices paid for bitters and aloe leaves were increased, the quantities harvested decreased proportionally as tappers needed to harvest fewer products to meet their livelihood needs. Income generated by harvesting ventures reportedly range between R400 and R1000 per month in the Eastern Cape (Melin, 2009) and was estimated to be R10 000 per annum for a full time tapper (harvesting all year round) in the Western Cape in 1992 (Newton and Vaughan, 1996). Recent figures are not available but the increasing economic value of* A. ferox *most likely ensures that most tappers are incentivised to harvest*

| | | |
|---|---|---|
| *using sustainable practices to secure their livelihoods in the long term.*<br><br>*In communal lands in the Eastern Cape, there are some cases of opportunistic, unselective harvesting occurring that aims to maximize profits without any consideration of sustainability.* | | |
| 14. Quotas: Is the harvest based on a system of quotas? | Ongoing national quota: based on biologically derived local quotas | 1 |
| | Ongoing quotas: "cautious" national or local | 2 |
| | Untried quota: recent and based on biologically derived local quotas | 3 |
| | Market-driven quota(s), arbitrary quota(s), or no quotas | 4 |
| | Uncertain | 5 |
| *There is no formal quota system, though traders applying for BABS Certificates are asked to provide voluntary (reasonable) quotas and as such, according to tappers and landowners, BABS indirectly provides a mechanism for a harvesting quota per permit holder.* | | |
| Control of harvest | | |
| 15. Harvesting in Protected Areas: What percentage of the legal national harvest occurs in State-controlled Protected Areas? | High | 1 |
| | Medium | 2 |
| | Low | 3 |
| | None | 4 |
| | Uncertain | 5 |
| *There is no legal harvest within protected areas.* | | |
| 16. Harvesting in areas with strong resource tenure or ownership: What percentage of the legal national harvest occurs outside Protected Areas, in areas with strong local control over resource use? | High | 1 |
| | Medium | 2 |
| | Low | 3 |
| | None | 4 |
| | Uncertain | 5 |
| *Most* A. ferox *harvesting, approximately 70%, occurs on private land, where tappers obtain permission from the landowner to harvest, and the landowner monitors access and harvest.* | | |
| 17. Harvesting in areas with open access: What percentage of the legal national harvest occurs in areas where there is no strong local control, giving *de facto* or actual open access? | None | 1 |
| | Low | 2 |
| | Medium | 3 |
| | High | 4 |
| | Uncertain | 5 |
| *In communal lands, permits are issued to the Traditional authorities who keep a list of the tappers in their areas of jurisdiction. These areas are however generally perceived as open access areas and, even though there might be a process of requesting permission to harvest from the Traditional authority, there remains little to no strong resource control in these communal lands. The Traditional authorities who are responsible for managing* A. ferox *on these lands also have no control over the extent to which the resource is utilised and there is no penalty for people who practice unsustainable harvesting in these areas.* | | |
| 18. Confidence in harvest management: Do budgetary and other factors allow effective implementation of management plan(s) and harvest controls? | High confidence | 1 |
| | Medium confidence | 2 |
| | Low confidence | 3 |
| | No confidence | 4 |
| | Uncertain | 5 |
| *In communal areas of the Eastern Cape, Traditional authorities are expected to impose strict protection* | | |

*measures in their areas of jurisdiction, but they are reportedly failing to do so, owing to the fact that most people are unemployed and depend on aloe tapping for their income. There is therefore no confidence in harvest management in these communal areas, primarily due to a lack of financial capacity and incentive to conduct effective monitoring and control. Conversely, there is a high confidence that* A. ferox *harvest is well managed on private land, both in the Eastern Cape and the Western Cape provinces.*

| Monitoring of harvest | | |
|---|---|---|
| 19. Methods used to monitor the harvest: What is the principal method used to monitor the effects of the harvest? | Direct population estimates | 1 |
| | Quantitative indices | 2 |
| | Qualitative indices | 3 |
| | National monitoring of exports | 4 |
| | No monitoring or uncertain | 5 |

*Exports of* Aloe ferox *from South Africa (extracted from the CITES Trade Database, UNEP World Conservation Monitoring Centre, Cambridge, UK) are monitored by South Africa's CITES Scientific Authority. The bulk of harvested* A. ferox *is destined for the export market, with limited secondary or tertiary processing taking place in the country (Newton and Vaughan, 1996; Sachedina and Bodeker, 1999; Merlin, 2009). South Africa remains the principal exporter of valuable aloe bitters (Chen* et al., *2012), which are produced from* A. ferox *leaves collected primarily in the wild. It is difficult to estimate the quantities of plants being harvested for trade, as the species is exported in many forms including derivatives (47%), extracts (26%), powder (13%) and leaves (7%). The export of live* A. ferox *plants is negligible, and accounted for only 3% of the exports between 2004 and 2013. During this 10 year period, Europe was the primary importer of A. ferox (60% of imports), followed by Asia (15%), and North America (10%). The main importers within each region were Germany (21%) in Europe, USA (73%) in North America, Argentina (58%) in South America, Korea (17%) in Asia; Australia (61%) in Oceania and Nigeria (17%) in Africa. There is currently no field monitoring programme for the species and the direct effects of harvest on wild populations need to be elucidated. The local use of, and trade in,* Aloe ferox *plants and products within South Africa also remains under-evaluated.*

| | | |
|---|---|---|
| 20. Confidence in harvest monitoring: Do budgetary and other factors allow effective harvest monitoring? | High confidence | 1 |
| | Medium confidence | 2 |
| | Low confidence | 3 |
| | No confidence | 4 |
| | Uncertain | 5 |

*Trade data are regularly extracted from the CITES Trade Database (UNEP World Conservation Monitoring Centre, Cambridge, UK) and analysed. However, data quality was flagged as an issue due to reporting errors. It is also difficult to quantify the number of wild plants impacted from the variety of products exported.*

| Incentives and benefits from harvesting | | |
|---|---|---|
| 21. Utilization compared to other threats: What is the effect of the harvest when taken together with the major threat that has been identified for this species? | Beneficial | 1 |
| | Neutral | 2 |
| | Harmful | 3 |
| | Highly negative | 4 |
| | Uncertain | 5 |

*Tappers reported that harvesting has a beneficial effect on aloe as it promotes new growth. Industry stakeholders suggest that* A. ferox *plants are increasingly recognized as an economically valuable wild resource, and landowners are therefore making concerted efforts to conserve the species. It should be noted though that this information is largely anecdotal. It is also important to note that illegal harvesting in communal lands, especially by untrained tappers who harvest large amounts of leaves, remains a real threat to the species.*

| | | |
|---|---|---|
| 22. Incentives for species conservation: At the national level, how much conservation benefit to this species accrues from harvesting? | High | 1 |
| | Medium | 2 |
| | Low | 3 |
| | None | 4 |
| | Uncertain | 5 |

Aloe ferox *is favored for its therapeutic uses, both locally and internationally (Newton and Vaughan, 1996; Grace* et al., *2008; DAFF, 2015). Owing to the high commercial value of* the *species and its derivatives, the industry is taking measures to implement sustainable harvesting practices that contribute to the conservation of the species. Tappers in the Western Cape implement correct tapping and harvesting practices that have been shared within families over many generations, and which ensure the selection of appropriate plants at each harvest.*

*In the Eastern Cape, a joint venture between industry and tappers, known as the Ikhala Agricultural Co–operative (the species is called Ikhala in Xhosa), has been generating incentives for the conservation of the species by involving harvesters and locals in business opportunities and providing them with access to a consistent market (Burgess, 2007). Trained harvesters participate in the collection and pre-processing of raw materials for local and international markets, whilst some locals are provided with the opportunity to make profits from the sales of finished products within and around their communities. Harvesters and locals are thus aware and protective of the benefits they derive from nature.*

| | | |
|---|---|---|
| 23. Incentives for habitat conservation: At the national level, how much habitat conservation benefit is derived from harvesting? | High | 1 |
| | Medium | 2 |
| | Low | 3 |
| | None | 4 |
| | Uncertain | 5 |

*Due to the commercial value of* A. ferox, *there is a high incentive for habitat conservation; landowners are thus encouraged to conserve the habitat to maximize sustainable harvest. Field visits also suggested that abandoned croplands are starting to be reestablished with* A. ferox *plants. There is however a lack of incentives for habitat conservation in communal land.*

| Protection from harvest | | |
|---|---|---|
| **24. Proportion strictly protected:** What percentage of the species' natural range or population is legally excluded from harvest? | >15% | 1 |
| | **5-15%** | **2** |
| | <5% | 3 |
| | None | 4 |
| | Uncertain | 5 |
| *It is estimated that 7.8 % of the distribution of* A. ferox *occurs within protected areas (see Figure 3). Legal harvest is excluded from these protected areas.* | | |
| **25. Effectiveness of strict protection measures:** Do budgetary and other factors give confidence in the effectiveness of measures taken to afford strict protection? | **High confidence** | **1** |
| | Medium confidence | 2 |
| | Low confidence | 3 |
| | No confidence | 4 |
| | Uncertain | 5 |
| *There have been no reports of illegal harvesting of* A. ferox *from protected areas in either the Eastern or Western Cape.* | | |
| **26. Regulation of harvest effort:** How effective are any restrictions on harvesting (such as age or size, season or equipment) for preventing overuse? | Very effective | 1 |
| | **Effective** | **2** |
| | Ineffective | 3 |
| | None | 4 |
| | Uncertain | 5 |
| *In the Eastern Cape, the majority of the tappers are informally trained by traders and processers of* A. ferox *and they are also provided with illustrated training manuals in order to further facilitate the sustainable harvesting of the species. There is an issue of untrained harvesters in some communal areas, but permitted tappers who form part of the Ikhala Agricultural Co–operative in the province have been well trained and equipped with training manuals published by the International Trade Centre (Domeisen* et al., *2006; Melin* et al., *2017). The manual recommends that only larger plants (>0.5 m) should be harvested and approximately 16 – 20 leaves should be left on individual plants. This is consistent with recommendations by Shackleton and Gambiza (2007), suggesting that young non-reproductive plants (< 0.5m) and taller plants (>2.5 m) that are difficult to harvest by hand should be excluded from harvest.*<br><br>*In the Western Cape where the bulk of the tapping occurs on privately-owned land, landowners strictly control the access to, and harvesting of plants on their properties. Many tappers in the province also implement self-imposed restrictions on their harvests in that they will only harvest leaves that are of sufficient length and thickness because yields of bitters decrease dramatically in smaller, developing leaves. Other factors that limit overuse include limited road infrastructure for transporting harvested material, inaccessible and steep areas, as well as the distance to processing facilities (the approximate economic radius for collecting leaves is 30 km).* Aloe ferox *can generally not be harvested in the dry season as sap yields are much lower (Adams, 2014).*<br><br>*The industry is also required to comply with the South African National Standards (SANS) 368 standard for* A. ferox, *developed by the South African Bureau of Standards (SABS), that outlines when and how the plants can and should be harvested based on historical harvesting methods used by previous generations of tappers.* | | |

**List of participants:**

1. Michele Pfab (SANBI)
2. Prof Neil Crouch (SANBI)
3. Jon McCosh
4. Lutendo Mugwedi
5. Thabo Gwiji (DEDEAT)
6. Neil Crouch
7. Ricky Hannan (DEDEAT)
8. Noluthando Bam (DEDEAT)
9. Luzuko Dali (DEDEAT)
10. Sam Coetzee (Industry)
11. Tertus Cloete (Aloe Exports)
12. Carlo van Tonder (Cape Nature)
13. Gert Schoonbee (Schibuna Aloe)
14. Phoebe Schoonbee (Schibuna Aloe)
15. Mark Kilbridz (Meihuizen International)
16. K Paulsen (K P Botanicals)
17. Roy Gower (Gower Enterprices)
18. Prince Ramafalo (DEA)
19. Mncedisi Cindi (DEA)
20. Mpho Tjiane (DEA)
21. Chris Pattinson (Organic Aloe)
22. Johan Canstenson
23. Ken Dodds (KAloes)
24. Sibusiso Ngubane (Cape Nature)
25. Micheal Hanson (Cape Nature)
26. Ben-Erik Van Wyk (Aloe Council-University of Johannesburg)
27. Henriette du Plessis (African Aloe)

**Tappers meeting in Eastern Cape, Alice**

28. N. Peter
29. Lindiwe Sigoyo
30. W.S. Zongethwa
31. B. Maki
32. M.J. Mathiso
33. D.A. Blom
34. R.S. Teyise
35. N.Z. Tokoyi
36. N. SikadeN. Kayiyaha
37. N. Matahila
38. M. Njanya
39. V.H. Sentha
40. F. Mani
41. A.M. Mananga
42. B. Kilani
43. B.N. Manzi
44. V.D Kanela
45. Bukelwa Joni
46. Busiwe Ntuli
47. Mphakamiseni koli
48. N.E. Lukwe
49. N. Nqina

50. N. Tyutyani
51. N.E. Petse

**Tappers meeting in Western Cape, Albertina**

52. Dorina
53. Maria Barels
54. Jacob Cupido
55. Shaun Kiewiet
56. Shantel Kiewiet
57. Irish Groenewald
58. Marry Muller
59. Elsie Helinis
60. Niek Cronje
61. J.C. Cronje
62. TLJ Kemp
63. Tania Lann
64. P.Du Plessis
65. S Aspinall

**References:**

**Adams, Z. (2014).** Comparative phytochemical analyses of *Aloe ferox* Mill. found in Eastern and Western Cape provinces in South Africa. MSc thesis, University of Fort Hare, Alice.

**Anjarwalla, P., L. Mwaura, D. A. Oforo, R. Jamnadas, P. Stevenson & P. Smith, P. (2013)**. Pesticidal lant Leaflet Consultative Group on International Agricultural Research. : *Aloe ferox* Mill. ISBN 978-92-9059-340-9.

**Bairu, M.W., Kulkarni, M.G., Street, R.A., Mulaudzi, R.B. & van Staden, J. (2009).** Studies on seed germination, seedling growth, and in vitro shoot induction of *Aloe ferox* Mill., a commercially important species. Horticultural Science 44: 751-756.

**Bond, W. (1983).** Dead leaves and fire survival in southern African tree aloes. Oecologia 58:110–114.

**Boon R (2010).** Pooley's trees of eastern South Africa. Flora and Fauna Publication Trust: Durban, South Africa.

**Bosch, C.H. (2006).** *Aloe ferox* Mill. Record from Protabase. In: Schmelzer, G.H., Gurib-Fakim, A. (Eds.), PROTA (Plant Resources of Tropical Africa/ Resources végétales de l'Afrique tropicale), Wageningen, Netherlands.

**Burgess, M. (2007)**. Aloes alleviate poverty in the Eastern Cape. Farmer's Weekly. 4 April.

**Breebaart, L., Bhikraj, R. & O'Connor, T.G. (2002).** Impact of goat browsing on Aloe ferox in a South African savanna. African Journal of Range and Forage Science 19: 77-78.

**Carruthers, J. (2008).** "Wilding the farm of farming the wild"? The evaluation of scientific game ranching in South Africa. Transactions of the Royal Society of South Africa 63: 160-181.

**Chen, W., van Wyk, B-E., Vermaak, I. & Viljoen, A.M. (2012).** Cape aloes – A review of the phytochemistry, pharmacology and commercialisation of *Aloe ferox*. Phytochemistry Letters 5: 1-12.

**Cousins S.R. & Witkowski, E.T.F. (2012).** African aloe ecology: A review. *Journal of Arid Environments* 85.

**Cowling, R. M., A. Kamineth, M. Difford & Campbell. E. E. (2009).** Contemporary and historical impact of megaherbivores on the population structure of tree euphorbias in South African subtropical thicket. African Journal of Ecology 48: 135-145.

**Department of Agriculture Forestry and Fisheries.** 2015. A profile on the aloe industry for export: a focus on South Africa. Pretoria, Republic of South Africa.

**Department of Environmental Affairs**. 2014. Resource Assessment for *Aloe ferox* in South Africa. Republic of South Africa.

**Domeisen, N., P. Ress, & Simpson. C. (2006).** New jobs for poor communties through trade. International Trade Forum Magazine. Issue1/2006. International Trade Centre.

**Donaldson, J. (2003).** Proposed revision of Resolution Conf. 9.24 (CoP12 Com. I. 3): Criteria for listing on Appendix I and Appendix II.

**Grace, O.M., Simmonds, M.S.J., Smith, G.F. & Van Wyk, A.E. (2009).** Therapeutic uses of *Aloe* L. (Asphodelaceae) on Southern Africa. Journal of Ethnopharmacology 119: 604-614.
**Hoffman, M.T. (1988).** Pollination ecology of Aloe ferox Mill. South African Journal of Botany 54: 345-350.
**Holland, P.G., Steyn, D.G. & Fuggle, R.F. (1977).** Habitat occupation by Aloe ferox Mill (Liliaceae) in relation to topographic variations in direct beam solar radiation income. Journal of Biogeography 4: 61-72.
**Holland, P. G. (1978).** An evolutionary biogeography of the genus Aloe. Journal of Biogeography 5: 213–226.
**Holland, P.G. & Fuggle R.F. (1982).** Impact of veld management on *Aloe ferox* in Western Cape Province. South African Geographical Journal 64, 83–96.
**Knapp, A. (2006).** A review of the trade in *Aloe ferox*, with a focus on the role of the European Union. TRAFFIC Europe.
**McCarthy, T. J. M. & van Rheede van Oudtshoorn, M. C. B. (1966).** The seasonal variation in aloin of leaf juice from Aloe ferox and Aloe marlothii. Plant Medica 14: 61–65.
**Melin, A. (2009).** A bitter pill to swallow: a case study of the trade and harvest of *Aloe ferox* in the Eastern Cape, South Africa. MSc Dissertation. Imperial College London, United Kingdom.
**Melin, A., Grace, O. M. Duckworth, G. D. & Milner-Gulland, E.J. (2017).** Social and ecological characteristics of an expanding natural resource industry: Aloe harvesting in South Africa. Economic Botany 71: 58-74.
**Newton, D. J. & Vaughan, H. (1996).** South Africa's *Aloe ferox* plant, parts and derivatives industry. South Africa: TRAFFIC East/Southern Africa.
**O'Brien, C. (2005).** Physical and chemical characteristics of Aloe gels. MSc Dissertation. University of Johannesburg, Johannesburg.
**Parker, D.M. & Bernard, R.T.F. (2008).** Lessons from aloes in the Thicket Biome: Reconstructing past elephant browsing to understand the present. South African Journal of Science 104: 163-164.
**Raimondo, D., Vlok, J.H., van Wyk, B.E., van Jaarsveld, E. & Victor, J.E. (2012).** *Aloe ferox* Mill. National Assessment: Red List of South African Plants version 2013.
**Reynolds, G.W. (1950).** The Aloes of South Africa. A.A. Balkema, Cape Town.
**Sachedina, H. & Bodeker, G. (1999).** Wild Aloe harvesting in South Africa. Journal of Alternative and Complementary Medicine 5: 121–123.
**Shackleton, C.M. & Gambiza, J. (2007).** Growth of *Aloe ferox* Mill. at selected sites in the Makana region of the Eastern Cape. South African Journal of Botany 73(2): 266–269.
**Smith, G.F., Klopper, R.R. Crouch, N.R. & Figueiredo. E. (2016).** Reinstatement of *Aloe candelabrum* A.Berger (Asphodelaceae: Alooideae), a tree-like aloe of KwaZulu-Natal province, South Africa. Bradleya 34: 59-69.
**Smith, N. & Wilson. N.L. (2002).** Changing land-use trends in the thicket biome: pastoralism to game farming. Report no. 38. Terrestrial Ecology Research Unit, Port Elizabeth.
**Stokes, C. J. & Yeaton. R.I. (1995).** Population dynamics, pollination ecology and the significance of plant height in *Aloe candelabrum*. African Journal of Ecology 33: 101-113.
**Van As, S., van der Linden, S.C., Phillips, D.P., Rous, K.G Beyers, A., Cowling, R.M. & Potts, A.J. (2016).** Impending local extinction of *Aloe ferox* Mill. populations in the absence of elephants and black rhino? African Journal of Ecology, DOI: 10.1111/aje.12289.
**Van Jaarsveld, E. (1996).** The Cape Aloe: *Aloe ferox* and its uses. Veld & Flora 82: 57.
**Van Wyk, B.E. & Smith, G. (1996).** Guide to the Aloes of South Africa. Briza Publications, Pretoria, South Africa.
**Van Wyk, B. & Van Wyk. P. (2013).** Field guide to trees of southern Africa. Struik Nature: Cape Town, South Africa.
**Raimondo, D., Vlok, J.H., van Wyk, B.E., van Jaarsveld, E.J. & Victor, J.E. (2012).** Aloe ferox Mill. National Assessment: Red List of South African Plants version 2017.1. Accessed on 2018/08/13.

# WARNING!!!

## To all *suppliers and potential suppliers* of goods to the Government Printing Works

The Government Printing Works would like to warn members of the public against an organised syndicate(s) scamming unsuspecting members of the public and claiming to act on behalf of the Government Printing Works.

One of the ways in which the syndicate operates is by requesting quotations for various goods and services on a quotation form with the logo of the Government Printing Works. Once the official order is placed the syndicate requesting upfront payment before delivery will take place. Once the upfront payment is done the syndicate do not deliver the goods and service provider then expect payment from Government Printing Works.

Government Printing Works condemns such illegal activities and encourages service providers to confirm the legitimacy of purchase orders with GPW SCM, prior to processing and delivery of goods.

To confirm the legitimacy of purchase orders, please contact:

Anna-Marie du Toit (012) 748-6292 (Anna-Marie.DuToit@gpw.gov.za) and

Siraj Rizvi (012) 748-6380 (Siraj.Rizvi@gpw.gov.za)

Printed by and obtainable from the Government Printer, Bosman Street, Private Bag X85, Pretoria, 0001
Contact Centre Tel: 012-748 6200. eMail: info.egazette@gpw.gov.za
Publications: Tel: (012) 748 6053, 748 6061, 748 6065