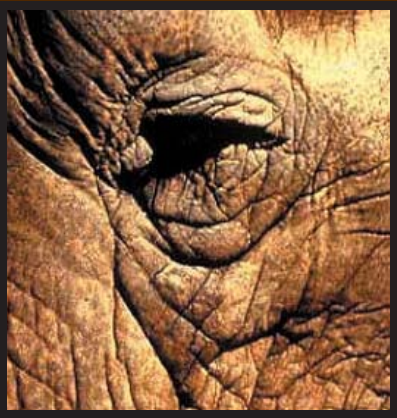
# Elephant management in South Africa

## The need to think BIG



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# Chapter 1. Introduction

The proposed decision to at least halve the Kruger National Park's elephant population by killing at least 6,000 individuals has attracted a wave of attention since the release of SANParks' 'Report on the Elephant Management Strategy' to the South African Minister of Environmental Affairs and Tourism in September 2005 (for comments see Appendix I).

This report offers a sober view of scientifically robust arguments and the legal justification underpinning SANPark's recommendation to resume elephant culling. It also presents an economic analysis of the potential financial gains and losses should culling go ahead. We also offer an up to date review of the intricate complexities governing the social life of elephants and draw attention to the moral pitfalls of interfering with elephant populations, particularly through lethal management. Finally, we offer a range of management actions which would minimize both risks and costs to South Africa's biodiversity and economy.

The report is intended to enhance the scientific debate around biodiversity conservation and the role of elephants in the KNP. In doing so, it provides:

- a historic context of biodiversity management in the Kruger National Park and its effects on the Park's biodiversity, including elephants
- multi-pronged scientific arguments, which set out why culling of elephants is not needed in the Kruger National Park
- details of why the basis for SANParks' recommendations for culling are scientifically unsound and misleading
- details of how the interpretation of the precautionary principle chosen by SANParks is selective and incorrect
- an economic analysis of potential community benefits through culling
- an assessment of the potential risk to South Africa's tourism industry if elephant culling is resumed
- a viable plan of action which relies on non-violent short and long-term conservation measures for the Kruger National Park

# Chapter 2. Sense and Sensibility in Biodiversity Conservation

### The scientific arguments underpinning SANParks' recommendations are incorrect

Viewed objectively, elephants are simply animals to which ecological principles apply, as to any other herbivores. Their feeding activity may affect individual plants, populations and communities, and thus indirectly affect other animal species, both positively and negatively, as do all other herbivores. It is only their large size and the correlated scale of their effects that makes them noteworthy, and requires of managers a commensurate level of imagination to judge both the spatial and temporal implications.

The reporting in the popular press of elephant management issues is sensational, outdated and misleading. This would indicate that SANParks has not done an effective job in communicating its new vision of ecosystem conservation (see below). A summary of recent media reporting (March 2004 - March 2005) is provided by Henley (2005); a copy of this paper is included in Appendix II. It lists 26 separate instances of negative wording applied to elephant conservation issues in the press.

The SANParks report contains much of this terminology. The terms "threat" (p.17), "degraded" (p.4), "degradation" (p.9 & 18) and "heavily impacted" (p.19) appear throughout the text and this does not give the appearance of an objective assessment stemming from ecological science. Rather, it appears as a value-laden position paper, aimed at steadily building a point about the unsuitability of the role played by elephants in ecosystem function, and then moving on to the argument: if we need to reduce elephant numbers quickly (i.e. by culling), then we may as well use the animal products for market-based social development. It is not unreasonable, given the slanted presentation, to question whether this principle of sustainable use, so ingrained in the agro-economic mentality (see below), is not the ultimate reason for

SANPark's desire to resume offtake from the elephant population. The prospect of resuming international trade in ivory always appears to lurk behind the culling question (Gillson & Lindsay 2003).

## In search of a meaningful baseline?

It is estimated that in 1930 Africa was home to between 5 and 10 million elephants. By 1979 numbers had collapsed to 1.3 million, and today the most optimistic estimate assumes a total population of 501,374 (AESR 2002) (Figure 1). Elephants used to leave their large footprints all over Africa's 22.6 million km2 land mass, including parts of the Sahara desert. Today elephants occupy a mere 22% of Africa. Despite this dramatic fall in the species' distribution and abundance, some claim that there are too many elephants, and that their high numbers pose a threat to biodiversity.

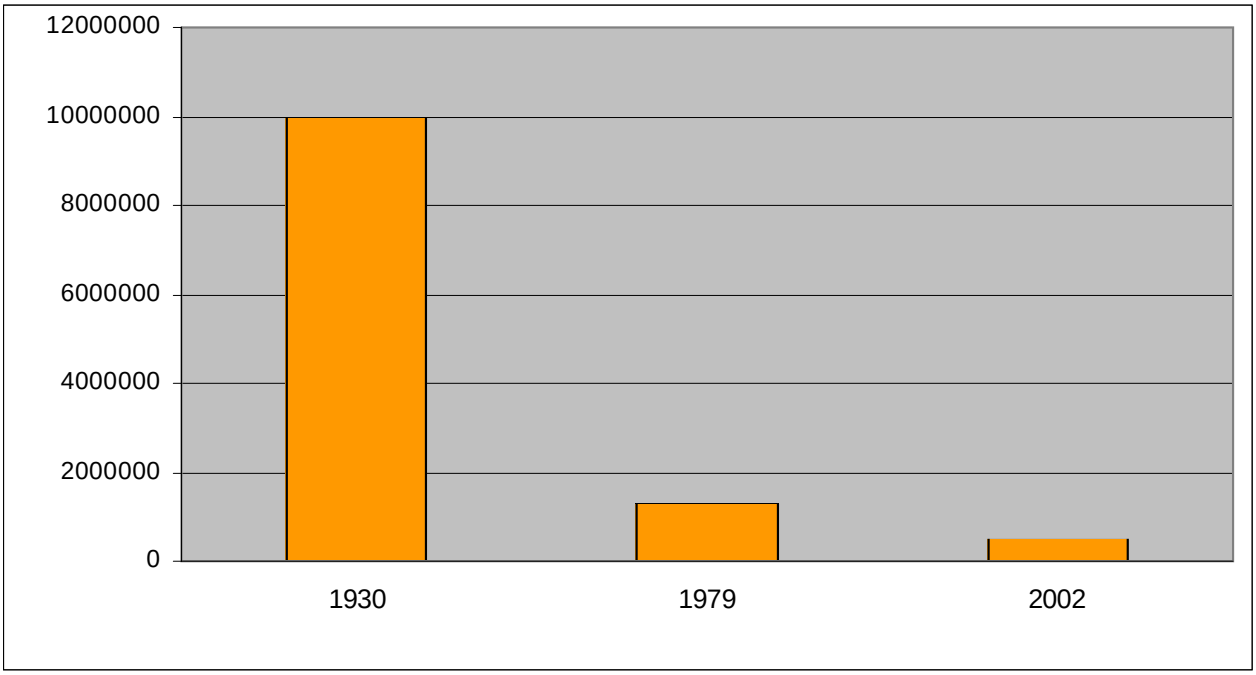


**Figure 1**. Elephant population development in Africa between 1930-2002. Source: African Elephant Status Report (AESR 2002).

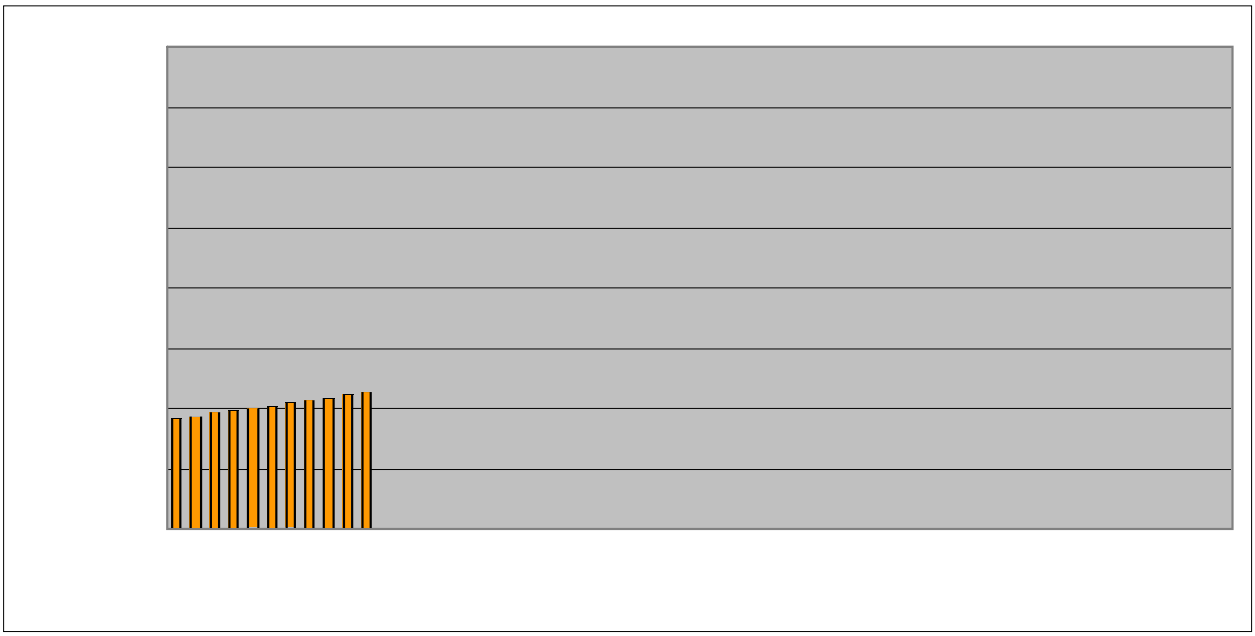

**Figure 2**. Human population development in Sub-Saharan Africa between 1950 and 2005. Source: US Census Bureau, International Data Base 2005.

**Culling of all manner of species in the Kruger used to be widespread. What follows is the minimum number of predators killed between 1903 and 1927:**

| | |
|---|---|
| 1272 lions | 402 pythons |
| 660 leopards | 1900 genets |
| 269 cheetah | 821 polecats |
| 521 hyenas | 50 otters |
| 1142 African hunting dogs | 87 badgers |
| 250 caracals | 2006 baboons |
| 678 servals | 1354 poisonous snakes |
| 417 Cape wild cats | 358 eagles |
| 3133 jackals | 310 hawks |
| 1644 civets | 110 giant eagleowls |
| 635 crocodiles | |

## Is Kruger's biodiversity at risk?

Ecological processes involving elephants are large-scale and long-term. Despite decades of draconian population management, there is little reliable evidence of the outcomes of elephant-habitat interactions, with respect to other species and to elephants themselves. However, amidst this uncertainty, there is no evidence to support a *reasonable* expectation of imminent, irreversible damage to biodiversity, despite SANParks' claims to the contrary.

Examples often given within South Africa of elephants' catastrophic damage to ecosystems are, in fact, myths. Tsavo National Park in Kenya was not destroyed (despite misleading reports to the contrary (e.g. Parker 1983) and remains dynamic, with diverse and productive plant (Leuthold 1996) and wildlife (Inamdar 1996) communities. Paleoecological studies (Gillson 2004) revealed that the recently observed changes in habitat structure in Tsavo East have in fact occurred several times over past millennia. Chobe National Park in Botswana, despite its steadily increasing elephant population, remains healthy and, rather than collapsing into devastation, has returned to the condition preceding the intense 1800s ivory trade (Skarpe et al 2004). Amboseli National Park in Kenya is by its very nature a dynamic ecosystem, with large-scale woodland change most likely due to saline water table effects (Western & van Praet 1973) and swamp-edge woodlands that spread rapidly when herbivore pressure is reduced (Lindsay in prep, Western & Maitumo 2004).

Extrapolation of exponential increase of elephant populations has been cited as a likely scenario, with the elephant population reaching 80,000 in Kruger NP and 400,000 across southern Africa by 2020 (Mabunda 2005, SANParks 2004). However, indefinitely unlimited growth at maximum rate has not been seen in any animal species on earth (Krebs 2000). In contrast, there is considerable evidence of population regulation mechanisms in elephants. They are realized as localized reduction in fertility and/or survival of elephants as food supply becomes limited. Data from long-term studies, such as Amboseli NP, Kenya (Moss 2001) shows that conception rates are reduced and juvenile mortality increased during years of low rainfall, and thus reduced food supply. This effect occurs both during drier than average, and particularly drought, periods and as local elephant density increases. The evidence from Tsavo NP shows that adult mortality, especially that of adult females with calves which remain near water, occurs during droughts (Corfield 1973). Recent evidence from Zimbabwe records that elephant mortality similarly increases when food is limited (Dudley et al 2001). Owen-Smith (2005b) noted that it is likely that similar processes would operate in Kruger if waterhole distribution were to be reduced.

Dispersal from areas of locally high density is also recognized as a potentially important population regulating mechanism in large mammals, including elephants (Owen-Smith 1983). This could occur within large protected areas which included patches of good habitat separated by less favourable regions, or between protected areas that are linked in a meta-population (van Aarde et al 2005). Both of these scenarios are workable in the Kruger context.

Effects on plant communities by herbivores are rarely uniform (Redfern et al 2003), and will have greater or lesser effects on plant and animal species in different parts of the park, which contains five main

vegetation zones and different soil/substrate conditions. Change is most likely to be localized in the vicinity of water where elephants and other water-dependent species spend most of their time (Gaylard et al 2003, Gaylard 2005, Hofmeyr 2005, O'Connor et al 2005, Redfern et al 2003). Vegetation in riverine areas has always been subjected to greater herbivory and is likely to be adapted to such impact, through unpalatability or considerable regrowth and/or coppicing capacity (O'Connor et al 2005) while communities at the top of drainages are normally subject to less attention - unless artificial water is provided in such areas. In the latter situation, certain tree species are likely to be reduced, as are animal species not normally dependent on water (O'Connor et al 2005).

Culling and water point provision in the past in Kruger has interfered with all these mechanisms of natural population regulation and habitat interaction by elephants. The fact that SANParks has maintained a fixed, and low, density of elephants for nearly three decades and the provision of 400-odd water points as well as a rotational burning policy, will have shaped the distribution of vegetation and dependent animal species considerably. The current and historical state of KNP should therefore not be mistaken as natural *status quo*. Consequently, the fact that the Kruger Park is said to be home to more than 12,000 elephants is not, as has been stated repeatedly "a conservation success" (e.g. Mabunda 2005), but the result of artificially created conditions, which have allowed elephant numbers to increase at the maximum rate and prevented the operation of self-regulating mechanisms.

The perception that the Kruger Park was changing intensified during a recent persistent drought, which lasted well into 1995. Yet, it is known that none of the 1,922 plant species in the Kruger Park are endangered, nor are any of the plant communities under threat. According to evidence discussed at the recent SANParks technical meeting, there is little reason to fear that biodiversity is under imminent risk in Kruger NP (Owen-Smith 2005b) and every reason to believe that imaginative elephant management approaches can result in population mechanisms that will promote heterogeneity within the Park and actually increase biodiversity in the longer term. The viewpoint that heterogeneity and temporal change can be creative and promote, rather than threaten, biodiversity in systems containing elephants, was articulated over a decade ago by Lindsay (1993), and there is little new evidence to challenge it.

## SANParks' philosophy and paradigm of conservation

SANParks is keen to point out that it has moved away from its previous "command and control", agro-economic, production system approach towards a modern non-equilibrium, ecosystem dynamics approach uncompromisingly subscribed to for over three decades, stressing heterogeneity and change through time (SANParks 2005, p.17). This position is a reiteration of statements made by Kruger's managers and scientists in published literature (Mabunda et al 2003, Rogers 2003). In a broader context, this "paradigm shift" has been heralded both in theoretical ecology and in its application to conservation, in international "best practice" (Fiedler et al 1997) and in specific protected areas (e.g. Yellowstone NP, Keiter & Boyce 1991).

Previously, SANParks' approach was characterized by attempts to homogenize ecosystems: placing waterpoints everywhere, burning regimes to control bush (keep open or prevent "encroachment", encourage mature trees), culling populations of many species including wild dogs, lions, hyenas, elephants and buffaloes, among others (see 'Lessons from history' section), in an attempt to impose order. However, these efforts in fact reduced biodiversity by removing refuges for water-independent, ecotone-loving species, such as roan antelope, and locked different wildlife populations into "eruptive" phases of rapid population increase rates.

This old approach, derived from an agro-economic commercial production system model, idealized a single, "correct", Balance of Nature state, with a set "carrying capacity" for each species. This term was, however, incorrectly applied as a limit set at maximum productivity rather the ecological limit on population size set by habitat conditions (Caughley 1979). SANParks believed, and passionately argued that this ideal balance of nature had been "lost" through human impacts and must be re-imposed and maintained by man (Mabunda et al 2003).

More recently, SANParks has articulated the new approach, a recognition that ecosystems are highly variable, particularly in semi-arid savannas subject to random weather patterns (Behnke et al 1993) and may occupy multiple stable states (Dublin et al 1990). Under such a view, management should intervene only to promote geographical heterogeneity and encourage change through time, and evaluate human impacts as additional ecological processes (Pickett et al 1997). Thus, biodiversity is maximized by embracing and allowing change, not controlling the system in every aspect - and terms such as "carrying capacity" are no longer considered useful (McLeod 1997).

Despite its stated intention to relax the population control of most animal species in Kruger NP, SANParks' embrace of the new paradigm has drawn the line at elephants. There remains the belief that elephants are somehow different from other herbivores and that their populations, alone among all wildlife, remain in need of control (Whyte et al 2003). In addition, there is a persistent tendency of some SANParks practitioners to use terms like "the number of animals the system can carry", "overpopulation", "optimum density" etc. (Mabunda 2005) - all attributes of the old and outmoded approach. The proclaimed paradigm shift towards a contemporary understanding of ecosystem dynamics therefore lacks consistency and credibility.

## Ecology is a historical science

As the title of this section states, ecology is a historical science - an especially important point in semi-arid savannah ecosystems. However, this is not reflected in SANParks' stance on elephant management.

The conditions present now, the age and size structure as well as the species composition of plant and animal communities, are the result of processes acting over long periods (Gillson 2004). Decimation of elephant populations by the ivory trade, especially the huge volumes trafficked in the 1800s, removed elephants over wide areas and had cascading impacts on vegetation and other species allowing tree species, such as marula and various acacias, to colonize and become established in a way that may have been unusual in ecological time (Skarpe et al 2004).

Much of the discussion on whether or not elephant populations have to be controlled in order to prevent irreversible vegetation damage has focussed on the marula tree (*Sclerocarya birrea*) and the baobab (*Adansonia digitata*). Marula trees are known to rapidly colonise new areas. Thus, it is likely that in the late 1800s, as elephant numbers dwindled away, the distribution range of marula trees would have expanded. Responding to recovering elephant numbers, the distribution range of marula trees would be expected to contract again. Because of the baobab's more than 1000-year life span, short term developments over barely one human generation cannot possibly provide sufficient information for the detection of population trends. This is even more likely in view of the fact that trees follow spatially and temporally irregular mosaic recruitment patterns.

There is a hypothesis, widely stated in SANParks and related literature, that elephants were never abundant, held at low density by human hunters (e.g. Whyte et al 2003), but the evidence is characterized by a lack of data, based on the absence of artifacts, rather than any positive demonstration. An alternative interpretation is that the large ivory volumes extracted from the region in the 1800s suggests there were large elephant populations in southern Africa at that time (Owen-Smith 2005a). In the modern era, parks were created in areas of woodlands that existed only because elephants had been effectively eradicated, and management was directed at maintaining this historical artefact. In fact, SANParks' interpretation, does not even accurately reflect Cooney's (2004) position. A comprehensive analysis of the mistakes made in SANParks' interpretation of the precautionary principle can be found in Appendix III.

## The precautionary principle

The precautionary principle has been invoked and applied by SANParks with a very specific interpretation biased towards sustainable use (Cooney 2004). Perhaps it is not surprising that this particular interpretation was the one of choice, as the chief proponent of the "Precautionary Principle Project" which led to it is ResourceAfrica, an organization devoted to promoting the principle of consumptive use (ResourceAfrica 2005). In fact, SANParks' interpretation, does not even accurately reflect Cooney's (2004) position. A comprehensive analysis of the mistakes made in SANParks' interpretation of the precautionary principle can be found in Appendix III.

In summary, SANParks' Report on the Elephant Management Strategy (EMS) fails to accurately reflect the precautionary principle as reflected in international environmental agreements and declarations as

well as Cooney's Issues Paper for several reasons. First, despite many examples from international environmental agreements and from Cooney's Issues Paper, the EMS treats the precautionary principle as merely a procedural, rather than substantive, obligation.[1] However, the precautionary principle calls for measures to minimize and avoid environmental harm. It also calls for cost-effective measures or measures that are proportionate to the potential harm. Although the outcome standard of cost-effective environmental protection is subjective and relatively discretionary, it does, nonetheless, require some analysis and suggests at least a baseline for a substantive result.

Second, the EMS suggests that neither local communities nor government conservation officials should bear the burden of proof. With respect to elephant management, however, SANParks is the project proponent and bears the burden to show that elephants are causing a loss of biodiversity and that the proposed policy to cull elephants minimizes harm to biodiversity and that it minimizes harm to elephant populations or other species that depend on elephants.

The EMS, from the outset, makes general statements regarding the role of elephants in harming biodiversity and, in particular, whether elephant culling will effectuate South Africa's biodiversity conservation policy. The EMS states that "it has to be accepted in principle that it is legitimate to apply population management as a precaution." That is not necessarily true. To the extent that SANParks promotes culling as a means to stem the loss of biodiversity, it must identify elephants as posing a risk to biodiversity. Elephant culling results in irreversible, direct loss of biodiversity, and, as such, warrants application of the precautionary principle. The EMS makes no attempt to show how that policy minimizes harm to elephants or other species. In NRM, where multiple environmental risks exist, precautionary principle implementation should aid decision-makers to make choices that balance each risk-versus-caution scenario, resulting in an overall cost-effective, environmentally protective decision. The *EMS* never assessed the various risks and thus never evaluated proportionate or cost-effective measures.

## Community benefits

The poverty of the human population adjacent to Kruger is not due to the protected area. It is the result of distance from and potential neglect by central government, from past regimes to the present. Rural development requires an integrated approach from several sectors of government at national and local levels and from the communities themselves. Sustainable benefit for rural communities can indeed be derived from PAs, but there is no prerequisite that this must involve consumptive use of the animals in the protected area. Indeed, non-consumptive use is likely to be the most economically sustainable approach, because it builds local capacity and infrastructure, increases skills and creates financial self-sufficiency and independence, while minimizing the potential harm done by killing wildlife within the ecosystem.

Killing of elephants cannot be maintained at a rate that will bring sustained development to rural communities. To base poverty reduction on elephant products that are handed down from SANParks will create expectations and dependencies, which are likely, sooner or later, to run counter to SANParks' conservation objectives, which still form the primary goals for protected areas. In so doing, this will tie the hands of conservation managers, while at the same time will fail to deliver sustainable social development to the communities. Elephants are the least productive of terrestrial animals; their great size means that their typical rate of increase (5%) is lower than typical discount rates. They are not a suitable resource upon which to base sustainable development activity. As Purvis (2001) notes: "*Orders composed of large species with slow life histories (e.g. elephants and perissodactyls) have a high prevalence of threat due to overexploitation*", which means that their low productivity makes them vulnerable to unsustainable offtake and potential extinction.

[1] If it is true that Cooney argues for a purely procedural interpretation of the precautionary principle, then her interpretation is not grounded in international environmental law, as all versions of the precautionary principle relating to biodiversity that require at least some level of environmental protection

Value can be added more effectively to wildlife existence values through tourism, and related employment and service industries supporting the PA and wildlife conservation, rather than treating the protected area as a farm for delivering animal products. As noted by Hutton & Dickson (2001), revenue generation from tourism is significantly greater than from "cropping" of wildlife, and photo-tourism offers greater opportunities for investment and added value than consumptive utilization, which is limited by the "offtake-determined threshold of revenues" (Murphree 2000); in other words, consumptive use can only provide returns up to the biological limit of productivity, while non-consumptive tourism can continue to diversify its attractions and services, and thereby its returns to investors (and communities).

Community wildlife areas outside the PAs should be encouraged to reduce the hard edge approach of SANParks. This is standard practice in all neighbouring countries, where there are Community Conservancies (Namibia), Wildlife Management Areas (Botswana) and CAMPFIRE areas (Zimbabwe). This multiple use would increase the prospects for corridors for wildlife dispersal and population regulation, and buffer zones for PAs.

Economic analyses of consumptive use fail to recognize all the costs of killing elephants and storing products, so that benefits are NET of costs, as in any other commodity. The reported benefits from consumptive use of raw animal products are, thus, greatly exaggerated. An example of a more thorough analysis is given in Table 1, using figures provided in the SANParks report on its experts' meeting (Grant 2005). The annual return of between R 0.5m and R 6m noted for culling with access to ivory markets is likely to be much too high, as a number of additional costs have not been estimated yet. Without an annual ivory trade, the culling appears as a net loss of R 1.5m or a modest net gain of R 4m.

According to SANParks' most recent Annual Report, their annual turnover for 2004/05 was R 419m, coming from tourism and sales, with a transfer from DEAT of R73.6m for operating costs. The total salary cost for the Executive Management team was R 9m. Thus, even with ivory sales (which are currently suspended), the net revenue from culling would be insignificant compared to the annual budget of Kruger NP, and would cover only a fraction of the salaries of senior staff alone. Nor could culling be seen to provide a source of significant benefit for distribution to local communities. Distributing these relatively limited net returns to a local population conservatively estimated in the region of some 5 million people (Statistics South Africa 2005a) will provide very little on a *per capita* basis (R 0.11 to 1.25 per person with ivory sales, and R -0.32 to 0.83 per person with hides and meat sales alone).

It is possible to question the detail of the financial analysis provided here, but the main points remain:

- taking costs as well as gross revenue into account, the net returns from culling are very limited and insignificant when compared to PA turnover and running costs
- the per capita benefit to local communities is minimal

**Table 1.** Estimates of potential gross and net revenue from elephant products. Figures on low and high amounts of products from Cumming at al (2005) and Whyte et al (2005) respectively. Figures on unit values of hides and meat, and on costs of culling are from Whyte et al (2005). Figures on current ivory prices are adapted from Martin & Styles (2005). Culling rate was taken to be 5% of the total population.

| **For a population size of 13,000 elephants:** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Gross Revenue** | | | | | | | |
| **Elephant part** | **% of pop.** | **No. culled** | **Unit weight (kg)** | | **Unit value (Rand)[1]** | **Total (Rand)** | |
| | | | **low** | **high** | | **low** | **high** |
| Ivory | 5 | 650 | 6 | 6 | 676 | 2,636,382 | 2,636,382 |
| Hide | " | " | 70 | 200 | 60 | 2,730,000 | 7,800,000 |
| Meat | " | " | 300 | 500 | 5 | 975,000 | 1,625,000 |
| **Total** | | | | | | **6,341,382** | **12,061,382** |
| **Costs** | | | | | | | |
| | | | | | | **Total (Rand)** | |
| Culling [2] | | | | | | 5,298,260 | |
| Ivory storage [3] | | | | | | 473,197 | |
| **Subtotal costs** | | | | | | **5,771,457** | |
| **Net Revenue** | | | | | | | |
| | | | | | | **Total (Rand)** | |
| | | | | | | **low** | **high** |
| **Total** | | | | | | **569,925** | **6,289,925** |
| **Total without ivory [3]** | | | | | | **-1,593,260** | **4,126,740** |

[1] Unit value of ivory of this mean tusk size is taken as US$100/kg, converted to SA Rand at an exchange rate of 0.14793 (Financial Times, 18 November 2005).

[2] Whyte et al 2005, p315. Note that these are *minimum* figures, based on 1994 values. The estimates were for culling 800 animals, but most of these costs will be relatively fixed and are likely to be only slightly reduced for a smaller cull. They greatly underestimate recurrent costs, such as current salaries and operating costs not corrected for inflation from 1994. They do not including refurbishment of facilities decommissioned since 1994, nor do they include annualized capital costs of infrastructure, or meat processing/canning costs.

[3] Figure of US$70,000, converted to SA Rand, was taken from Namibia's CITES CoP11 proposal (Government of the Republic of Namibia 2000), the only available figure for the costs of storing and protecting ivory stocks. We did not have the equivalent figure for South Africa. Note that the net revenue without ivory did not include ivory storage as a cost.

It is noteworthy that SANParks itself has not produced well-supported figures to demonstrate a significant, sustainable benefit from extracting elephant products from Kruger National Park. One aspect of the lack of proper documentation is that the estimates of hide and meat resulting from culling vary greatly between two different sources (Cumming et al 2005; Whyte et al 2005) in the same SANParks document (Grant 2005).

SANParks rightly note that local communities should benefit from the park, but focus incorrectly on the products of culling. In Uganda for example, 20% of all gate fees flow directly to local communities, see below. Chapter three on tourism will illustrate that South Africa as a whole has derived financial benefits several orders of magnitude above the best possible gains to be derived from elephant culling.

## Conflict issues

Increased fence breakage has been reported as due to the increasing elephant population in Kruger NP, allowing elephants to damage farms and livestock disease to spread (Bengis 2005). However, the truth

is that this increased incidence of fence problems is not an ecological effect, but an administrative failure. The agency responsible for fence breakage should be clearly identified and properly supported, so that fences are maintained.

Protection of the fence from within KNP does *not* require wholesale reduction of the entire elephant population in a large zone. More effective measures would include localized deterrence activity and/or strategic location of waterpoints away from fences.

The economic argument presented by SANParks, citing the cost of livestock disease at R93million versus the cost of effective fencing at R37million (SANParks 2005, p.5), does not make sense - it appears that the highest cost fence would show benefits outweighing costs by a ratio of over 2.5 times. An additional alternative to strengthening and protecting the boundary fence would be to remove the hard boundary between protected wildlife on the one side and human communities on the other. This approach, would create community wildlife areas outside the protected area, with the disease-free zone one line back along a more appropriate physical and administrative alignment, and has been recently proposed for the southeastern Lowveld area of Zimbabwe (du Toit 2005).

## SANParks have misrepresented opposition to culling

"*Do nothing is not an option*" is a catch-phrase used over and over again by SANParks in an attempt to dismiss opponents to culling as out-of-touch or sentimental (e.g. Mabunda 2005). However, 'doing nothing' is not what we are proposing. At a recent press conference Minister Mr Van Schalkwyk said: "*Culling is something I would rather not have to do. If there was any way of avoiding it, we would have done that*" (Bridgland 2005). We agree with the first part of his statement and like many other international and South African scientists, believe that culling is unnecessary. The focus of this report therefore to put forward constructive, practical proposals other than simply killing elephants.

SANParks (2005, p.22) listed the following management options - "*not all practical or desirable*" - as having been discussed at their expert meeting in March 2005:

1. Do nothing (laissez faire), with or without additional information collection.

2. Expand elephant habitat by:
   a. increasing the size of national parks;
   b. providing corridors for dispersal to elephant "sinks" (e.g. hunting zones);
   c. removing barriers to dispersal (fences) that currently surround national parks.

3. Restrict elephant habitat within parks by closing water points permanently or cyclically thereby increasing mortality of juvenile elephants by forcing them to travel longer distances between sources of water and foraging areas.

4. Introduce biological control in the form of predators or diseases.

5. Protect sensitive areas by excluding elephant from them as is the case in AENP.

6. Increase mortality to reduce population growth rate and/or size. The main options are:
   a. culling (full culling or selective),
   b. allowing hunting and
   c. failing to control poaching.

7. Reduce birth rate by contraception to effect, in the long term, a reduction in population growth rate or size.

8. Translocation of elephants from an over populated, to a less populated, area.

However, in the conclusions of their recommendations to the Minister, they have limited themselves merely to the following options (SANParks 2005, p.33):

- The use of culling in the short to medium term shall be considered in the context of adaptive management and shall be applied on the basis of the specific needs of each PA.

- Other management tools such as translocation, contraception and migration corridors to be applied as medium to long term management interventions.

Many realistic alternatives to the short-term, single-species focus on culling elephants across a broad landscape were presented (O'Connor 2005, Owen-Smith 2005b, van Aarde et al 2005) at the expert meeting held in Luiperdskloof in March 2005. It is therefore surprising that, despite statements about comprehensive consultation, the alternatives presented below have not found their way into their recommendations to the Minister (SANParks 2005).

If SANParks is taking their commitment to the a new, contemporary conservation paradigm seriously, one would expect to see it embrace the goal of creating a heterogeneous landscape, where elephant population and dispersal processes can unfold with minimal interference, playing out their role in the wildlife community. The proposal of a small number of large culling zones are said to produce such heterogeneity, but - akin to gardening - these would once again simply represent blanket treatments over large areas of otherwise diverse habitat, a repetition of the old homogenizing approach; this time across subsections of the park rather than the Kruger as a hole. Instead of the proposed regime, several alternative actions could be taken. They are outlined below.

These actions will not have immediate effects on overall elephant density - which is not required - but will increase heterogeneity at the landscape level and large-scale diversity. As noted above, there is no evidence of an imminent risk to biodiversity. Thus, neither is there a need for management action to produce immediate effects.

**Alternative actions to SANParks' proposed elephant management recommendation**

- reduce waterpoints, particularly in areas at the top of drainages where there was NEVER water in the first place, creating areas that would naturally be used by elephants (e.g. dry river beds etc.) and other "refuge" areas that are used less.
- encourage linkages with other areas of elephant habitat, such as Limpopo NP in Mozambique. Elephants will colonise, without translocation, such adjacent areas. It just takes a few years, but SANParks seems to expect an instant response, part of the old "control" paradigm.
- encourage a meta-population, linking protected areas by corridors and develop community-based wildlife management outside the PAs (see below)
- protect vulnerable, and valuable, areas through fencing (as in Addo), or deterrence methods (burning herbaceous vegetation, scaring methods)
- apply pZP contraception, which is an affordable, minimal intervention method - one which is constantly improving -- that can be used to reduce local density within a large population such as Kruger, or more effectively, the whole population in small enclosed populations (Bertschinger et al 2005)

# Chapter 3. International implications: what's at stake?

International tourism contributes significantly to South Africa's Gross Domestic Product (GDP). The following section collates information about the scale of that contribution and examines global trends in tourism behaviour and travel choices in an attempt to gauge the potential impact of a resumption of elephant killing in the Kruger National Park on tourist revenue in South Africa as a whole.

## Development through tourism

"*Tourism is the world's largest industry and every year it pumps billions of dollars into some of the poorest countries on Earth*," so read a recent article in Business Week (Leonard 2005). "*When tourism is thriving we get better schools, better hospitals and better infrastructure*," says Kenya tourism ministry official Rebecca Nabutola. "*When tourism does well, so do our other industries*." Mrs Nabutola's remarks are echoed by Uganda's Minister of Tourism and Antiquities, Akaki Ayumu Jovino. "*Tourism means jobs, poverty reduction and a better life for all our citizens. It is becoming our No. 1 foreign exchange earner*." Unlike in South Africa, in Uganda, 20% of all park gate fees go directly to local communities to spend as they see fit, says Minister Jovino. "*Our studies also show that one tourist means eight jobs, not just for the tourism industry but also in agriculture and all the support businesses*" (Leonard 2005). Bene Maleka, of the Southern African Development Bank seems to agree: "*If managed properly, tourism can make a huge contribution to the regeneration of the African continent*" (Leonard 2005).

## International Tourism to South Africa

According to the World Travel and Tourism Council, WTTC, tourism in South Africa has earned the country R31.1 billion in 2002. In doing so, it created 492,700 jobs (WTTC 2002). If indirect benefits, such as fuel, catering companies, laundry services and accounting firms etc., are taken into account, this figure increases to R72.5 billion - the equivalent of 7.1% of South Africa's Gross Domestic Product and 6.9% of the country's total employment (Table 2).

**Table 2** Revenue earned and job creation through tourism in South Africa for 2002. Figures presented include direct benefits, e.g. airlines, hotels, car rental companies, etc, and indirect benefits such as fuel, catering companies, laundry services, accounting firms etc. (WTTC, 2002).

| Direct Impact | | | | Direct & Indirect Impact | | | |
|---|---|---|---|---|---|---|---|
| **Revenue Earned** | **GDP** | **Jobs Created** | **Total Jobs** | **Revenue Earned** | **GDP** | **Jobs Created** | **Total Jobs** |
| R31.1 billion (US$3.1 billion) | 3.0% | 492,700 | 3.0% | R72.5 billion (US$7.2 billion) | 7.1% | 1,148,000 | 6.9% |

These figures are expected to rise substantially over the coming years and by 2012, direct and indirect revenue earnings are projected to reach R194.3 billion, with a predicted 1,555,300 dependent jobs (Table 3). Tourism was identified as one of the key growth sectors for the South African economy (Mason 2003), and the WTTC too believes that travel and tourism offer enormous potential as a catalyst for future economic and social development across the whole country (WTTC 2002).

A study carried out by the South African Department of Environmental Affairs and Tourism (DEAT) indicates that every overseas tourist who visited South Africa in 2000 generated about R66,400 towards the country's Gross Domestic Product (GDP). Furthermore, on average one new employment opportunity is created for every eight additional overseas visitor to South Africa. According to DEAT, "*tourism development in South Africa is expected to play an increasingly significant role in the national (and regional) economy in terms of its contribution to national production, government revenue, foreign exchange earnings, employment creation and entrepreneurship development*" (Mason 2003).

**Table 3** Revenue earned and job creation through tourism in South Africa for 2012. Figures presented include direct benefits, e.g. airlines, hotels, car rental companies, etc, and indirect benefits such as fuel, catering companies, laundry services, accounting firm etc. (WTTC, 2002).

| Direct Impact | | Direct & Indirect Impact | |
|---|---|---|---|
| **Revenue Earned** | **Jobs Created** | **Revenue Earned** | **Jobs Created** |
| R84.8 billion ($US9.3 billion) | 679,200 | R194.3 billion (US$ 21.3 billion) | 1,555,300 |

## Why go there?

In 2004, 6,815,202 foreign visitors travelled to South Africa (Statistics South Africa 2005b). Scenic beauty and wildlife remain the main attractions for international travellers to South Africa, with the Kruger Park featuring in the top ten attractions visited (WTTC 2002).

The 1996 White Paper on Development and Promotion of Tourism in South Africa committed the government to a policy of responsible tourism development, arguing that "*responsible tourism is not a luxury for South Africa*" (Mason 2003). The UK has the single biggest market share in visitors to South

Africa (463,021), followed by Germany (261,194), the US (197,561) and France (130,365) (Statistics South Africa 2005c). Mason (2003) explicitly states: "*Already it is clear that tourists in developed economies such as the United Kingdom - from which 24% of all South Africa's inbound tourists come - actively consider ethical issues when choosing holidays, destinations and operators.*" According to research commissioned by the charity Tearfund, which works with poor communities in developing countries, 52% of British tourists would be more likely to book a holiday with a tour company that had a written code guaranteeing good working conditions, environmental protection and support for local charities in tourist destinations. This reflects a rise of 7% amongst UK travellers in just two years between 2000 and 2002. It is predicted that as an increasing number of people travel from developed to developing countries for holidays, ethical tourism will become an increasingly big issue (Mason 2003).

The UK is the third biggest tourism spending country in the world, with an international holiday market worth £27.1 billion in 2001 (Holiday Purchasing Patterns Market Assessment 2001) - a 43% increase in just four years. In 2000, UK tourists spent about £2.94 billion on overseas holidays in developing countries. This is roughly the same amount the UK government provided in overseas aid during that year (Tearfund 2002).

The Kruger National Park (KNP) is the second most visited destination in South Africa (Mabunda 2004). Almost two thirds (65%) of all tourists to South Africa express a wish to go there and almost one third (31.5%) of all long-haul tourists actually visit the Park (Mabunda 2004).

The KNP constitutes 16% of South Africa's ecotourism market, with each tourist spending R315 per day (Mabunda 2004). In 2001, tourism in the KNP was reported to have brought in R136 million through on site expenditure, or R267 million in terms of all expenditure related to visiting the park. Together with a consumer surplus of R1 billion, this represents a total recreational value of the KNP of R1.267billion (Turpie & Joubert 2001). Over the past five years, The KNP witnessed a 25% rise in foreign visitors. (Mabunda 2004). SANParks' David Mabunda is right, "*without the KNP, more than 50% of tourists would stay away from South Africa*" (Mabunda 2004).

Since the release of Nelson Mandela in 1990, South Africa has benefited from a steady increase in popularity amongst international tourists (Figure 3), following the suspension of international sanctions and a tourism boycott.

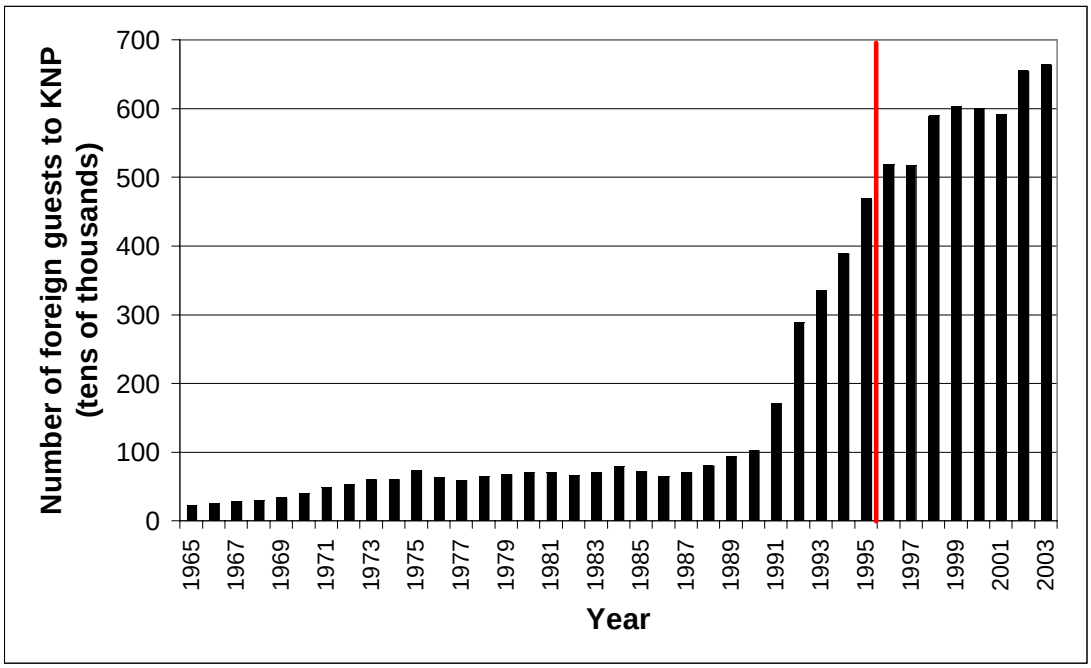


**Figure 3.** Tourism figures for South Africa between 1985 and 2003. The red line indicates the suspension of elephant culling in the Kruger National Park (Statistics South Africa 2005c).

In contrast, using data published in Mabunda (2004) adapted from Stevens (2002), the increase in foreign visitors to the KNP followed a different pattern. Instead of the gradual rise for South Africa as a whole after 1990, growth in visitor numbers to the KNP is delayed by several years and more abrupt (Figure 4). The sudden upsurge in excess of 50% after 1995 - the time elephant culling was suspended - suggests a potential link between visitor behaviour and the mass killing of elephants in the park.

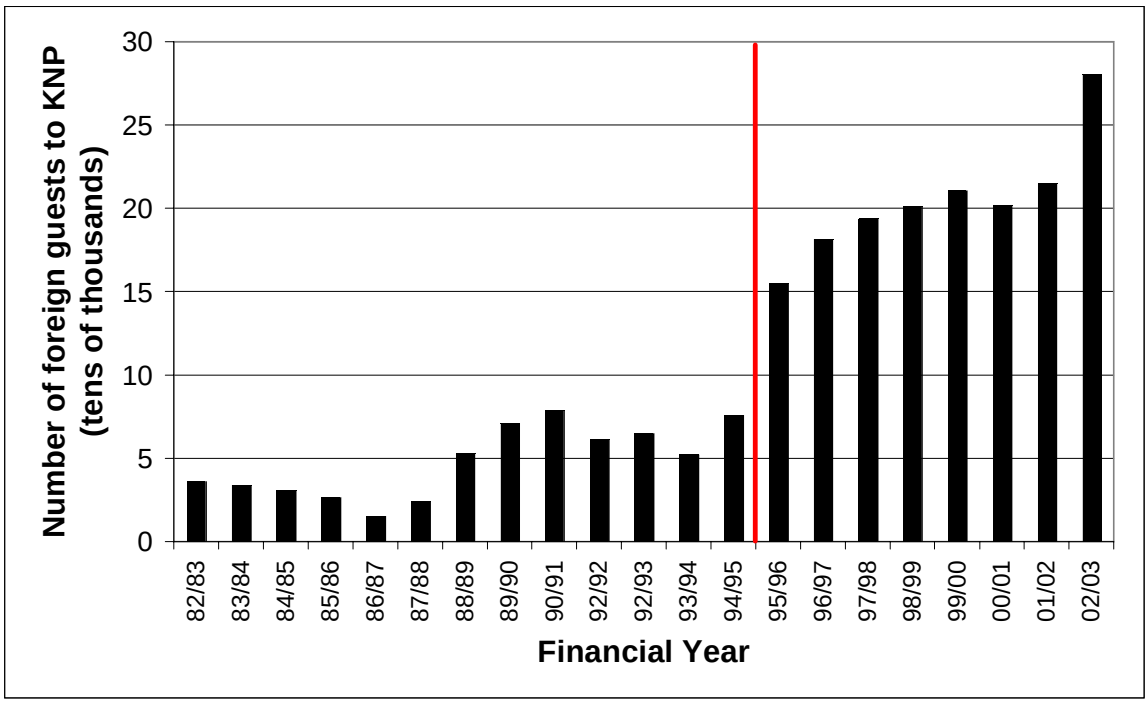


Figure 4. Tourism figures for The Kruger National Park between 1985 and 2003. The red line indicates the suspension of elephant culling (Mabunda 2004).

## Is South Africa's tourism industry vulnerable?

Speaking at a press conference in Johannesburg, Mike Speed, President of the Southern Africa Tourism Services Association (SATSA) recently expressed grave concerns about the expected harmful consequences a resumption of culling is likely to prompt for South Africa's tourism industry. Similar fears were voiced by Colin Bell of South Africa's Wilderness Safaris (Pickover pers. comm.). Given that some organisations around the world have already threatened to call for a tourism boycott to South Africa if culling is resumed, these fears are not unfounded. To avoid this economic backlash, the South African government depends on engaging in a fair and transparent decision making process, which takes account of the best available scientific information. It is with this in mind that we offer the material presented in this report.

## Conclusion

As the information presented in this chapter has shown, tourism constitutes a significant source of revenue and employment for South Africa. However, over the past five years, western tourists, who com prise the overwhelming majority of visitors to South Africa, have become increasingly interested, as well as conscious of the social justice, human rights and environmental records of the countries to which they travel - and rightly so.

This mounting awareness amongst foreign visitors is reflected in the growth of responsible travel, eco-tourism and ethical travel programmes across the sector and affects where people travel and why.
In light of these developments it seems unlikely that South Africa's image as a popular tourist destination will not be harmed if elephant culling is resumed. People travel to Africa because they want to experience its rich cultural diversity, enjoy its scenery and marvel at its wildlife. As part of 'the big five', elephants no doubt represent one of the main attractions Africa and the Kruger National Park have to offer. If the KNP's landscape is once again to be turned into killing fields, it stands to reason that foreign visitors from the UK and elsewhere, who would otherwise travel to South Africa to see its magnificent wildlife, will vote with their feet, being turned off by the prospect that the elephants they enjoy during their safari

one day, might find themselves hanging upside down from a meat hook in the Skukuza abattoir the next. These effects are likely to be exacerbated as awareness grows about the lack of scientific justification for the proposed elephant kill, that much of the perceived biodiversity problems facing the KNP today are the result of decades of mismanagement, and that a variety of non-violent tools are available to address the Park's short and long-term future.

# Chapter 4. Why should we care?

Most people will agree that taking a life is an act with a clear moral dimension, a) because of the termination of the life itself and b) because of the manner in which this is achieved. The latter is of concern because death is generally accompanied by varying degrees of pain and fear. The evidence that animals feel pain and seek to avoid it is overwhelming (Appendix IV). Inflicting it, therefore, has moral implications. The effects of an animal's death on those who are left behind is also to be considered. In the highly social African wild dog (*Lycaon pictus*) for example, the death of a single individual can threaten the survival of an entire pack (Rasmussen pers. comm.) To subject our actions as individuals and societies to such scrutiny is part of progressive intellectual, cultural, and moral refinement and distinguishes us as cultured, morally sophisticated and ultimately, civilised.

Elephant 'culling' is not a morally neutral act, and as such requires an ethically defensible basis. Like the previous sections of this document, the following segment is intended to inform this process by providing scientific information about the complexities of elephant life.

## Elephant Life

African elephants live in multi-tiered fission-fusion societies, in which individuals are embedded in complex layers of family, while maintaining a nested network of social relationships across a population (Douglas-Hamilton 1972; Moss & Poole 1983; Moss 1988; Wittemyer et al 2005). Elephants defend each other against predators or other elephants, care for each others' young, recognise and mourn their dead, communicate over vast distances, listen with their feet, use tools, learn through experience and pass it on, and get wiser as they get older.

## Elephant Society

The patchy distribution of resources in savannah ecosystems, in combination with their heavy feeding requirements, makes elephants susceptible to intraspecific competition. Such competition in other animals limits both the size of social units and their proximity to one another (Jarman 1974, Clutton-Brock & Harvey 1977). Fission-fusion societies limit the effect of within-unit competition through unit splits during periods of high competition (Dunbar 1992, Kummer 1995) and enhance cooperative effects through unit cohesion when the ecological costs of aggregating are low or benefits of sociality are high (Takahata et al 1994, van Schaik 1999).

Recent research by Wittemyer and colleagues (2005) confirmed six hierarchical tiers of organization amongst elephant populations (Buss 1961, Laws 1970, Douglas-Hamilton 1972, Moss & Poole 1983). They include: mother-calf units: tier 1, families: tier 2, bond/kinship groups: tier 3, clans: tier 4, subpopulations: tier 5, and populations: tier 6.

In elephants, this nested hierarchy of social tiers can separate into smaller units, down the hierarchy, during times of constraints and increased competition or fuse into larger units, building up the hierarchy, when facilitated by conditions leading to increased cooperative benefits amongst this multilevel fission-fusion society. Individuals maintain the benefits of their second-tier units, while avoiding the costs of third or fourth tiers by coalescing into the higher-order units for limited periods at opportune times.

The first four tiers show significantly different degrees of cohesion and respond differently to temporal

and seasonal effects. Individual elephants generally displayed strong unit fidelity across time and season. Individuals almost always remain in their family unit (second-tier), which is significantly affected by the age of matriarchs, with units lead by females older than 34 years significantly larger than those led by younger females (Wittemyer et al 2005). Strong bonds operate between family members. Moss (1988) notes that activities within a family group are almost always synchronised, which means that all members of a family unit would either be feeding, walking, drinking, resting or mud-wallowing at the same time.

Wittemyer and colleagues found that both cohesion and social networks increased in size during the wet season and could form aggregations of more than 100 animals - sometimes referred to as super-herds. During the dry season, when resource quality and abundance decreases, inter and intra-group competition rises (Altmann 1974, Jarman 1974), which shapes the social structure of elephant society. Thus, social cohesion of elephant units decreases across all social tiers during the dry season; albeit not evenly. The composition of family units is least changeable across seasons and over time. Similarly, the number and cohesion of second-tier units changed little across seasons, showing that structural organization at this level is robust against potentially divisive ecological forces. Alloparental care was common within second - and third-tier units but infrequent among fourth-tier groupings.

In contrast, seasonal effects were marked across the third and fourth social tiers. "*Tighter ecological constraints of the dry season thus lead to greater levels of disassociation and splits in higher social units, inhibiting second-tier units from coalescing into third-tier units for extended periods*." (Wittemyer et al 2005) Elephants may derive greater social benefits from larger aggregations during the breeding season (coinciding with the wet season here) by attracting mates (speculated by Moss & Poole 1983), which may be the reason individuals coalesce into third-tier units more frequently during wet seasons, when food is more plentiful. Furthermore, the authors found differences in the average size of third tier units between Sambura and Lake Manyara National Parks elephants. The smaller average of 28 (14-48) individuals in Lake Manyara versus 16 (6-40) animals in Samburu is related to much drier conditions in there compared to Lake Manyara.

SANParks (Mabunda 2005) suggested that large elephant herd size in the KNP is a further indication of elephant overpopulation. Considering Wittemyer et al's research, this is unlikely to be correct. On the contrary, elephants are less likely to form large herds when food is scare. Another reason for elephants to move in larger herds is disturbance through poaching or other harassment (Moss 1988). Moss (1988) for example, recounts aggregations of over 300 elephants in an area suffering under rampant poaching pressure. However, since no elephants have been culled in the Kruger for ten years, this is an unlikely explanation.

## Elephants need big mothers

Female African elephants live in matrilineal family units led by the oldest female, or matriarch, whose importance has already been alluded to above. The matriarch is the oldest female in the family unit, and plays an important role in coordinating the group's activities. In Amboseli, a family unit encounters an average of 25 other families, representing around 175 adult females during the course of a year (McComb et al 2001). This level of social complexity is likely to be matched by a considerable social intelligence. Females are familiar with the contact calls of around 100 others in the population and discriminate between calls on the basis of how often they associate with the caller (McComb et al 2000).

In their paper entitled, *Matriarchs as repositories of social knowledge in African elephants*, McComb and colleagues (2001) demonstrated that enhanced discriminatory abilities by the oldest individual in a group can influence the social knowledge of the group as a whole.

Examining the association patterns of more than 1,700 individual elephants over a 28 year period, researchers have found that family units with older matriarchs are better at discriminating the calls of close associates from those of distant associates (McComb et al 2001). Elephants were less likely to bunch into defensive formation on hearing playbacks of calls from other families the more they had associated with the caller. The probability of bunching decreased with increasing matriarch age, suggesting that families with older matriarchs may either have larger networks of vocal recognition or greater social confidence than families with younger matriarchs. Families with older matriarchs also appear considerably more able to use auditory signals to discriminate between familiar and unfamiliar females nearby and respond appropriately. Moreover, ageing may also influence reproductive success through its effects on the acquisition of social knowledge.

## Elephant Communication

Using scores of different vocalizations (Langbauer 2000, Poole et al 1988, Soltis et al 2005a & b, Poole, in press), expressions, and gestures (Kahl & Armstrong, 2000; Poole & Granli, 2003), elephants are able to communicate specific information and emotions, and they use these to reinforce bonds, care for youngsters, reconcile differences between friends, form coalitions against aggressors, coordinate group movement, and keep in contact over long distances (Poole et al 1988, Langbauer et al 1991, Soltis et al 2005a & b).

Elephants are extremely tactile animals who constantly touch each other with their trunks or lean or rub against each other (Moss 1988). Their extraordinarily dextrous trunks are able to perform the most delicate and precise movements.

Elephants have a lifespan of 60-70 years, and much of their social and ecological knowledge is acquired through learning over many years. Their communication requirements are therefore complex. Their large brains can process intricate information and are equipped with good memories.

As long-lived social animals living in complex multi-tiered societies, elephants need to be aware about what goes on in the group and communicate information to others. The survival of females and their offspring depends on the cohesion and co-ordination of the extended family, and on their ability to compete with other groups for access to scarce resources. They use hearing, smell, vision and touch to communicate to do this and communicate over a variety of distances from touching to perhaps 10 kms or more apart and they convey information about their physiological (e.g. sexual/hormonal, body condition, identity) and emotional (e.g. fearful, playful, joyful, angry, excited) state as well as communicating specific statements about their intentions or desires (Poole & Granli 2005, Soltis et al 2005b).

Elephants also communicate with a wide range of sounds, some of which are not audible to humans. These include infrasound transmissions, which are too low to be detected by human ears and are referred to as 'rumbles'. These vocalisations are so strong, that the vibrations can be felt with the entire body, when standing next to a rumbling elephant, rather than heard. Scientists have identified 70 different elephant vocalisations for different circumstances, and as we have heard earlier, elephants can recognise the voices of at least 100 con-specifics. This includes the extraordinary ability to detect vibrations through their feet. Elephants emit seismic-evoking sounds that are transmitted through the ground - in what have been described as mini earthquakes. Vibration sensors known as Pacinian corpuscles, detect vibrations as they ripple through the ground and pass signals to the brain. These sounds carry many kilometres and allow more distant groups to assess the location of others, co-ordinate group movement and alert others to their sexual and emotional state (Poole & Granli 2005, Soltis et al 2005b).

## Elephant Awareness

Elephants are aware of their own existence, in the sense that they recognise themselves as separate beings. Scientists determine this ability by testing whether or not animals are able to recognise their own reflection. Elephants recognise a smudge on their faces when studying their reflections and wipe it off with their trunk (Simonet et al.2000). Only very few species, including chimpanzees, have so far achieved this. Numerous observations suggest that they have the capacity for both empathy (or Theory of Mind; Nissani 2004) and anticipatory planning (Rensch 1956 & 1957), including the possibility of imagining future events, such as pain to themselves and others (Poole in press).

African elephants are not only more self-aware than most other species, they also show a great deal of interest in dead elephants and their remains (e.g. Moss 1988). They exhibit unusual behaviours on encountering the bodies of dead con-specifics, become highly agitated and investigate them with their trunk and feet. They also pay considerable attention to the skulls, ivory and associated bones of elephants that are long dead (Douglas-Hamilton & Douglas-Hamilton 1975, Moss 1988, Spinage 1994).

Karen McComb and colleagues (2005) recently confirmed and quantified these observations. They write, "*The elephants typically approached the objects and began investigating them by smelling and touching individual objects with their trunks and, more rarely, placing their feet lightly against particular objects*

*and manipulating them (similar behaviours are observed during natural encounters with elephant remains, e.g. Spinage 1994)*." The researchers, who presented elephants in Amboseli National Park with an array of different objects, found that elephants exhibit a higher level of interest in elephant skulls and ivory than in natural objects or the skulls of other large terrestrial mammals. The animals' preference for ivory was very marked, with ivory not only receiving greater attention in comparison with wood but also being selected significantly more than the elephant skull. Subjects also placed their feet on or against the ivory significantly more often than on other objects. When passing a location where a companion has died, elephants have been observed to stop and linger for several minutes (Moss 1988). There many accounts of elephants attending to dead, sick or dying con-specifics. A particularly compelling example is presented in Appendix V.

BBC wildlife film maker John Downer recently filmed a programme on elephants through cameras hidden in artificial dung piles - or dung-cams. This allowed him to obtain the most intimate insights into elephant life. He says: "*I know of no other species, apart from ourselves, who gather to greet a newborn and equally appear to mourn their dead relatives*" (BBC 2005).

The use of tools is another indicator that elephants are not dumb jumbos. Elephants have been observed using a variety of tools, including sticks and branches to scratch themselves or remove flies. They also strip branches according to various designs to create fly swatters. Older animals pass down tool use to their young, who acquire them through learning.

## Effects of Culling

Considering the information presented above about the complexities and intricacies of elephant societies, the systematic killing of hundreds of individuals to reduce populations is bound to have repercussions. The following subsection is devoted to identifying and examining some of these effects.

There is no doubt that herding elephant families by helicopter alone will be a source of stress and fear. Elephants are not evolutionarily adapted to running long distances and family members, especially calves may be split off. Because SANParks has recognised that the previously used method of immobilising and then shooting fully conscious, but paralyzed elephants is inhumane and has abandoned it, this process will not be addressed here. However, whatever killing method is to be adopted, if elephant culls in the Kruger are to be resumed, it will inevitably involve fear, pain, stress and suffering, which will not be restricted to the immediate targets of the cull but reverberate throughout the population.

The system of shooting entire elephant families is considered more humane than killing only a few animals from several family units (e.g. Bengis 1996), but world-renowned elephant expert Cynthia Moss believes that the elephants understand very well what is happening and even relay this message throughout the population. In her book Elephant Memories, Moss (1988) describes the response of 80 elephants who lived in a private reserve adjacent to Zimbabwe's Hwange National Park. Elephant numbers had been systematically reduced there by culling for several years. All "*80 animals disappeared on the very day the culling started in the park 90 miles away. Several days later they were found bunched together in the opposite corner of the reserve as far away from the park boundary as they could get*." Moss concludes that the message of danger and death had been relayed to them across those miles. As we have seen above, elephants communicate over long distances. Fear, panic and distress caused by culling operations is therefore likely to affect distant elephant herds.

> *"They cull whole families except for the youngest calves and then offer them for sale. And everyone said, 'Oh, that was okay, because the whole family was killed and no other elephants knew about it. But now we find through our field studies that elephants can hear over long distances - these infrasonic sounds - so they can hear the screams - the death screams of those elephants - maybe from two kilometres away. And then those elephants that remain alive are terrorized and every time the helicopters go up, they're afraid. They live lives of terror, which is something that we cannot accept."*
>
> Cynthia Moss, quoted in Page (1999).

Elephant populations subject to poaching become more wary of humans and/or vehicles and are more likely to assume defensive formations (e.g. Karesh 1998, pers. obs.), which suggests some long-term effects. Iain-Douglas-Hamilton's research on elephant movements shows that elephants will quickly dart across unprotected areas where, they feel vulnerable and unsafe. In as far as it involves mass killing of elephants, poaching and culling are not dissimilar. This raises the possibility that elephants will regard areas where culling operations have taken or are taking place 'unsafe'. This problem will become exacerbated if culling is spread over a large area and, like in the Kruger National Park, the elephants' movements are restricted.

Whyte (1993) too describes how some elephants "*reacted dramatically to a culling operation by moving many kilometres away*". Others are reported as showing no response at all. In one example a female elephant located seven kilometres from the cull moved a further 30km away in a straight line over a period of two days. Whyte used radio-collars to obtain his data in the context of a study of elephant home ranges and admits that the techniques employed do not produce conclusive results.

The deep complexity of elephant life can also be revealed when things go wrong. Group size and cohesiveness in African elephants are correlated with the ecological health of an elephant population in response to shifting resource availability (Nyakaana 2001). The authors use genetic evidence to demonstrate the breakdown of social structures in elephant societies in response to sustained poaching.

A recent paper published in the journal *Nature* draws important parallels between the behavioural consequences of psychobiological trauma in humans as a result of war and socio-ecological disruptions and similar outcomes in elephants (Bradshaw et al 2005). Neuroscience demonstrates that all mammals share developmental attachment processes and a common stress-regulating neurophysiology. The authors state that "*studies of human PTSD [Post-traumatic stress disorder] can be instructive in understanding how violence also affects elephant culture,*" adding that "*studies on animals and human genocide indicate that trauma early in life has lasting psychophysiological effects on brain and behaviour.*" Disruption to the attachment bonding process, such as maternal separation, deprivation, or trauma as a result of poaching or culling can trigger a series of symptoms displayed by wild elephants including abnormal startle responses, depression, unpredictable asocial behaviour, and hyper-aggression. Bradshaw et al. state that these damaging effects operate directly, through the behaviour of individuals, and indirectly through social transmission and the collapse of social structures. Culling orphans sustain a series of traumas, such as premature weaning, shock and lack of socialisation with older males, which have been shown to subdue the young males' violence. While intact functioning social order helps to buffer trauma, culling orphans are deprived of healthy social groups. Hence, teenage culling orphans go on the rampage. Calves who have witnessed culls and have been raised by young, inexperienced mothers are high-risk candidates for later disorders, including an inability to regulate stress-reactive aggression.

## Conclusion

The complexities of elephant life extend from individuals across entire populations. They are highly intelligent, lead intricate social and emotional lives, and feel pain and fear. The moral onus is therefore on us if we wish to take their lives or expose them to conditions which negatively affect their immediate and/or long-term welfare.

Elephant management choices adopted in South Africa have yet to address these issues, which introduce new layers of complexity. Immobilisation with Succinylcholine chloride (Scoline), as well as handling, translocation and sales of culling orphans are now recognised as inhumane and have been abandoned. However, the effects of culling on the multi-tiered strata of the area's elephant population as a whole have not been given appropriate consideration. The cumulative effects of getting it wrong have been plain for all to see in the legacy of releasing culling orphans to grow up on their own, without the guidance and support of their families and socialisation through older females and bulls, who subdue the young animals' violent behaviour.

Who can say for sure what goes on inside an elephant's head? But, one thing is certain: the more we learn about elephants and their social environment, the more we have had to adapt our appreciation of the level of sophistication and complexity that govern their daily lives.

# Chapter 5. Paradise lost?

The decision before Minister van Schalkwyk and indeed before the South African people is momentous. Much is at stake in every respect. History will have its own take on this someday. In the meantime there are measures we can take now to ensure that history's judgement will not be unnecessarily harsh. One of these is to ensure that any decisions taken are based on a solid foundation of facts.

At a scientific meeting held in June 2005 at the Zoological Society of London, ecologists noted a lack of convincing evidence of irreversible damage to biodiversity by elephants, either in peer-reviewed ecological studies over recent decades or through the past centuries as revealed by paleo-ecology. These concerns are echoed in an open letter by Prof. John Skinner (2005) who writes: "*I was initially relieved that SANParks consulted scientists from outside in dealing with the problem of whether elephants reduce biodiversity within the Kruger National Park and, if so, whether to cull them. I gather from colleagues who attended these earlier meetings that there is not a shred of evidence in papers published in the primary scientific literature that elephants affect biodiversity.*" Compared to some other conservation areas, the Kruger Park is densely covered in bush. Its biodiversity is not at risk from elephants. If anything it continues to suffer under a legacy of misguided management decisions, which range from the calculation of unsupported population limits for different animal species, large scale killing of all manner of those species - first predators, then ungulates and then predators again - the even provision of hundreds of waterpoints across all habitat types, rotational random burning policies, as well as ecological impatience, which fails to take long-term ecosystem dynamics into account. All these interventions worked against, rather than with, ecological processes of feedback and competition that regular populations and structure communities.

Chapter two of this report also demonstrated that, even under the best possible scenario, South Africa does not stand to make a fortune from elephant culling and could even incur a loss. Therefore even those of us interested primarily in money have to ask themselves: is it really worth it? On the other hand, as shown in Chapter three, South Africa's economy benefits enormously from international tourism. Pictures of dead or dying, skinned and tinned elephants are unlikely to attract foreign visitors to the country. Billions of tourism dollars are at stake here. There can be no doubt that there will be an international outcry if South Africa once again turns its guns on Kruger's elephants. Whatever their reasons, many potential visitors to South Africa will not be willing to embrace the systematic killing of elephants in the Kruger National Park; particularly in the absence of a compelling reason why. It seems an enormous risk to take.

Elephants once populated the whole of Africa. Since then they have lost a lot of ground. Their range and numbers have contracted at an alarming rate. The Kruger elephants too live in an environment characterized by severe anthropogenic disturbance, which no doubt has also taken its toll on the animals' intricate social systems. Since 1967, 14,562 elephants have been sacrificed to the god of c arrying capacity; an archaic and ill-conceived conservation concept. It has been just about ten years since culling was suspended in the Kruger Park - not long enough for a single generation of elephants to grow up outside the shadow of mass slaughter. In chapter four we have seen just what the implications of that might be. For this reason alone, it is important to get it right this time. The moral costs of getting it wrong are enormous.

If research about the projected effects of climate change on South Africa's biodiversity is anything to go by, there is a great deal more than elephants to worry about and a lot more dynamic ecosystem changes to get used to (Erasmus et al. 2002). Huge range shifts are to be expected, with 17% of species expanding their range, 78% displaying range contractions, 3% showing no change and 2% becoming locally extinct. Inside the Kruger National Park up to 66% of species examined by scientists may be lost.

Even those firmly wedded to the concept, fashionable in some circles, that wild animals must pay their way, will surely concede that this is exactly what the Kruger's wildlife, including elephants have done for South Africa. For those of a different persuasion, Matthew Scully's words will serve: "*In the carnage and terror they have endured, elephants have already "paid their own way" - with a security deposit for decades to come. And the ones left have plenty of value just as they are, without a need of men with guns and machetes to give it to them.*" (Scully, 2002)

You are the protecting spirit of Africa
You are the whisperer of our stories in the wind that has forgotten its heritage
You, whose trumpet saluted the first dawn
And you, whose trumpeting will also say farewell when the last evening ends,
*Sawubona*
Bayete, elephant!
Animal of our kings

*Praise Song to the Elephant,* Credo Mutwa, 1996

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# Appendices

## APPENDIX I: Comments on SANParks 'Report on the Elephant Management Strategy (EMS)'

**Comments are embedded in the text of the report and highlighted in red**

# REPORT ON THE ELEPHANT MANAGEMENT STRATEGY

**Report to the Minister: Environmental Affairs and Tourism On Developing Elephant Management Plans For National Parks With Recommendations on the Process To be Followed**

## 08 SEPTEMBER 2005

**SUBMITTED BY:** **Dr David Mabunda**
**Chief Executive**
**South African National Parks**

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## ACCRONYMS & ABBREVIATIONS

| | |
|---|---|
| Addo | Addo Elephant National Park |
| Biodiversity Act | National Environmental Management: Biodiversity Act No. 10 of 2004 |
| CBD | Convention on Biological Diversity |
| CE | Chief Executive |
| CITES | Convention on Trade in Endangered Species of Fauna and Flora |
| CSD | Conservation Services Division |
| DCAs | Damage Causing Animals |
| DEAT | Department of Environmental Affairs and Tourism |
| DWAF | Department of Water Affairs and Forestry |
| ED:CSD | Executive Director: Conservation Services |
| EXCO | Executive Management of SANParks |
| GLTP | Greater Limpopo Transfrontier Park |
| Indaba | Great Elephant Indaba |
| IUCN | World Conservation Union |
| KNP | Kruger National Park |
| Minister | Minister of Environmental Affairs and Tourism, Marthinus van Schalkwyk |
| Marakele | Marakele National Park |
| MINMEC | Minister and Members of Executive Council Committee |
| MINTEC | Ministerial Technical Committee |
| MNP | Mapungubwe National Park |
| PAs | Protected Areas |
| PAA | Protected Areas Act, 57 of 2003 |
| P&C | People & Conservation Division |
| PPF | Peace Parks Foundation |
| Protected Areas Act | National Environmental Management: Protected Areas Act No 57 of 2003 |
| SANParks | South African National Parks |
| TPCs | Thresholds of Potential Concern |
| V-STEEP | Values-Social, Technological, Environmental, Economic, Political |
| $V^{th}$ WPC | $V^{th}$ World Parks Congress |
| Working Group 1 | Technical group consisting of representatives of provincial and national protected area agencies, reporting to MINTEC |

## General Comments

The current Management Strategy report represents a missed opportunity. It could and should have presented a balanced review of the management options, with arguments for and against each option. Instead it has focussed on the option of culling from the outset and has built a series of arguments supporting this action, from a number of different angles, from the scientific/ecological through to social development.

It has presented alternatives to culling as "doing nothing", which it says is not an option. We agree that "doing nothing" is not constructive, but several options, other than culling, have in fact been suggested, of which the efficacy is supported by evidence within SANPark's own consultation documents. Such options include:

- reduction and/or manipulation of water supplies beyond the closures already instituted, to create water-free "refuges" from elephant impact, increased heterogeneity of wildlife habitat and thus increased biodiversity
- increasing the size and heterogeneity of protected area estate through the encouragement of linkages to the adjacent Limpopo National Park in Mozambique,
- deterrence methods (including buffer – burned or cleared – strips in areas bounding areas of habitat deemed in need of special protection,
- erecting elephant-proof fencing around areas deemed in need of special protection,
- development of community wildlife "buffer areas" in lands adjacent to the Kruger Park to the east (reducing the "hard edge" effect of the boundary fence and creating opportunities for wildlife-related income generation), in line with international best practice,
- corridors to other protected areas in the region.

The threats to biodiversity have been exaggerated and while the risk of **permanent** damage is always **possible**, there is no evidence or models presented that it is **likely** or **imminent**, as is acknowledged within SANPark's own documents. Action is NOT required urgently to address such an issue.

The application of the precautionary principle is selective and misplaced.

# EXECUTIVE SUMMARY

1. This document
    a. Gives a brief review of values and scientific information relevant to the question of elephant management.
    b. Reports on the stakeholder consultation process currently being conducted by SANParks on the elephant management strategy,
    c. Gives an outline of a proposed elephant management approach for SA national parks under the management of SANParks - a process which is not yet complete and which will continue as part of the development of protected area management plans for those parks with elephants.
    d. Puts forward guidelines for consideration in drafting norms and standards for the management of elephants in protected areas.

2. The Biodiversity and Protected Areas Acts identify the conservation and sustainable use of biodiversity as values that must be maintained in South Africa's protected areas. Although the Protected Areas Act has not yet come fully into effect, SANParks is aligning its planning and policies to accord with the requirements of this new Act.

3. The scientific evidence shows that the interrelationships between elephants and other species of large herbivores and biodiversity are complex, and the outcome will vary depending on the characteristics of the protected area in question.

4. There is reason to expect that, in large unbounded systems which are minimally impacted by surrounding human development, population management of elephant and other large herbivore populations may be unnecessary. However in smaller protected areas, surrounded by transformed land, biodiversity is very likely to be degraded if population management is not practiced.

Kruger NP is large, especially with the addition of Limpopo NP and adjacent protected areas. If this is not large, what is?

5. Natural systems, whether small or large, are inherently complex and outcomes are difficult to predict. Scientific certainty regarding biodiversity losses will very seldom be attained until the

losses have actually occurred. Biodiversity losses are likely to be increasingly irreversible with the increasing transformation of surrounding land and isolation of protected areas.

6. In certain situations, for example the western boundary of the KNP, elephants at high densities tend to disperse, breaking fences and invading cultivations or allowing other species such as buffalo to leave the park. Buffalo carry economically important diseases such as foot and mouth and bovine tuberculosis which infect livestock and have a negative economic impact. Outbreaks of foot and mouth disease to the west of the Kruger National Park have increased in recent years, the current one having so far incurred approximately R93 million in direct costs to the state. Even at great expense (a fence of the most effective design would cost in the region of R37 million) it is not possible to maintain an elephant proof barrier on the western boundary of the KNP.

The claim that elephants at high density, are responsible for breaking fences and allowing the spread of disease and that culling to reduce density, is in this way, justified has a number of problems:

- The assertion ignores the fact that fences have not been maintained to operational standards by the responsible authorities. Preventive maintenance is much less costly than building a new fence or dealing with outbreaks.
- The cited cost of building the most effective fence (R37million) is less than 40% of the cited cost of outbreaks (R93million), thus actually representing a good investment in prevention. There is no evidence that such a fence would be ineffective as an elephant-proof barrier.
- It is possible to create a “fence protection zone” along the boundary inside the fence, of cleared area and/or elephant deterrence. It is NOT necessary to reduce elephant density over a large area to reduce pressure on the fence.
- It emphasizes the “hard edge” effect of an agricultural area immediately on the boundary of a protected core area, one solution of which would be a community wildlife “buffer zone” in line with the Biosphere Reserve concept.

7. A consultation process with relevant stakeholders revealed that stakeholders have a range of opinions on elephant management options, at least some of which are conflicting and irreconcilable.

   a. Groups promoting animal welfare or animal rights oppose population management by lethal means, advocating non-lethal means such as contraception.

   b. Groups in favour of sustainable use, and also a number of local community representatives oppose contraception on the ground of cost and the fact that it “wastes” the economic benefits that can be derived from animal products.

There are number of problems with this point:

- Sustainable use of protected areas does not **require** consumptive use; much economic evidence shows that non-consumptive use can generate more employment, infrastructure development and higher turnover than consumptive use.
- Use of elephant products derived from management for biodiversity purposes would be only a **windfall**, not a steady resource generating reliable income opportunities. As a means of social development, it is a short-sighted, and ultimately irresponsible, approach. The government of South Africa has many innovative social development programs in rural areas (e.g. Working for Water) and should be focusing on such integrated approaches, rather than wasting time and resources on the limited benefits from culling.
- Once reliance on elephant "products" became established in a local constituency, it would be difficult, in a democracy, to resist political pressure to maintain the supply. Indeed, it is entirely likely that pressure would build to increase such a supply. If managers decided that culling should be suspended, for biodiversity conservation reasons, there would be justified opposition from those who had become dependent on the resource.

c. Communities on the western boundary of the KNP currently experience occasional elephant-related impacts, and are acutely aware and apprehensive of the possibility of increased impacts if the elephant population remains uncontrolled.

This point relates to the "hard boundary" problem noted above. With a multiple use buffer zone, and/or effective fence management, this would not be a problem.

d. Government conservation agencies indicated a need to consider a solution that is practical and economically viable as they are faced with more challenges than just the management of elephants.

8. The precautionary principle, as formulated in Principle 15 of the 1992 Rio Declaration on Environment and Development, is central to conservation decision-making in the face of uncertainty. This states that: "*In order to protect the environment the PrecautionaryApproach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation*."

The interpretation of the precautionary principle used here is selective and biased in favour of killing elephants. It quotes the phrase "*threats of serious or irreversible damage*", but does not interpret this to define the level of "threat" faced by Kruger NP. There is (always) a finite possibility of serious or irreversible damage, just as there is a possibility that a large asteroid will destroy all life on earth, but the Strategy document

presents **no estimate of the probability** that such a result is likely or, indeed, imminent. All the evidence from similar systems elsewhere suggests that changes between woodlands and open bushlands are reversible, with historical and paleo-ecological precedent. It is further quoted that "*lack of scientific certainty shall not be used as a reason for postponing cost-effective measures…*" Opponents to culling are not requiring **certainty** as a prerequisite for a specific management action, but would suggest that **likelihood**, at least, should be demonstrated. It could be argued equally strongly that in there is a risk that elephant culling could result in serious damage to biodiversity in Kruger, by reducing habitat heterogeneity.

a. The Precautionary Principle has been called into question because it is subject to various interpretations. SANParks advocates the interpretation of Cooney (2004), whereby the Precautionary Principle is regarded as an approach to decision-making which requires (i) consultation with stakeholders to identify competing interests and values, (ii) science-based risk assessment of the consequences of decisions in terms of the range of stakeholder interests, and (iii) identification of the burden of proof.

Cooney was employed on the Precautionary Principle Project, supported by Resource Africa, noted advocates of consumptive use of wildlife. This interpretation of the precautionary principle is thus selective and biased in favour of consumptive use of protected area resources by a range of stakeholders.

b. Assigning the burden of proof is one of the most important ways in which the precautionary principle is given operational effect. This entails analysis of any proposed activity in terms of its implications and risks for the various interested and affected parties.

c. Where does the burden of proof lie in decision making on population management? It is not reasonable to place the burden on conservation agencies to provide 'proof' that population management is necessary to prevent loss of biodiversity. Because of the inherent uncertainty noted in point 5[1], this attitude to the burden of proof will be to the detriment of biodiversity conservation. It needs to be accepted as legitimate to apply population management as a precautionary measure to avert risks to biodiversity and/or community livelihoods. It would also be unjustified to apply the Precautionary Principle without mechanisms for learning from the experience; hence it should be applied as part of an adaptive management system.

[1] Natural systems, whether small or large, are inherently complex and outcomes are difficult to predict. Scientific certainty regarding biodiversity losses will very seldom be attained until the losses have actually occurred. Biodiversity losses are likely to be increasingly irreversible with the increasing transformation of surrounding land and isolation of protected areas.

As noted above, the term 'proof' should be extended to 'likelihood'. We suggest that there **are** a number of management options, in addition to simply killing elephants, that would reduce risks to biodiversity and/or community livelihoods. We also suggest that there is a risk that removing elephants could actually represent a risk to biodiversity.

9. The principle of sustainable use of biodiversity with tangible benefits for neighbouring communities is established in the Biodiversity and Protected Areas Acts, in recommendations of the 2003 V$^{th}$ World Parks Congress, and in the Addis Ababa Principles and Guidelines on the Use of Biological Diversity. To give effect to this we advocate that - given that a decision has been taken to control a population in a national park to avert risks to biodiversity or to the livelihoods of neighbours - it be accepted as legitimate to apply lethal rather than non-lethal population management in situations where economic benefits for stakeholders, amongst other considerations, can be derived from this course of action.

There is nothing in the Biodiversity Act that requires **consumptive** use. There is considerable evidence from economic case studies elsewhere that non-consumptive use has greater employment potential, much higher turnover and greater potential for adding value through additional investment and, in addition, does not depend on fluctuation in, or indeed biological productivity limits on, resource supply.

Establishing a linkage between management culling and social development can quickly become a case of "the tail wagging the dog", and restricts the managerial independence of the protected area authorities. When does "lethal management" for social benefits begin to lead the decision-making process, **even if it is not necessary** to protect biodiversity? Once the protected area becomes a production system with livelihoods dependent on it, similar to an agricultural system, then its decision-making options become inevitably compromised.

10. As indicated in 3 above[2], it is not possible to generalize regarding the risks to biodiversity conservation posed by elephants the question needs to be considered in the context of particular PAs. The values and interests of stakeholders, as well as the risks to those interests, are also specific to particular PAs. It is therefore necessary to consider the question of population management at the level of individual PAs in consultation with stakeholders in line with approved Norms and Standards. This is appropriately done in the course of revising protected area management plans as required by the Protected Areas Act.

[2] The scientific evidence shows that the interrelationships between elephants and other species of large herbivores and biodiversity are complex, and the outcome will vary depending on the characteristics of the protected area in question

11. It is recommended that application of lethal means, specifically culling, be approved as part and parcel of a range of options for the management of elephant populations. The implementation of culling should be informed by the application of adaptive management principles, while also not excluding the application of and learning from other viable management options.

The document is recommending not only that culling be approved as **one** of the range of options, but that it is the **preferred** option.

12. It is recommended that other management tools such as translocation, contraception and migration corridors be applied as medium to long term management interventions.

The methods listed are all about producing uniform elephant densities over large areas. There is no mention of methods to influence **local** densities, which are more likely to increase heterogeneity and biodiversity. One glaring omission is the control of waterpoints as a management tool. This is perhaps the single most important option for influencing the distribution, population dynamics and habitat interactions of elephants. There is also no mention of selective fencing or deterrence methods to reduce local elephant densities.

13. It is recommended that draft norms and standards for the management of elephants in South African PAs be compiled under the leadership of the Department of Environmental Affairs and Tourism and that points 8(b) to 9 and 11 above be considered for inclusion in these norms and standards. It is suggested that other national and provincial protected area agencies be consulted in the development of these norms and standards.

14. There are biodiversity concerns with regard to the management of elephants in the Kruger, Mapungubwe, Marakele and Addo Elephant National Parks and in the case of Kruger there is a grave risk of economic impacts resulting from disease spread. There is broad consensus that decisive action is required. It is therefore recommended that a decision on the use of culling as a legitimate option for management of elephants, and the approval of norms and standards should not be delayed beyond March 2006.

While there may be a general feeling that biodiversity issues are important, there is not a consensus that there is imminent danger and urgent need of action. The concern over livestock disease is surely best addressed rapidly by targeted action on improved fencing and, if absolutely necessary, creating a buffer zone in the vicinity of highest outbreak potential. Is it possible that the pressure for a sudden decision to have culling in place is to accumulate a substantial ivory stockpile in time for the next CITES CoP? Is there pressure from within SADC for South Africa to take a lead on culling, to make it easier for other states to follow suit?

# INTRODUCTION

This document has three purposes:

1. To report on the stakeholder consultation process followed so far by SANParks on the issue of elephant management in national parks and;

2. Based on SANParks' findings in the stakeholder consultation process, to put forward certain guiding principles and a decision-making framework for consideration as norms and standards for the management of elephants in South African PAs.

3. To put forward a proposed elephant management approach as informed by the current available knowledge.

Provision for norms and standards is made in terms of Chapter 1 Section 9 of the National Environmental Management: Biodiversity Act and Chapter 2 Section 11 of the National Environmental Management: Protected Areas Act. Given the divergence of stakeholder viewpoints and societal values surrounding the issue of control of mammal populations in protected areas, SANParks is of the view that national norms and standards would be of value in setting out guiding principles.

Decision-making on environmental/conservation problems should be informed by science but cannot be determined purely by science. It needs a broad societal response that incorporates the full range of value systems and social, technical, economic, environmental and political understanding. It is therefore appropriate to briefly outline some relevant values that are already established in national legislation, in international conventions, to which South Africa is a signatory, as well as in IUCN recommendations and resolutions. Thereafter, the underlying scientific considerations have been given.

The first step in drafting a strategy for elephant management in national parks has been the stakeholder consultation.

# STAKEHOLDER VIEWPOINTS

Appendix 4 lists the major consultative meetings on the question of elephant populationmanagement that SANParks has held since 1994.

## 1. THE GREAT ELEPHANT INDABA

The most recent multi-stakeholder meeting was the Great Elephant Indaba held in October 2004. The proceedings have been published (SANParks 2005), and divergence of viewpoints expressed are given below. The names in parentheses refer to addresses delivered at the Indaba in which the relevant viewpoints were expressed.

### 1.1. Ethical and value considerations:

i. Concern that avoidance of elephant population management may lead to loss of biodiversity (H. Ebedes[3], R Thomson[4], R. van Aarde[5])

ii. Concern that the moral principles that underpin human rights should be extended to animals, that culling is unethical and inhumane and should never be used (M. Pickover[6], S Smit[7]),

iii. That contraception and other non-lethal control methods should always be preferred as being more humane than culling (M. Pickover, S Smit, N. Greenwood[8], A.Antonites[9]).

iv. Concern that population die-offs resulting from habitat degradation and starvation may be more traumatic for the animals than culling (H Ebedes, J Sturgeon[10]).

v. Concern that contraception may impact on the social well-being of elephants and may not achieve objectives (R van Aarde, M Masuluke[11]).

vi. Concern about spending resources using contraception, thereby wasting useful products that could be yielded by lethal population management (M Mjadu[12], R Thomson).

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[3] Hym Ebedes, Livestock and Animal Welfare Association
[4] Ron Thomson, SA Hunters and Game Conservation Association
[5] Prof Rudi van Aarde, Department of Zoology and Entomology, University of Pretoria
[6] Michelle Pickover, Justice for Animals
[7] Steve Smit, Justice for Animals
[8] Neil Greenwood, International Fund for Animal Welfare (IFAW)
[9] Prof Alex Antonites, Department of Philosophy, University of Pretoria
[10] Julian Sturgeon, Resource Africa
[11] Michael Masuku, Community Representative for communities surrounding Kruger National Park
[12] Mzwandile Mjadu, Community Representative for communities around Addo Elephant National Park

### 1.2. Concerns Regarding Economic and Livelihood Costs:

vii. Evidence from Chobe National Park that although elephants contributed to the removal of large tracts of riparian forest, it is currently smaller herbivores, e.g. impala that are responsible for preventing Acacia regeneration. This raises the risk that in some situations resources spent on elephant population management could be wasted (J du Toit[13]).

viii. Concerns regarding the economic costs of increasing elephant numbers on local communities (M Masuluke, R Bengis[14], P Lindeque, L. Rutina, C Jonga).

ix. Concern that decision-making on elephant management ignores the concerns and impacts on communities surrounding national parks with elephants (M Masuluke)

x. Plea that economic opportunities for communities should be created by maximizing benefits associated with elephant products or hunting opportunities (M Masuluke, R Thomson, P Lindeque[15], L Rutina[16], C Jonga[17]).

xi. Concern regarding the disease risk associated with elephant breakouts, for example the economic impact of foot and mouth and bovine TB in the areas adjoining the KNP, and the costs of fence maintenance (R Bengis).

xii. Concern that international outrage about elephant culling may seriously affect tourism (M Pickover, S Smit, H. Bertschinger[18]).

### 1.3. Summary of Feedback from the Working Groups:

Participants were divided into five working groups and tasked with formulating a short term and a medium term vision for elephant management in South Africa and the conclusions of each group are recorded in SANParks (2005). Specifically with regard to the situation in the KNP, three of the five groups reached consensus on elephant culling as being necessary and desirable to attain their proposed visions, whereas members of two groups could not reach agreement on an appropriate management approach.

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[13] Prof Johan du Toit, Mammal Research Institute, University of Pretoria
[14] Dr Roy Bengis, Directorate of Animal Health in the Kruger National Park, Department of Agriculture
[15] Dr Pauline Lindeque, Ministry of Environment and Tourism, Namibia
[16] Dr Lucas Rutina, Department of Wildlife and National Parks, Botswana
[17] Charles Jonga, Representative from Communal Areas Management Programme for Indigenous Resources (CAMPFIRE)
[18] Prof Henk Berchinger, University of Pretoria

# 2. CONSULTATION WITH COMMUNITIES NEXT TO THE KNP

## 2.1. Views and Opinions on the 1994/5 Proposed KNP Elephant Management Plan:

On 31 March, 1 and 5 of April 2005, community workshops were held in the Northern, Central and Southern regions of the KNP with the aim of bringing the proposal for Elephant Management in the KNP to communities for their comment and input. Communities were also asked to comment on potential options for the roll-out of benefits to their communities, should the plan be approved. Concerns, comments and suggestions were:

- Delegates from the Northern Region commented that when elephant numbers needed to be reduced in national parks, culling should be the management option of choice as it potentially holds the most benefit for communities.
- Delegates from all three regions in the KNP supported culling as the most practical option to manage elephants in the park.
- Delegates in the areas bordering zones of low elephant impact accepted the proposed zoning plan as they are confident that the impact of elephants on communities will be reduced by managing their numbers in these areas.
- Delegates from the Central Region (predominantly communities bordering proposed areas of high elephant impact) were divided in their comment on the proposed Elephant Management Plan. Although there was general acceptance of culling as the most practical option, the suggested zoning system was hotly debated and two points of view emerged:
    a) that the proposed high elephant impact zones would not reduce the impact of elephants on the community and that the zones should be realigned to have low elephant impact zones from north to south in the areas adjacent to communities to act as a buffer and limit damage and impact on communities.
    b) others felt that communities adjacent to high elephant impact zones could benefit from having high elephant concentrations, provided adequate measures are put in place for communities to safeguard themselves and the situation with regard to Damage Causing Animals (DCAs) is resolved so that communities can realize benefits.
- Other delegates felt there should be tight security along fences bordering communities adjacent to high elephant impact zones and that an increased number of rangers should be recruited to protect villages. These Rangers should be recruited from the local villages themselves as they would have a vested interest in doing the job well.

- Yet a third group felt that the fence should be strengthened and electrified and that barriers should be constructed across the rivers to keep the elephants out of the communities.
- It was also observed by delegates from the Central District that the proposed plan was a good news because while it allowed for culling and for communities to benefit, the zones of high elephant impact would please those who favoured uncontrolled elephant numbers.

## 2.2. Benefits for communities:

- The community should stand to benefit from the culling process in as many ways as possible and this could include:
    - outsourcing of various functions associated with the processing of the carcases
    - community canning plants or butcheries
    - processing, marketing and selling of bi-products
    - tusks and tusk carving.
    - bones and bone carving
    - elephant hair products
    - employment of community members to be involved in all aspects of the culling
    - process
    - training and skills transfer to communities
- Sourcing labour from communities for the implementation of elephant management activities was seen as being very important and could be a real benefit to communities.
- Delegates from the Central District made the point that communities expected real benefits from culling. The notion of meat over the fence is viewed as much too simplistic.
- Repeated calls were made for negotiations to ensure that DCAs become the property of the community so that real benefits can be realised.
- A suggestion was made that licences should be granted to communities to enable subsistence and trophy hunting of animals on communal land.
- Communities in the South recognised that there is a ban on international trade in ivory. They would however like to see a register kept, of elephants shot in communal areas, to ensure that communities will benefit from the sale of the ivory, in the event of the ban being lifted.
- Any money accrued as a result of benefits should be paid into a trust account and mechanisms put in place to ensure that communities benefit.
- The abattoir at Skukuza should be reinstated to produce meat, biltong and canned goods and the option of additional processing plants investigated in communities.

- Another group felt that it was not realistic to have these facilities in the communities as communities would not have the resources or skills to market the products effectively.
- The counter argument was that the training and skills development to run all aspects of the business should be an integral part of the project.
- The stomach contents of culled elephants should be made available to traditional healers and the remains used to manufacture compost.

## 3. CONSULTATION WITH THE SCIENTIFIC COMMUNITY

Appendix 3 summarizes the outcome of a three-day consultative workshop with the scientific community, and includes relevant information on the state of scientific knowledge. In preparation for this workshop a group of researchers undertaking field studies in the KNP conducted a detailed literature survey of the issues to be dealt with during the workshop. Many other researchers also made independent submissions on particular topics within their expertise. Over 300 pages of submissions were available for the participating scientists to use in the workshop.

An important outcome of the workshop was the agreement to establish a scientific reference group to re-examine and agree on all elephant-related Thresholds of Potential Concern (TPCs) currently set in the management plan of the KNP and to model them to establish the likelihood of their being exceeded. TPCs, established previously for the KNP in consultation with external scientists (Appendix 4), are defined as upper and lower levels along a continuum of change in a selected environmental indicator which, when reached, prompts an assessment of the causes which led to such an extent of change, and may result in management action to moderate such causes.

## 4. CONSULTATION BETWEEN SOUTHERN AFRICAN ELEPHANT RANGE STATES

The elephant range states of southern Africa met recently at the African Wildlife Consultative Forum hosted by the Zimbabwe NPWLMA. The primary purpose of the workshop was to reach agreement amongst the range states on a framework for regional elephant conservation and management strategy. There was recognition of:

- the need to accept culling as one of the management options, but that this should be decided within a framework of clear objectives set for specific areas, including a definitive description of the desired state in terms of specified ecological & socioeconomic thresholds or targets.
- the need to apply management measures in accordance with the principle of adaptive management, in the spirit of learning by doing.

A preliminary report on the outcomes of this Forum is attached as Appendix 5.

# PROPOSED ELEPHANT MANAGEMENT APPROACH

## 1. RELEVANT VALUES SET IN LEGISLATION, INTERNATIONAL CONVENTIONS, AND GUIDELINES

Chapter 3 Section 17 of the National Environmental Management: Protected Areas Act No. 57 of 2003 lists the purposes of protected areas, which include, among others:

- preservation of the ecological integrity of PA's;
- conservation of biodiversity;
- protection of South Africa's threatened or rare species;
- provision for the sustainable use of natural and biological resources;
- management of the interrelationship between natural environmental biodiversity, human settlement and economic development.

The Protected Areas Act takes guidance from the international Convention on Biological Diversity (CBD), to which South Africa is a signatory, in defining biodiversity as:

"*.. the variability from among all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes the diversity within species, between species and ecosystems."*

The Protected Areas Act thus identifies the conservation and sustainable use of biodiversity as central objectives of managing PA's. SANParks' biodiversity conservation values, which have been developed in sympathy with the above, are included in Appendix 1.

It is recognized (for example Recommendation 3.094 of the 3rd IUCN World Conservation Congress, Bangkok 2004) that where natural dispersal of large herbivores is constrained their populations may pose a threat to an area's biodiversity, and it may be necessary for agencies responsible for managing ecosystems to control those populations. This is particularly so in South Africa, where most protected areas are fenced and surrounded by areas that have been transformed to a greater or lesser extent by human development. Because of their propensity to alter their habitats elephants and other large mammalian herbivores often give cause for concern in this regard. Elephants are potentially difficult to confine within protected areas, and if they leave the area they are likely to pose a threat to the lives and property of neighbours.

It is further recognized that the control of large mammal populations is a source of concern to many people. Because of their charismatic nature the mega herbivores, especially elephants, tend to attract particular concern. Thus, the control of large mammal populations in protected areas is often a source of controversy, with widely divergent views among government, conservationists, neighbouring communities and animal welfare/rights groups. Policy guidelines are needed to provide a framework for decision-making by agencies responsible for protected areas.

Both the Protected Areas Act and the V$^{th}$ World Parks Congress (WPC), hosted by South Africa in 2003, urge protected areas to provide a sustainable flow of benefits to local communities. Recommendation 5.20 of the V$^{th}$ WPC calls on protected area agencies to mitigate human-wildlife conflicts. WPC Recommendation 5.29 urges that protected areas should strive to contribute to poverty reduction at the local level, and at the very minimum must not contribute to exacerbating poverty. In accordance with the principle of sustainable use, SANParks is permitted in terms of the Protected Areas Act to use natural resources to generate revenue for use in developing and managing national parks. Conferences of the Parties to CITES (COP11, COP12, and COP13) have allowed South Africa to trade internationally in elephant hides and goods made from elephant leather, and to sell accumulated ivory in a once-off sale to an approved trading partner.

The fourteen Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity, adopted at the 7$^{th}$ Conference of the Parties to the CBD, are also of relevance, in particular:

- Principle 11. Users of biodiversity components should seek to minimize wasteand adverse environmental impacts and optimize benefits from uses.
- Principle 12. The needs of indigenous and local communities who live with and who are affected by the use and conservation of biological diversity, along with their contributions to its conservation and sustainable use, should be reflected in the equitable distribution of benefits from those resources.

The draft National Biodiversity Strategy and Action Plan, drawn up by DEAT in consultation with stakeholders, sets the following objectives:

- Management plans for species and processes posing a threat to biodiversity must be developed and threatening processes need to be managed and controlled, to minimize the impact on biodiversity.
- Biodiversity management (including conservation, access, use and rehabilitation) must be integrated with poverty alleviation strategies and local economic development.
- Human development and well-being should be enhanced through sustainable utilization of biological resources and equitable sharing of benefits derived from biodiversity use.

# 2. OUTLINE OF SCIENTIFIC CONSIDERATIONS

## 2.1. Past and present scientific paradigms influencing management:

In all South African national parks with elephants, the populations are increasing at near maximal rates and currently show no signs of being limited by either density dependent or density independent factors. Populations cannot continue to grow indefinitely. Eventually food resources become limited bringing the growth rate to zero. Food and other environmental resources may be depressed at this level causing a decline in the carrying capacity and hence population size.

In the field of livestock production it is standard practice to set carrying capacities or stocking rates at levels which are compatible with maintaining the animal population in a productive state over the long term. The economic concept of carrying capacity tended to influence wildlife managers in southern Africa, where it became customary to set stocking rates for wild herbivores. Thus, before 1994 the 'elephant carrying capacity' in the KNP was set at around 7 500.

While the agricultural (economic) concept of carrying capacity might be appropriate for certain game farming situations, where the objective is animal production, it is not appropriate when the objective is to conserve biodiversity. As explained in more detail below, the maintenance of biodiversity is best achieved by permitting – or if appropriate actually encouraging - variation in time and space, rather than attempting to manage for stability. This realization led to a change in thinking, or "paradigm shift", in the scientific literature from the so-called equilibrium paradigm to the non-equilibrium paradigm (e.g. Mentis et al. 1989, Westoby et al. 1989).

In the revision of the Management Plan for the KNP of 1995-96, the maintenance of biodiversity was set as the main objective (Whyte et al. 1999) and the notion of a constant carrying capacity of 7500 elephants was abandoned as being incompatible with this objective. The new elephant management plan aimed at promoting spatial and temporal heterogeneity by applying elephant population management within specific zones in the park (Whyte et al. 1999, Whyte et al. 2003). Other management interventions applied in the KNP with the aim of promoting heterogeneity are listed in Appendix 2.

On the basis of the shift from equilibrium to non-equilibrium paradigms, Gillson and Lindsay (2003) question the rationale for the control of elephant populations in southern African countries as put forward in the context of CITES, which they believe to have been based on the equilibrium paradigm. They state that population management is "nearly always avoidable except perhaps in the rare cases of very small enclosed reserves."

As noted above, the managers of the KNP abandoned the equilibrium paradigm in favour of the non-equilibrium paradigm a decade ago, but nevertheless believe population management of elephants to be necessary (Whyte et al. 1999). The critical question is: how big must a protected area be before managers can safely avoid population management? The question of spatial scale is critical and this is examined in the light of current knowledge in the following section.

This section rightly describes the paradigm shift in conservation from an "agricultural", production system approach towards an ecologically based appreciation that variability in space and through time produces resilience and greater biodiversity. It emphasizes that the notion of a **constant carrying capacity of 7500 was abandoned as incompatible with biodiversity conservation**.

However, the reference Gillson & Lindsay (2003) is misquoted. It is said that these authors state that population management is "nearly always avoidable…". The original reference said that **culling** is nearly always avoidable, and they discuss a range of other population management options that can be used to good effect if elephant density becomes a concern.

### 2.2. Current scientific understanding of the impact of elephants on biodiversity:

Because of their large size and high food intake elephants can change both the species composition and the structure of the vegetation. There are examples from the scientific literature which show that habitat changes brought about by elephants can create conditions which favour certain species of plants and animals. Equally there are examples of species being negatively affected as a result of the impact of elephants (see for example Whyte et al. 1999, 2003;Western and Gichohi 1989; Cumming et al. 1997; Cumming and Jones 2005) .

This paragraph is biased, in noting, **but not citing**, examples from the scientific literature that show elephants can create conditions that favour certain species, and then citing examples of species negatively affected. However, a number of the latter references are in unpublished, rather than peer-reviewed, reports (e.g. Whyte et al 1999, Cumming & Jones 2005), while others (e.g. Western & Gichohi 1989) can be challenged on methodological grounds.

Given the present state on knowledge it is clearly not possible to generalize regarding the impact of elephants on biodiversity, in some protected areas it may be unnecessary to manage the elephant population to maintain biodiversity; in others a *laissez faire* approach may lead to degradation.

It is undoubtedly the case that elephants feeding on plants may affect other species in the same habitats. This is an unremarkable ecological process that is pervasive and acknowledged as intrinsic to ecosystem structure and function; most species affect the abundance of most other species. There is a bias in this section in the way that changes in

response to elephant feeding are termed “degradation”, “severely reduced”, “heavily impacted” etc. These are not ecologically neutral terms and surely the ecological role played by elephants should be expected rather than the focus of alarmist hyperbole.

Given the lack of knowledge and the inherent complexity of natural systems, it is difficult to predict in advance whether degradation of biodiversity will occur in a particular park. However, as indicated above, spatial scale appears to be one of the critical factors, with degradation of biodiversity being highly likely, if not inevitable, in small confined areas.

For illustrative purposes we present the situation in Addo Elephant National Park, which is well-documented and useful to explain the underlying principles. In AENP elephant numbers have increased steadily since the proclamation of the park in the 1930s. It has never been considered necessary to control this population because it has been possible by land acquisition to enlarge the size of the park, especially in recent years. As elephant numbers have increased they have opened up the dense woody thickets, thereby bringing about a steady rise in the numbers of kudu, a species which favours open woodland, and a progressive decline in Cape grysbok and bushpig, which require dense cover (Knight and Hall-Martin 1994).

There is evidence that the abundance of a number of plant species, including endemic geophytes and succulent shrubs, and mistletoe species, has been significantly reduced by elephants (Midgley and Joubert 1991; Moolman and Cowling 1994; Johnson 1998; Johnson et al. 1999; Lombard et al. 2001). This was demonstrated by comparison of the vegetation within the so-called Botanical Reserves - which is enclosed by fences that keep out elephant and black rhino but allow smaller herbivores to enter – with surrounding areas that are accessible to all large herbivores in the park (Midgley and Joubert 1991; Moolman and Cowling 1994, Johnson 1998).. Significantly from the point of view of conservation, the plant species that were heavily impacted by indigenous elephants in the park were also severely reduced by livestock grazing on privately owned land surrounding the park – unprotected land. Those species that are particularly vulnerable to elephants comprise the bulk of the regionally endemic, Red Data Book and rare species associated with succulent thicket, and AENP is the only national park which contains this thicket (Lombard et al. 2001).

At the broad landscape level, the key to maintaining biodiversity over the long term, as indicated earlier, lies in spatial and temporal variability. In a heterogeneous habitat, composed of a mosaic of different patches, some of the patches will be heavily impacted by elephants and others will be avoided. The pattern of impacts will also change over time, for example after subjecting certain patches to heavy use the elephants may move away, allowing them to recover. Such a ‘shifting mosaic’ would be compatible with the maintenance of biodiversity (see e.g. Whyte et al. 1999). In terms of the AENP example, patches heavily utilized by elephants would be good for kudu, and other

species favouring open vegetation. Grysbok and bushpig would disappear from these localities, but this would not matter so long as sufficient dense habitat patches, avoided or lightly impacted by elephants, remained available for them, and also for the endemic geophytes and succulent shrubs.

In a landscape of large size there is likely to be sufficient diversity in terms of topography, soils, vegetation and microclimate to ensure the full range of habitat conditions necessary to maintain the biodiversity characteristic of the area. However, human development has destroyed natural habitat over vast areas, isolating and fragmenting the remaining patches. More so in South Africa than in neighbouring African countries, protected areas are increasingly becoming islands in a sea of modified land.

The important question is, how do elephants and other large herbivores adapt to the islands that constitute today's protected areas? Enclosed protected areas differ from open ecosystems in two important respects: dispersal is restricted and predation is often absent. Artificially confined populations often reach densities much higher than those in situations where dispersal is possible (Owen-Smith 1983). This is frequently, but not inevitably, followed by depletion of food resources and a crash of the herbivore population. The absence of predation is also likely to result in inflated population densities. In the case of elephants there is evidence that man has been a key predator since prehistoric times (Kay 2002, Surovell et al. 2005). The trade in ivory from the Limpopo valley, dating from as long ago as AD900, is well-documented.

How may atypically high large herbivore populations impact upon biodiversity? The example of AENP illustrates the risk of species losses. The high population densities that a megaherbivore species may reach under confined island-like conditions in effect constitutes a perturbation that may bring about the extinction of some of the rarer species in the protected area.

It is correctly recognized that heterogeneity is the basis of biodiversity in spatial terms, and that elephants promote such heterogeneity. However, it is stated that this process is not possible in present circumstances of restricted habitat for wildlife. This is true in the case of very small, isolated reserves, where intensive management including the fencing of Botanical Reserves, as described for Addo, should be advocated. In addition, there should be attempts to provide corridors to link such reserves with larger areas. But in the case of large reserves such as Kruger, less intensive management options become possible.

In terms of the examples given above from AENP, the grysbok, bushpig, mistletoes and endemic geophytes and succulents can be regarded as 'impact sensitive species' which are vulnerable in the face of persistent and accumulative elephant impacts. It has been argued (e.g. Gillson and Lindsay 2003) that localized high impacts of elephants, even to the point of causing extinctions of other species

in the system, is a natural phenomenon and should not be a matter of concern. However, this ignores the ever-increasing loss of biodiversity caused by habitat transformation by humans. The vulnerability of endemic plant species to both the elephants and other large herbivores in AENP and to livestock on the surrounding farms is a good illustration of this. Habitat loss is making it increasingly important for protected areas to maintain their complement of species as far as may be possible. This means that simply leaving nature to take its course would not be a sensible management option, indeed leaving a confined system to "take its course" would be unnatural. Active management intervention is therefore called for.

Gillson & Lindsay (2003) are misquoted again: the text above has them saying that "localized high impacts of elephants, even to the point of causing extinctions of other species in the system… should not be a matter of concern." In fact, they were talking about **localized** extinction in **parts** of ecosystems in the short term, noting that change through time was as important as heterogeneity in space in promoting biodiversity in a landscape. They did not "ignore… habitat transformation by humans", nor advocate letting nature "take its course" as the only sensible management option. The fact that the author(s) of the Elephant Management Strategy have chosen to misrepresent this reference here (and as noted above) raises serious questions about their objectivity and commitment to providing accurate advice to decision-makers.

The likelihood of biodiversity losses in the island situation may seem to imply that management should intervene to stabilize elephant populations, or at least to dampen fluctuations. However, as pointed out above, localized high densities of elephants need to beencouraged in order to maintain biodiversity. Maintaining elephant populations at an equilibrium level may in fact prevent heterogeneity of impacts in space and time, thereby losing biodiversity. It is for this reason that SANParks decided in 1995 to abandon its previous policy of keeping the elephant population of the KNP at around 7 500.

In the context of the KNP, SANParks believes that the best approach to maintaining biodiversity is to identify certain specific zones in the national park within which elephant numbers will be reduced (Whyte et al. 1999). Outside these zones elephant numbers should be left to fluctuate naturally. It is intended by this means to encourage the full range of elephant impacts necessary to maintain biodiversity. If elephant populations are left entirely alone and allowed to reach high levels then the entire park may eventually be subject to heavy impact, with no refuge for impact-sensitive species. The population management zones serve firstly as a 'safety valve', to simulate the effects of dispersal and/or predation, and secondly as a guaranteed refuge for impact sensitive species. The rationale for population management within specified zones is analysed by Owen-Smith (1983).

This paragraph of this section (p21) does not follow logically from the preceding discussion. Why are large elephant reduction zones "the best approach" to maintain biodiversity? As noted, waterpoint restriction will create refuges from elephant impact

and greater landscape diversity, while in AENP, fenced Botanical Reserves achieve the desired protection for "impact-sensitive species".

## 2.3. Conclusion on the role of science:

Although science should inform conservation decision making, the decisions are ultimately based on value systems. The divergence of views on elephant management arises primarily from completely different values held by different stakeholders. Scientific information cannot resolve these value differences. It is up to decision-makers to set the value systems that should be upheld in national protected areas.

Ecology is unlikely to become a predictive science (Cooney 2004). Uncertainty arises partly because of our limited understanding of ecosystem functioning. However even given near perfect nderstanding, uncertainty will remain because ecosystems are so complex and dynamic that outcomes will remain difficult to predict. A good analogy is the weather; despite good scientific understanding of weather patterns we remain unable to predict it with certainty. Consequently dealing with uncertainty from an imperfect knowledge base is central to effective conservation decision making and management.

It is appropriate to point out the unreasonableness of demanding 'proof' that elephants will have a deleterious impact in a given protected area. Firstly 'deleterious' is a value judgement, and rational decisions and some measure of consensus can only be reached in relation to clearly stated and accepted values and associated management objectives. Secondly experimental proof of negative impacts will only be at hand once the impacts have occurred, which is undesirable as they are likely to be difficult to reverse or irreversible.

This section correctly notes that science should inform conservation decision-making, but that broader value systems must also be brought into play. It is important to be re-emphasize here the change in paradigm in conservation, from an agricultural, fixed-equilibrium, command-and-control approach towards a non-equilibrium approach that accepts and encourages variation in space and through time.

Much is made of the uncertainty inherent in ecosystem dynamics, as if this presents a problem for 'proof' that elephants' effects on ecosystems will be deleterious. However, if the non-equilibrium paradigm is truly accepted, then the issue is **not proof but probability**. How likely are irreversible changes, given what is known about the changes seen in a wide range of ecosystems? A more reasonable approach is to expect that systems may move from one more-or-less "stable state" to another (and back), and to work to identify the conditions that attend the transition between such states.

# 3. DESCRIPTION OF METHODOLOGY AND OPTIONS FOR CONTROL

The following options for managing elephant, not all practical or desirable, were identified at a consultative workshop on elephant management with the scientific community (Appendix 3).

2. Do nothing (*laissez faire*), with or without additional information collection.
3. Expand elephant habitat by:
    a. increasing the size of national parks;
    b. providing corridors for dispersal to elephant “sinks” (e.g. hunting zones);
    c. removing barriers to dispersal (fences) that currently surround national parks.
4. Restrict elephant habitat within parks by closing water points permanently or cyclically thereby increasing mortality of juvenile elephants by forcing them to travel longer distances between sources of water and foraging areas.
5. Introduce biological control in the form of predators or diseases.
6. Protect sensitive areas by excluding elephant from them as is the case in AENP.
7. Increase mortality to reduce population growth rate and/or size. The main options are:
    a. culling (full culling or selective),
    b. allowing hunting and
    c. failing to control poaching.
8. Reduce birth rate by contraception to effect, in the long term, a reduction in population growth rate or size.
9. Translocation of elephants from an over populated, to a less populated, area.

# 4. SUMMARY OF RISKS AND BENEFITS TO STAKEHOLDERS

The SANParks consultation process showed that the values held by stakeholders on the issue of lethal population management are highly divergent, varying from total opposition to active support on a variety of grounds, including sustainable resource use, averting population crashes through starvation, or risks to biodiversity. The stakeholder interests are not easily reconcilable, it is inevitable that whatever management option is chosen, one or more value systems will be transgressed, and the consequence is likely to be a feeling of alienation or even outrage on the part of those whose values have been transgressed.

Regarding economic and livelihood risks two main concerns were voiced in the consultation process:

(i) the risks posed by dispersing elephants to neighbours and

(ii) the possibility of declining tourism as a result of either outrage over elephant culling or degradation of parks through excessive elephant impacts.

Fence breaks are currently fairly frequent on the western border of the KNP. As the elephant population increases breaking will increase as the animals disperse in response to habitat degradation. As made clear by community representatives participating in the Indaba and during the community consultation process, the risks posed by elephants are a reality; incidents of damage to property are not uncommon, and a few lives have been lost. Both SANParks and provincial conservation authorities frequently need to shoot damage causing elephants in the areas outside the park.

Bengis (2005) outlined the disease concerns associated with the elephant issue on the western boundary of the KNP. Fence breaks by elephants allow other species to leave the park, including buffalo which carry economically important diseases (with adverse economic impact) such as foot and mouth, bovine tuberculosis, theileriosis or brucellosis. The available evidence strongly suggests that the disease problem to the west of the KNP is associated with the expanding elephant population in the KNP. From 1983 to 2000 there were no outbreaks of foot and mouth disease in this region, since 2000 there have been four (2000, 2001, 2003 and 2004), all of which have been associated with fence breaks which allowed buffalo to come into contact with cattle. The case of the 2000 outbreak was brought about by the floods in the year 2000 which swept away fences. In the other three cases the evidence points to elephants as the cause of the fence breaks. Recent estimates indicate that over 90% of fence breaks are

caused by elephants (R Bengis, personal communication[19]). The last outbreak of foot and mouth disease in the Letaba District west of Phalaborwa resulted in approximately R93 million in direct costs to the state. If the outbreak goes beyond the control zone South Africa may lose its zonation status resulting in a prohibition of export of all animal products (red and white meat, hides, bone meal, dairy products, etc) - a massive economic loss for the country (estimates not available).

The western boundary fence of the KNP extends over 300 km and is crossed by numerous rivers, streams and drainage lines which are subject to annual flooding. In the experience of SANParks the fence design most effective in keeping in elephants is the so-called Armstrong fence that has been used since the early years of AENP. To construct an Armstrong fence along the western boundary of the KNP would cost in the region of R37 million, a figure which is currently completely beyond the means of SANParks with all its competing priorities. Such a fence could not be extended over rivers or streams. Thus, even at enormous cost, there is no question of maintaining an elephant proof fence on the western boundary of the KNP. Recently local community members have been employed by SANParks, using poverty relief funds, to assist with fence maintenance and the reporting of fence breaks. This is of great value in creating employment and increasing the amount of information on the rate and causes of fence breaks. Although the participation of community members in fence maintenance reduces the risk by shortening the reaction time to a fence break, it is not a complete solution in that it cannot eliminate fence breaks.

The human-wildlife-livestock disease interface in this region is a very complex problem with considerable risk to both the state and community livelihoods. Consultation with communities showed widespread awareness, concern and apprehensiveness on this issue. Elephants are only one part of this complex problem but it is likely that the elephant population in the KNP will increasingly exacerbate the risks if it is allowed to continue expanding. Population management within the KNP as a means of alleviating risks to neighbours is preferable to the reactive approach of dealing with animals only once they have left the park and caused damage or brought about the spread of disease.

The possible risks for tourism were voiced by a small number of participants in the consultation process. Some predicted that outrage over lethal population management would harm tourism. Others felt that extensive habitat transformation by elephants, in particular the

[19] Dr Roy Bengis, State Veterinarian, Directorate of Animal Health, Department of Agriculture, Skukuza)

loss of tall trees, could be perceived as degradation and have a negative effect on tourism. These viewpoints are speculative; there is no clear evidence to indicate either way what the impact on tourism may be. Certainly there was no tourism boycott of the KNP during the period when elephant culling was conducted.

A number of stakeholders, in particular representatives of local communities, advocated the realization of economic returns from elephant products. There is significant potential for returns; Cumming and Jones (2005) estimate that the sustainable use of elephant products can potentially contribute US$ 200-300 per square km per year towards the costs of managing protected areas.

# 5. KEY PRINCIPLES UNDERLYING DECISION-MAKING UNDER CONDITIONS OF UNCERTAINTY:

## 5.1. The Precautionary Approach:

Protected areas with elephants and other large herbivores constitute highly complex systems, set within even more complex systems of human land use patterns, influenced by a great diversity of economic, cultural, ethical and social interests and viewpoints. As a result of this complexity, the impact of elephants - whether on biodiversity or on stakeholder interests – will seldom be fully predictable in advance. It is always necessary to make decisions on the basis of incomplete information, in situations where the likelihood of different outcomes and risks are difficult to establish and in which preparedness to tolerate risks will vary between stakeholders depending on their value systems.

The Precautionary Principle is relevant to situations where decision making is required in the face of uncertainty This Principle is incorporated into the CBD, numerous other international conventions e.g, CITES, the Cartagena Protocol on Biosafety, and the national legislation of many countries, including South Africa's National Environmental Management Act. There are various formulations of the Precautionary Principle the most widely cited being Principle 15 of the Rio Declaration on Environment and Development (1992):

"*In order to protect the environment the Precautionary Approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."*

The Precautionary Principle is subject to confusion, and has to some extent come into disrepute, because it is susceptible to interpretation in a multitude of ways. However, a recent analysis by Cooney (2004) provides a rational basis for invoking the Precautionary Principle. Cooney advocates that the Principle be applied as an approach to decision making that entails:

1. A consultative, democratic approach to establish interests and values held by stakeholders, identification of possible conflicts of interest and competing objectives.
2. Identifying the options available in decision-making to achieve objectives
3. Conducting a science-based risk assessment to determine risks that the available options pose for the various stakeholder interests and values, focusing on the question of who bears the costs, especially the livelihood and economic costs
4. Analysis, in terms of the above, of where the 'burden of proof' lies, and what may constitute an appropriate decision.

The 'precautionary approach', applied in this way, does not necessarily result in a precautionary decision, but rather a decision based on consultation and recognition of competing interests and objectives (Cooney 2004).

Assigning the burden of proof is one of the most important ways in which the precautionary principle is given operational effect. Proponents of potentially harmful activities may need to demonstrate that such activities are safe and acceptable, rather than those opposing the activities required to argue that they are harmful (Cooney 2004).

Where does the burden of proof lie in the question of population management of elephants? It is often assumed, especially by those who oppose lethal population management on ethical grounds, that it is incumbent on conservation agencies to 'prove' negative impacts on biodiversity before applying control measures. As noted, ultimate proof only comes once biodiversity is lost. Hence insistence on assigning the burden of proof to those tasked with averting risks to biodiversity effectively renders their task impossible. Given the value placed on the maintenance of biodiversity in South Africa's new legislation, and the potential for economic returns for both communities and parks, it has to be accepted in principle that it is legitimate to apply population management as a precaution. We strongly advocate that the norms and standards for large mammal population management should make this clear.

In many situations in Namibia, Botswana, Zimbabwe and numerous other African countries elephants pose a threat to community livelihoods (SANParks 2005, Parker 2004). In South Africa this is true for the western boundary of the KNP. In such cases it is highly likely that if nothing is done about elephant populations, either neighbouring communities will incur substantial costs or else heavy demands will be made on the fiscus to maintain elephant proof barriers. This will increase animosity between the communities and conservation authorities. The appropriate precautionary decision should protect those at risk. In these cases there appears to be a good case for assigning the burden of proof to those who are against elephant population management rather than those who support its adoption.

However, it would clearly be contrary to the spirit of Cooney's (2004) interpretation of the Precautionary Principle to invoke it to apply population management as a matter of course wherever elephants may be found. There is evidence (for example Du Toit 2005) that in certain large ecosystems, remote from human development, it may be possible to reconcile unmanaged elephant populations with both biodiversity and human interests over the long term.

Thus the question of whether or not population management should be applied is context and situation specific, and needs to be addressed on the level of individual protected areas**.** A framework is required that allows decision-making to be made in accordance with the principles listed above for the application of the precautionary approach, namely consultation, identification of values and objectives, risk assessment, burden of proof. This is dealt with in the following section.

## 5.2. Adaptive Management:

Adaptive management is designed to produce information about the system being managed. This approach aims at achieving explicit objectives and outcomes, and emphasises "*learning by doing*" through careful monitoring of outcomes and continual refinement of the management approach as knowledge increases. SANParks advocates the application of the Precautionary Principle, as interpreted by Cooney (2004), within a framework of adaptive management.

# APPENDIX 3:

## Outcomes of the Science Workshop: 15-17 March 2005

### *ELEPHANT AND BIODIVERSITY AN EXECUTIVE SYNTHESIS OF CURRENT UNDERSTANDING OF THE ROLE AND MANAGEMENT OF ELEPHANT IN SAVANNA ECOSYSTEMS*

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## General

This whole summary is very disappointing. It is not an accurate reporting of the divergent views of the Luiperdskloof meeting and contains many outmoded ideas, mixing science with management in a way that indicates confusion and lack of understanding.

### Introduction

The SANParks mission and new Protected Areas and Biodiversity Acts mandate biodiversity custodianship in National Protected Areas and the need for co-operation with stakeholders in decision making. In October 2004 SANParks held The Great Elephant Indaba in which it consulted with over 200 stakeholders covering a very wide spectrum of interests. It was felt that scientific issues of the debate were not dealt with in sufficient depth at the Indaba and that the scientific community should be engaged separately. This document represents an executive summary of a workshop in which some 50 scientists, from a range of biophysical disciplines, discussed and synthesised current understanding of the role of elephants in ecosystems, and of their management.

Ecosystems are complex, dynamic systems that change in uncertain ways and our understanding of ecosystem functioning is limited. Dealing with uncertainty from an imperfect knowledge base is central to effective decision making and management. Environmental/conservation problems need a broad societal response that incorporates social, technical, economic, environmental and political understanding and value systems, each of which provides its own level of uncertainty. An uncertain knowledge base and a lot to learn are, however, not valid reasons for deferring decisions. The time frame of many problem issues is shorter than that for learning “enough” about them. The process of Adaptive Management, also called “learning-by-doing”, has been developed to deal with these problems in conservation and natural resource management.

**Elephant population dynamics**

In all South African National Parks, elephant populations are increasing at or near maximal rates and currently show no signs of being limited by either density dependent or density independent factors. Populations cannot continue to grow indefinitely. Eventually food resources become limited bringing the growth rate to zero, at which time the population is said to have reached ecological carrying capacity. Environmental resources may be depressed at this level causing a decline in the carrying capacity and hence population size.

There are a number of problems with this summary. It introduces the idea of "carrying capacity" and shows that the authors are muddled, mixing up parameters in population equations and their application to the real world. Very basic ecological theory uses the so-called "logistic model" of population growth, which has two parameters, growth rate (r) and carrying capacity (K). In a growing population, per capita food resources are steadily reduced, the health of individual animals declines, fertility and survival decrease, and r slows towards zero. When zero growth is reached, the population level is termed "ecological carrying capacity", the number K that can be sustained indefinitely by that level of food supply. However, the next statement departs from this theory: "environmental resources may be depressed at this level, causing a decline in carrying capacity and hence population size". This is re-defining K and leaves open the question: where is the new K – at what level will the population stabilize now? If populations interact with their food supply in this way, then it is better to replace the term K with the growth rate of the food population. In such a case, the term "carrying capacity" is no longer useful; it makes better sense to talk of "equilibrium" or a "stable state".

An additional problem with this summary is that the above analysis applies to stable environmental conditions. It has now been accepted, by most ecologists and some conservationists (and apparently by Kruger NP managers), that conditions are never stable, particularly in semi-arid savannas, and that food supplies for herbivores will fluctuate widely depending on rainfall. Thus, while there may be underlying relationships between the growth rates of plant and herbivore populations, the system rarely, if ever, sits at a single level. "Carrying capacity" becomes even less useful and the term has been abandoned under the new conservation paradigm.

Water distribution can become a factor regulating elephant populations if water points are far enough apart that individuals, especially calves, cannot balance their food and drinking water requirements during times of drought. Elephant need to drink at least every 2-3 days and this limits their foraging range to about 15km from water. The provision of artificial watering points in National Parks has essentially eliminated water as a population regulation mechanism.

Which is why we recommend closure of water points in all areas that did not originally have natural sources.

Past conservation policies have largely interpreted “ecological carrying capacity” as “stocking rate” (an agricultural interpretation) for a particular species, or species mix. Unfortunately, the figures used to define carrying capacity for elephants in National Parks have largely been guesstimates and have not been tested scientifically, or by adaptive management. Carrying capacity is a difficult number to pin down in wild populations subject to variable environments. Elephant populations in savanna regions elsewhere have attained regional densities of up to 3 animals per km2, meaning that KNP's population could reach as high as 50-60 000 elephants.

“Stocking rates” defined in commercial agriculture are based on maximizing productivity of cattle for rapid turnover and sales. At such levels, population growth rate is at its highest and the population is far from “ecological carrying capacity”. This is just one reason why it is a mistake to apply “stocking rate” thinking to conservation of ecosystems, which are not about maximizing productivity, but maximizing population sizes or some other goal of community structure. It is indeed the case that past designations of carrying capacity, for elephants and **all other wildlife species in Kruger**, have been based on guesstimates, which were not based on scientific theory, nor were ever subjected to validation against theory. They were based on aesthetic judgements of habitat structure, which was in turn a result of the removal of elephants from the ecosystem by ivory hunters.

“Carrying capacity” can NEVER be pinned down, nor should it be, since the populations themselves should be allowed to vary in line with environmental variability. The suggestion that elephant numbers in Kruger could reach 50-60,000 is based on a uniform density across the whole of Kruger – is there ANY scientific reason to think this is likely? And if so, then is there ANY reason to think this is problematic?

The main concern in National Parks is that vegetation will be severely altered by the time an elephant population reaches ecological carrying capacity, with a resultant highly deleterious effect on biodiversity in general.

As noted, the expectation that elephants will reach, stabilize at, and exceed carrying capacity is scientifically out-of-date and time should not be wasted on discussing it. In addition the terminology is not objectively scientific but value-laden. What evidence is given, what reason is there to fear that Kruger will be “severely altered” through elephants’ “highly deleterious effect on biodiversity”?

### Vegetation

The main influences of elephant on vegetation are ultimately expressed as: (1) A change in plant species composition (loss or gain of species or a combination) (2) A change in vegetation structure, usually manifest as a reduction in tall trees and/or change in the tree/grass ratio. Not all changes are negative. Elephants prefer some species over others and their influences are played out through the complex interaction of plant attributes (e.g. mode of reproduction, ability to sprout), plant community

processes (e.g. plant succession, competition between plant species) and ecosystem drivers (fire, drought, other herbivores). The outcome of these interactions can manifest differently in vegetation at different scales, and with different management histories. It is therefore often difficult, in specific situations, to separate elephant effects on vegetation from other disturbance drivers such as fire, drought and other herbivores.

There is general acceptance that past elephant impacts on vegetation in Africa must have been variable and patchy. Parts of the landscape would experience periods of high impact leading to reduced woodland and more grassland. Elephant would then move on to other areas providing opportunity for woodland "recovery". The African landscape would then consist of a mosaic of patches of different stages of elephant impact and vegetation "recovery". A general principle is that the reduction of woodland (to shrubs and/or grassland) by elephant occurs much faster than recovery in their absence.

While it is correct to accept that past impacts are likely to have been variable and patchy, there is no evidence for the model that elephants necessarily would convert one area of woodland to grassland and then "move on". Much variability could have occurred *in situ*: Such effects could have been localized and persistent near water, while more diffuse elsewhere, droughts or extended dry periods could have dramatically reduced elephant populations and allowed plant populations to change. Different elephant populations could have been in different phases of growth and decline, and dispersal between them could have occurred.

There is no general acceptance that woodland reduction necessarily occurs more quickly than "recovery" – there are many fast-growing tree species, such as marula or various acacias, while other species can tolerate elephant browsing by coppicing into shrubby growth form and can rapidly emerge as canopy height trees when browsing is reduced.

It is generally agreed that no South African National Park is large enough to naturally accommodate such spatially and temporally patchy fluctuations in elephant and vegetation.

There is no general agreement that no South African National Park is large enough to accommodate spatially and temporally patchy fluctuations. Kruger is plenty large, especially with the linkages in the Limpopo TFCA. If the managers can take seriously their stated intention to increase heterogeneity, and shut waterholes in all areas that were previously water-free, then there is every reason to expect that elephant-habitat interactions can be successfully accommodated.

## Biodiversity

Biodiversity composition (e.g. number of species), structure (e.g height of trees) and function (e.g nutrient cycling) are expressed across the range from genes to ecosystems and landscapes. Past conservation research concentrated on individual wildlife species while management focussed on manipulating their populations by culling, fire, water provision, reintroductions and translocation. Understanding of biodiversity and its conservation remain largely untested in African savannas.

Ecologists recognise that elephants are important agents of positive and negative biodiversity change in ecosystems. The list of positive consequences of elephant activities for biodiversity is extensive but it has been little studied. Broadly speaking these positive consequences seem to outweigh the negative consequences at “low” densities of elephant. What these low densities represent will differ from region to region and vegetation type to vegetation type. They have not been quantified and will be considerably lower than ecological carry capacity.

There is ample evidence that high levels of elephant activity can, and has, had deleterious effects on biodiversity, at least in some patch types of our National Parks, and that increased elephant impacts will eventually have a deleterious effect on biodiversity in general.

This is simply not true. There have been a small number of studies suggesting that elephants may have localized negative effects on some species, but other studies show different results. There is no reason to believe that the general effect is deleterious.

Elephants prefer to feed near water and this concentrates the influence of their activities around water points, especially during the dry season and droughts. The number and distribution of water points, and hence the area of elephant influence (piosphere), in the landscape can have important implications for the distribution of elephant impacts. As water points become closer together and elephant numbers/impacts grow, piospheres will begin to overlap thereby homogenising the landscape. At greater and more variable distances between water points, disturbance variability and landscape heterogeneity are enhanced.

Not all components of biodiversity found in ecosystems without elephant can continue to exist under the disturbance regime provided by elephant. Some will be lost, some will be reduced but others will be increased. The issue, therefore, is do these effects matter to the conservation effort at this stage, and if not, when will they matter?

New biodiversity legislation presents some conflict with the past focus on carrying capacity because it concerned only large mammals and how much food they needed. It did not take any biodiversity, aesthetical, or other values of the ecosystem into account. The numbers of animals at which changes

in biodiversity, or aesthetic appearance of a landscape, occurs will be much lower than that for the ecological (food availability) carrying capacity. The "biodiversity carrying capacity" of a park has yet to be quantified but it would not represent a single number or duration of impact. It would have to consider spatiotemporal scales and flux in numbers, impact and recovery periods.

### Management options

Six options for managing elephant, although not all practical or desirable, exist:

(1) Do nothing (Laissez faire). (2) Expand conserved elephant habitat. (3) Restrict elephant habitat within parks by excluding elephant or closing water points. (4) Increase mortality by culling, hunting, biological control through disease management, or failing to control poaching (5) Reduce birth rate by contraception. (6) Translocate elephants to less populated areas.

There are many issues that must be taken into account when weighing up the different options. (1) **Costs/Benefits** in short and long term. (2) **Feasibility**: Technical, Physical, Legal, Logistical (3) **Ethics:** Does it fit with SANParks values. (4) **Social**, **Political** and **Legal** considerations. **(5) Environmental/Biodiversity Consequences** (6) **Institutional and park image**

### Elephant Management in Kruger

Past management in the KNP (and AENP) invoked the ecological carrying capacity "rule". Managers strived to keep the elephant population growth rate at zero with 0.35 elephant per square km. Currently the KNP elephant population is growing at approximately 7% pa. This means that doubling time is about 10 years and that there will be about 20 000 and 30 000 elephants in 8 and 14 years time respectively. Different landscapes of KNP and AENP are differentially used by elephant and "carrying capacity" by any definition will differ with landscape vegetation and type. It is therefore difficult to know how close the KNP ceiling of 7000 elephant was to any of the carrying capacity measures, and this is probably a moot point under the current biodiversity mandate.

Extrapolation of elephant population growth at a fixed increase rate of 7% p.a. for 14 years is unrealistic, and indeed runs counter to earlier points suggesting that as density increase, growth rate slows. It is correct to note that "carrying capacity measures" are a moot point under the current biodiversity mandate – why were they discussed earlier in the report?

The current elephant management plan was developed in 1997 by an eminent body of scientists. After considering many different options it was accepted as a workable plan directed at adaptive biodiversity management. The plan is not about culling but about managing elephant numbers, through a range of

possible interventions, to achieve explicit adaptive management and biodiversity goals. Contraception is not one of the options as it does not fit the KNP objectives or value system.

It should be about neither culling or managing elephant numbers; rather it should be about biodiversity targets on a landscape level, and allowing for change through time.

Why does contraception not fit KNP objectives or value system? There is no logic or explanation in this statement.

Although no conservation targets (Thresholds of probable concern) have been exceeded in the KNP + 90% of scientists at the meeting believed they will be if elephant numbers continue to rise. About 60% of scientists accepted that the precautionary principle could be invoked to cull elephants to reduce population size because other options would not solve the problem. The precautionary principle is, however, largely a value judgement suitable for data poor situations and current ecological knowledge and modelling expertise could improve decisions.

The great majority of the scientists at the meeting were Kruger staff, with a history of supporting the previous culling programme. To simply report a percentage figure, as if the correctness of ideas depends on a democratic vote, is to mis-represent the scientific process.

It is interesting that this percentage supporting the precautionary principle was much lower than the percentage on TPCs. It is also noteworthy that they recognized that the precautionary principle (PP) was best suited to data-poor situations and that **"current knowledge"** could improve decisions.

The KNP objectives, values and adaptive management process were endorsed as an innovative and detailed planning framework against which to convincingly examine the management plan and thereby lessen dependence on the Precautionary Principle. SANParks proposed that a credible reference group, that will give wide approval, should, within the current year:

1. Re-examine and agree on all elephant-related TPCs against all appropriate values.
2. Model these to explore whether exceeding the TCPs can be confirmed
3. If this study confirms that TPCs will be exceeded, refine current planned interventions and learning processes for implementation of an elephant management plan.

The workshop appeared to note that the KNP adaptive management process was sufficient to examine the management plan and lessen dependence on the PP, with a **credible reference group** recommended. It is strange, therefore, to see such prominence given to the PP in the main text of the SANParks report to the Minister.

## Elephant Management in other National Parks

Addo Elephant National Park is experiencing an expanding elephant population. The loss of rare endemic plants of the "valley bushveld" is a concern. A proposal to prototype contraception as a management tool is being developed.

Four different contraceptive methods have been considered by SANParks for controlling elephant population growth but only two have been tested in elephants per se. Many concerns regarding unwanted physiological and ecological side effects of using contraceptives have been raised. Any experiment or management action where the dynamics of a free-range population is manipulated using contraception, must include detailed studies of the potential physiological and pathological responses in contracepted individuals. All individuals and family units must be known and their behavioural responses tracked over several years of booster contraceptive application. Most importantly the experiment must also clearly have mechanisms in place to examine and monitor the biodiversity consequences of the population response as these are the prime target of conservation efforts.

The lack of clear biodiversity objectives and associated elephant management plans for Addo, Marekele and Mapungubwe National Parks did not permit an effective analysis of their proposals.

## Concluding statement

In accepting the SANParks proposal to re-examine all elephant related TPCs for the KNP, the workshop agreed to a credible process to further develop and scrutinise the KNP elephant management plan before finalising decisions. The proposal provides a way of taking “bite sized” steps on the way toward consensus on elephant management within a biodiversity context. The proposed learning process, steered by a “credible reference group”, satisfied the scientists at the workshop.

The workshop recognised the preliminary nature of proposals for management of elephants in the other parks. These proposals need to be formally placed within a biodiversity management context, with well considered objectives that meet SANPark’s mission and biodiversity value system.

A learning process, steered by a “credible reference group” was proposed. For a reference group to be credible, it should be inclusive of the range of opinion in society, or at least the scientific community. It is to be hoped SANParks and the Ministry will promote a truly credible group of this nature, in order to reach an informed consensus, not just a decision based on the entrenched perspectives of an “inner group” of technical people.

## Appendix II: Examples of statements used in recent media reports on the management of Kruger National Park's elephant population (Henley 2005)

Examples of statements used in the media with regard to the management of the Kruger National Park's elephant population. Online media releases that were consulted between March 2003 and March 2004 relating to this topic are listed below. (excerpts from: 'Considering more than elephants,' Michelle. D. Henley (Ph.D), Save the Elephants Transboundary Project, South Africa.

| DATE | MEDIA SOURCE | TITLE | DEFINITIVE PHRASES USED |
|---|---|---|---|
| 15 Mar 04 | Press release: Utrecht University, Netherlands | African elephant in danger of becoming victims of their own success | "..elephant populations have increased well beyond the carrying capacity…" |
| 16 Mar 04 | The Herald | Elephant cull "is the only way to stop catastrophe" | "..elephant populations were stripping reserves of natural vegetation and threatening other species." |
| 14 Apr 04 | United Press International | Thousands of elephants may be killed | "…keep their populations from growing beyond capacity." |
| 18 May 04 | US Newswire | Cull no answer to control Kruger elephants, says IFAW | "Last week the former head of conservation at the park suggested that recent fatal attacks by elephants on human beings might be triggered by stress brought on by overpopulation." |
| 24 May 04 | SABC News | Elephant culling could resurface at Kruger Park | "…that can only accommodate 7 000 of them." |
| 27 May 04 | News 24 | Kruger won't cull elephants | "The ideal elephant population for the Park is about 7 000, to prevent damage to the park's biodiversity." |
| 9 July 04 | Mail & Guardian | Canning Kruger's elephants | "…as scientists say there are too many elephants…" |
| 14 July 04 | Reuters | Past nuke test may unlock Africa ivory sales | "…far above the optimal number of around 7,000…" |
| 13 Aug 04 | Zimbabwe Independent | Zimbabwe to lead SADC jumbo team | "…which is twice the desired carrying capacity." |
| 7 Sept 04 | Inter Press Service | South Africa: To cull, or not to cull? | "… the problem of elephant overpopulation." |
| 20 Sept 04 | The Boston Globe | In southern Africa, too many elephants | "…elephants exceed the capacity of the land…" |
| 20 Sept 04 | Sunday Times | Radical plans to cut elephant overpopulation | "…the Kruger National Park can only accommodate 7 500 elephants…" |

| DATE | MEDIA SOURCE | TITLE | DEFINITIVE PHRASES USED |
|---|---|---|---|
| 14 Oct 04 | BauNews | Elephant debate not a ploy to reintroduce culling, says Mabunda | "…elephant population that is placing enormous stress on the biodiversity of game reserves." |
| 17 Oct 04 | Sunday Times | Elephants face cull as numbers rise | "Experts claim that there are too many elephants in the country's parks…" |
| 18 Oct 04 | News 24 | Elephants: vets offer help | "Scientists say this is well above what the environment can withstand…" |
| 20 Oct 04 | BauNews | Elephant debate heats up | "…to manage the country's oversized elephant population." |
| 21 Oct 04 | Reuters | South Africa weighs killing off excess elephants | ""We do have serious problem in terms of numbers of overpopulation…" |
| 22 Oct 04 | Mail & Guardian | SANParks reconsiders elephant culls | None (mention of the word 'carrying capacity' and the figure of '7 500' but merely in a historical context) |
| 23 Oct 04 | The Australian | A 'just war' no one wants | "…in an area that experts say should hold no more than 7000." |
| 25 Oct 04 | Pretoria News | Massive elephant culling on the cards | "reduce the vast over-population that is causing havoc …" |
| 3 Nov 04 | Business day | SANParks brews plan to cull elephant herds | "…reduce the "exorbitant" number of elephants…" |
| 22 Nov 04 | Ijnter Press Service News Agency | One park, three countries | "…but the park's capacity is just 7,000." |
| 13 Mar 05 | Reuters | South Africa edges towards culling elephants | "Kruger National Park is in crisis because of rising numbers of the world's largest land mammal…" |
| 15 Mar 05 | The Independent | Elephants in Africa return to the culling fields | "At Kruger Park, more than 13,000 elephants now populate the park, 6,000 more than the optimum level." |
| 20 Mar 05 | News 24 | Culling tourism boycott looms | "Kruger Park has more than 12 000 elephants and is overpopulated by at least 5 000." |
| 27 Mar 05 | Independent online | Kruger elephants head for Mozambique | "Kruger has about 13 000 elephants, and its maximum carrying capacity is set at about 7 000." |

## Appendix III-A: Legal opinion on SANParks' use of the precautionary principle

# Legal Opinion concerning the Use of the Precautionary Principle in South Africa's Elephant Management Strategy

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**November 17, 2005**

## I. Introduction

The *Report on the Elephant Management Strategy* (*EMS*) [1] provides a framework for decisionmaking regarding elephant population management in South Africa's National Parks. In particular, the *EMS* proposes "that application of lethal means, specifically culling, be approved as part and parcel of a range of options for the management of elephant populations."[2] To support this decision, the *EMS* relies on the precautionary principle[3] as it believes the principle is interpreted by Rosie Cooney's *The Precautionary Principle in Biodiversity Conservation and Natural Resource Management: An Issues Paper for Policy-makers, Researchers and Practitioners* (*Issues Paper*).[4]

This legal opinion concludes that the *EMS* fails to adequately reflect widely accepted understandings of the precautionary principle and/or mischaracterizes Cooney's *Issues Paper* in four significant ways:

- First, the precautionary principle is substantive, and not merely procedural as the *EMS* concludes. As various statements of the precautionary principle provide, including statements found in Principle 15 of the Rio Declaration, the Convention on Biological Diversity, the Convention of International Trade in Endangered Species of Flora and Fauna, and the United Nations Fish Stocks Agreement, the precautionary principle is understood to require measures that minimize or avoid environmental harm.

- Second, the precautionary principle commonly requires cost-effective measures or measures proportionate to the risk or chosen level of protection. The concepts of cost-effectiveness and proportionality are broad enough to include consideration of social, cultural, economic, and livelihood interests. Stakeholder participation and risk averseness are important means for ascertaining those

[1] Dr. David Mabunda, *Report on the Elephant Management Strategy* (Sept. 8, 2005)(hereinafter *EMS*).
[2] *Id.* at 7.
[3] *Id.* at 5, para. 8(a).
[4] Rosie Cooney, *The Precautionary Principle in Biodiversity Conservation and Natural Resource Management: An Issues Paper for Policy-Makers, Researchers, and Practitioners* 5 (2004).

interests, but they do not substitute for cost-effective or proportionate measures in a precautionary principle analysis, as the *EMS* suggests.

- Third, natural resource management (NRM) often requires more than one application of the principle because it often pits one environmental risk against another, creating a multiple-risk scenario. It further requires an assessment of the uncertainties surrounding those multiple risks. The *EMS* fails to assess risks to elephant populations due to culling or species dependent on disturbance regimes caused by elephants. The *EMS* also fails to identify a risk to biodiversity and more specifically a risk to biodiversity in any specific area caused by elephants.

- Fourth, application of the precautionary principle shifts the burden of proof to project proponents to show that their activity will not harm the environment or that cost-effective measures to minimize environmental harm will be taken. As such, the precautionary principle lifts the burden of proof from the shoulders of the environment and those who advocate for its protection. Nonetheless, the *EMS* specifically states that the project proponent in the case, SANParks, should not have the burden and that opponents of elephant management do.

This legal opinion evaluates the application of the precautionary principle in biodiversity conservation and natural resource management and, in particular, in SANPark's elephant management strategy. Section II summarizes the foundational elements of the precautionary principle as found in biodiversity-related international agreements and declarations. Section III summarizes the interpretation of the South African National Park System's *Report on the Elephant Management Strategy* (*EMS*). It also critiques the *EMS's* interpretation in light of foundational elements of the precautionary principle as well as Rosie Cooney's *Issues Paper.* Section III also draws upon the *Guidelines for Applying the Precautionary Principle to Biodiversity Conservation and Natural Resource Management* (*Guidelines*) as those Guidelines elaborate upon Cooney's interpretation of the precautionary principle. Section IV concludes that the *EMS* is neither an accurate reflection of the precautionary principle as understood generally in international environmental law nor of Cooney's *Issues Paper*.

## II. Background on the Precautionary Principle

The precautionary principle is an important tool for the development of environmental policy, because it guides decisionmaking in the face of scientific uncertainty. The precautionary principle is "concerned with taking anticipatory actions to avoid environmental harm *before* it occurs."[5] It emphasizes anticipatory actions because scientific certainty often comes too late—or not at all—to design effective responses to an environmental threat. For that reason, appropriate legal and policy responses must be in place before a project is undertaken.

More specifically, the precautionary principle provides that scientific uncertainty about potentially negative environmental effects should not be used as a reason for going forward with a project.[6] Said another way, decisionmakers should not use scientific uncertainty as a reason for not implementing measures that prevent environmental degradation.[7] Essentially, "precaution has

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[5] DAVID HUNTER ET AL., INTERNATIONAL ENVIRONMENTAL LAW AND POLICY 405-406 (2d ed., 2002) (emphasis in original).

[6] *See* David Freestone & Ellen Hey, *Origins and Development of the Precautionary Principle*, in THE PRECAUTIONARY PRINCIPLE AND INTERNATIONAL LAW: THE CHALLENGE OF IMPLEMENTATION 12 (David Freestone & Ellen Hey, eds. 1996) (noting that the precautionary principle recognizes that waiting for scientific certainty as to possible detrimental effects on the environment could lead to irreversible damage as well as cost inefficiency).

[7] As stated by Rosie Cooney, "Where there is uncertainty concerning the impacts of an activity, rather than assuming human economic activities will proceed until and unless there is clear evidence that they are

emerged as a broad principle weighing in favour of environmental protection in the case of uncertainty."[8]

The international community has embraced the precautionary principle through many international agreements and declarations. The most widely recognized statement is found in Principle 15 of the Rio Declaration:

> In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.[9]

International agreements on natural resources management articulate the same precautionary concept in slightly different terms. The Convention on Biological Diversity (CBD) notes that "where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat."[10] The Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)[11] provides that where scientific uncertainty exists the Parties should "act in the best interests of the species and adopt measures that are proportionate to the anticipated risks to the species."[12] The United Nations Fish Stocks Agreement most directly adopts the anticipatory approach envisaged by the precautionary principle. It includes language similar to the CBD,[13] but also requires Parties, as part of fisheries management, to set reference points that trigger previously agreed actions to prevent further harm to the fish stock.[14]

While using different language, these internationally agreed versions of the precautionary principle convey four fundamental ideas essential to implementation:[15]

- First, the precautionary principle does not lead decisionmakers to outcome-specific results in all cases, such as a ban on trade or a particularly kind of management.[16]

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harmful, the precautionary principle supports action to anticipate and avert environmental harm in advance of, or without, a clear demonstration that such action is necessary." Rosie Cooney, *The Precautionary Principle in Biodiversity Conservation and Natural Resource Management: An Issues Paper for Policy-Makers, Researchers, and Practitioners* 5 (2004).

[8] Cooney, *supra* note 4, at 5.

[9] Principle 15 of the Rio Declaration on Environment and Development (1992).

[10] Convention on Biological Diversity, *signed* June 5, 1992, *entered into force* 29 December 1993, 1760 U.N.T.S. 79, at preamble, para. 9. [hereinafter CBD].

[11] Convention on International Trade in Endangered Species of Wild Fauna and Flora, *signed* Mar. 3, 1973, *entered into force* July 1, 1975, 27 U.N.T.S. 243 [hereinafter CITES].

[12] Resolution Conf. 9.24 (Rev. CoP13), *Criteria for amendment of Appendices I and II.*

[13] United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks: Agreement for the Implementation of the Provisions of the Convention Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, Art. 6, para. 2, *signed* September 8, 1995, U.N. Doc. A/Conf.164/37, reprinted in 34 I.L.M. 1542-80 (not yet entered into force) ("States shall be more cautious when information is uncertain, unreliable or inadequate. The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures.") [hereinafter FSA].

[14] *Id.* at Annex II, "Guidelines for the Application of Precautionary Reference Points in Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks."

[15] Many scholars interpret the precautionary principle to convey other essential concepts, such as a certain heightened potential risk, as opposed to a merely negligible risk, but these interpretations are less relevant to this analysis.

- Second, although the precautionary principle does not dictate a particular outcome, it implies that the outcome of any decision-making process employing the precautionary principle should, at the very least, minimize environmental harm.[17] The Rio Declaration calls for cost-effective measures *to prevent* environmental degradation; CITES calls on Parties to act *in the best interests of the species*; the CBD calls for measures to *avoid or minimize threats* of a significant loss of biodiversity; the FSA calls for pre-agreed conservation and management action at levels consistent with previously agreed precautionary reference points.

- Third, most versions of the precautionary principle expressly state that all risk of harm need not be avoided at any cost. [18] The Rio Declaration calls for cost-effective measures; CITES calls for measures proportionate to the risk.[19]

- Fourth, the precautionary principle shifts the burden from the environment and environmental proponents to proponents of a proposed activity. Project proponents are generally required to ensure that measures are in place to minimize or avoid the threat of harm to the environment.[20]

Implementation of these four elements of the precautionary principle in the pollution context may differ from implementation in biodiversity conservation and natural resource management (together, NRM). In the pollution context, the question is whether, for example, to allow pollution or a certain amount of pollution. The only potential environmental harm at issue is the pollution.

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[16] *See* Freestone & Hey, *supra* note 6, at 12 (noting that the precautionary principle does not dictate specific results); Andre Nollkaemper, *What You Risk Reveals What You Value*, in THE PRECAUTIONARY PRINCIPLE AND INTERNATIONAL LAW: THE CHALLENGE OF IMPLEMENTATION 12 (David Freestone & Ellen Hey, eds. 1996) (indicating that the precautionary principle does not guarantee one particular outcome); Barnabas Dickson, *The Precautionary Principle in CITES: A Critical Assessment*, 39 NATURAL RESOURCES J. 211, 215 (1999) ("The Rio Formulation . . . makes no assumptions about what type of response is appropriate."); Cooney, *supra* note ___, at 5 (noting that, unless specified, the precautionary principle does not specify a certain decision).

[17] *See*, Ellen Hey, *The Precautionary Concept in Environmental Policy and Law*, 4 GEO. INT'L. ENVTL'L. L. REV. 303, 309–10 (1991–1992) (noting that the precautionary principle requires that society act to avoid future environmental degradation). Whether this requirement demands prevention, avoidance, or minimization specifically is debatable; for purposes of this article, IELP assumes it means at least minimization, which may entail, some level of mitigation.

[18] Where not expressly included, such a requirement is often read into most statements of the precautionary principle. *See id.* ("The precautionary concept does not insist that all risk of harm be avoided at any cost. Rather, it requires that society be willing to accept higher costs now in order to avoid the possibility of environmental degradation in the future."); Freestone & Hey, *supra* note 6, at 12 (indicating that the precautionary principle should lead to an efficient distribution of economic resources by incurring costs early to prevent the high costs of environmental degradation later).

[19] *See also* Commission of the European Communities, Communication from the Commission on the Precautionary Principle, COM(2000) 1, at page 4, para. 6 (Feb. 2, 2000).

[20] *See* DAVID HUNTER ET AL., INTERNATIONAL ENVIRONMENTAL LAW AND POLICY 406 (2d ed., 2002) ("Many commentators also argue that the precautionary principle acts to switch the burden of proof necessary for triggering policy responses from those who support prohibiting or reducing a potentially offending activity to those who want to continue the activity.").; Cooney, *supra* note4, at 29 (noting that many effectuate the precautionary principle by shifting the evidentiary burden to proponents of the activity); Warwick Gullett, *Environmental Protection and the Precautionary Principle*, 14 ENVT'L & PLANNING L. J. 52, 59 (1997) (suggesting that the a burden of proof shift is a "unifying feature" of most precautionary principle statements)

In the NRM context, however, decisionmakers face two or more possible environmental harms that require balancing the various harms. Actions to reduce one potential harm may increase the risk of another harm. For example, managers may thin a forest to reduce the risk of a forest fire. However, that thinning requires the elimination of some trees, snags, shrubs and other habitat on which certain species depend. If managers act with extreme caution to prevent forest fires, they risk harming a larger number of plant and animal populations. In contrast, if managers act to maintain species diversity at all costs, the risk of fire increases. This is often the crux of NRM: managers cannot eliminate all risks.[21] Where decisionmakers face uncertainty for multiple risks to biodiversity and natural resources, they may need to balance risks by applying the precautionary principle to each risk.

## III. The EMS's Interpretation of the Precautionary Principle

### A. The Report on the Elephant Management Strategy

The *EMS* describes the decisionmaking process of SANParks regarding elephant population management.[22] An overriding theme of the *EMS* is implementation of the precautionary principle. The *EMS* refers to Principle 15 of the Rio Declaration and adopts Cooney's interpretation of the precautionary principle.[23] The *EMS* describes Cooney's version of the precautionary principle as requiring (1) stakeholder consultation, (2) scientific risk assessment of various potential decisions, and (3) clarification of who bears the burden of proof.[24]

To implement stakeholder participation, SANParks has held consultative meetings since 1994 to bring all interests in elephant population management to the forefront.[25] From these meetings, SANParks developed a list of possible options for elephant population management, including doing nothing, creating habitat restrictions, increasing mortality rates either by culling or hunting, reducing population growth through contraception, and translocation.[26] The *EMS* then makes a case for immediate and definite elephant population reduction, describing the effects that elephants are purported to have on biodiversity.[27] However, the *EMS* does not indicate whether or not the effects on biodiversity are normal dynamic changes caused by elephant foraging. Finally, the *EMS* indicates that the burden of proof should be on those who are against elephant population management or those who are against the chosen method of population management.[28] The basis for this conclusion is twofold. First, because concrete proof in ecosystem and biodiversity contexts exists only when harm has actually occurred, the *EMS* argues that those tasked with preventing harm to biodiversity, *i.e* park officials, should not bear

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[21] *Cooney*, *supra* note 4, at 27–28.

[22] *EMS*, *supra* note 1, at 4. As stated the four main purposes include: (1) overviews the values and science relevant to elephant management in South Africa's National Parks (SANParks); (2) describes the ongoing stakeholder consultation process developed by SANParks; (3) outlines the proposed elephant management strategy for SANParks; and (4) establishes guidelines for draft norms and standards for elephant management. *Id.*

[23] *Id.* at 5.

[24] *Id.* at 6. Later in the *EMS*, the author suggests that Cooney's interpretation entails four elements: (1) stakeholder participation to identify various interests and competing objectives, (2) identification of options to achieve goals, (3) science-based risk assessment to determine risks of each available option and who bears the costs, and (4) determination of where the burden of proof lies. *Id.* 25–26.

[25] *Id.* at 9.

[26] *Id.* at 22.

[27] *Id.* at 22–24.

[28] *Id.* at 26. The *EMS* notes that "[t]the appropriate precautionary decision should protect those at risk. In these cases there appears to be a good case for assigning the burden of proof to those who are against elephant management rather than those who its adoption." *Id.*

the burden of proof.[29] Second, the *EMS* argues that because many local communities stand to bear the cost of a lack of population control and because these populations often support elephant population management, they should not bear the burden of proof either.[30]

The *EMS* concludes that the "precautionary approach" applied in this way, does not necessarily result in a precautionary decision, but rather a decision based on consultation and recognition of competing interest and objectives."[31]

## B. Analysis of the EMS's Interpretation of the Precautionary Principle

Simply stated, the *EMS* is neither an accurate reflection of the precautionary principle as interpreted in international legal documents nor by Cooney in her *Issues Paper.*

### 1. The Precautionary Principle is Substantive, Not Merely Procedural

The *EMS* concludes that the precautionary principle "does not necessarily result in a precautionary decision, but rather a decision based on consultation and recognition of competing interest and objectives."[32] Based on this assumption, the *EMS* makes no attempt to reach a substantive outcome. In doing so, the *EMS* misstates and misapplies both international law and Cooney's presentation of the precautionary principle. In fact, the precautionary principle calls on decisionmakers to adopt measures (1) that minimize or avoid environmental harm and (2) that are cost-effective or proportionate to the level of risk or the chosen level of protection.

***Measures to minimize or avoid environmental harm.*** While it is true that the precautionary principle does not demand a single, specific outcome, such as a ban, an export quota, or a specific kind of management plan, it does direct decisionmakers to a substantive outcome: the minimization or avoidance of environmental harm. The language of Principle 15 of the Rio Declaration makes this clear. The first clause of the first sentence reads: "In order to protect the environment." Thus, the purpose of the precautionary principle could not be clearer. Adoption of Principle 15 indicates that any obligation the precautionary principle imposes should be one that protects the environment. This is clearly an outcome standard, and, thus, application of the precautionary principle imposes more than merely a procedural obligation.

More specifically, and as discussed above in Section II, the Rio Declaration calls for cost-effective measures *to prevent* environmental degradation; CITES calls on Parties to act *in the best interests of the species*; the CBD calls for measures to *avoid or minimize threats* of a significant loss of biodiversity; the FSA calls for pre-agreed conservation and management action at levels consistent with previously agreed precautionary reference points. Scholars also describe the precautionary principle as requiring actions to avoid environmental harm.[33]

The *EMS* also misinterprets Cooney's *Issues Paper* as suggesting that the precautionary principle is merely a decisionmaking process based on consultation and recognition of competing interests. Page 1 of Cooney's *Issues Paper* states that the precautionary principle "provides for

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[29] *Id.* The *EMS* states that assigning the burden of proof to park officials would render their duty to protect biodiversity impossible. *Id.*
[30] *Id.*
[31] *Id.*
[32] *Id.*
[33] *See* Hey, *supra* note 17, at 309-310 (noting that the precautionary principle requires that society act to avoid future environmental degradation).

action to avert risks of serious or irreversible harm to the environment"; "Applying precaution will usually involve restrictions on human actions."[34]

Cooney does note that "[i]n some cases, precaution *may be seen* as imposing a procedural rather than a substantive requirement."[35] In this section of her paper, however, she is describing different ways in which precaution has been implemented at the national level; she is not describing the precautionary principle itself. In any event, she concludes this section with a strong endorsement of a substantive precautionary principle. She says that formulations of precaution that are merely procedural:

> leave ample scope for precautionary considerations to be ignored or overridden. It appears likely that the precautionary principle will often have little systematic impact on practice unless formulated as an obligation, and linked to a specified process or outcome standards developed on a sectoral basis, with respect to, for instance, specific species, fisheries, or protected areas.[36]

***Cost-effective measures or measures proportionate to the level of risk.*** The precautionary principle also calls on measures to be "cost-effective" or proportionate to the level of risk. Such a standard, while not prescribing a specific type of measure, is nonetheless an outcome standard.

For example, the Rio Declaration calls for "cost-effective measures to prevent environmental degradation measures." CITES, in the case of scientific uncertainty as to whether to list a species in the CITES Appendices, calls on the Parties to adopt measures that are proportionate to the anticipated risks to the species."[37] Similarly, the European Commission provides that measures based on the precautionary principle should be, among other things, "proportional to the chosen level of protection."[38] Cooney acknowledges that many versions of the precautionary principle incorporate "proportionality" or cost-effectiveness; the *Guidelines* state that measures should be "proportionate to the potential threats."[39] Implementation of a "cost-effective" or "proportionate" standard may be subjective, but it remains a clear component of the precautionary principle in international environmental law.

***The value of stakeholder participation in decisionmaking.*** Stakeholder participation in the decisionmaking process is essential to informed decisionmaking. Certainly, stakeholder participation provides decisionmakers with the most realistic view of competing values and objectives at stake. As such, stakeholder participation is important at early stages of precautionary principle implementation. In the context of the precautionary principle, stakeholder participation can help identify cost-effective or proportionate measures.

However, stakeholder participation is not a substitute for cost-effective or proportionate measures. Community involvement and stakeholder participation legitimate decisionmaking and identify the competing values and interests, but such procedures do not substitute for the substantive obligation to implement cost-effective or proportionate measures. Instead, such processes should inform decisionmaking regarding the cost-effectiveness of possible measures. For example, if a local community is likely to raid the resources of a park that is managed in a top-down fashion, then barring the local community from using the park's resources may not be cost-effective, because the park may need to deploy substantial resources to enforce the ban.

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[34] *Cooney*, *supra* note 4, at 1.
[35] *Id.* at 25 (emphasis added).
[36] *Id.*
[37] CITES, Resolution Conf. 9.24, Appendix 4.
[38] *EC Communication on the Precautionary Principle*, *supra* note 19, at page 4, para. 6.
[39] The Precautionary Principle Project, *Guidelines for Applying the Precautionary Principle to Biodiversity Conservation and Natural Resource Management* (*Guidelines*), at Guideline 10.

This type of consideration should be taken into account when deciding whether a particular measure is truly cost-effective.

In this regard, Cooney's *Issues Paper* provides insight into why stakeholder participation is valuable. For example, those who utilize, manage, and trade biological resources will "often be those most detrimentally affected by serious or irreversible harm" and consequently they may have valuable information for precautionary measures for managing those resources.[40] There is, indeed, "a strong case to be made for precautionary decision-making to incorporate the understanding and knowledge of traditional, indigenous or local resource users themselves."[41] Similarly, social, economic, development and other interests should be taken into account. However, Cooney never argues that deriving ideas from local people satisfies the need for cost-effective or proportionate measures. In fact, Cooney suggests that the "weight given to economic, social, livelihood and environmental factors in applying precaution will depend crucially on context."[42] All these factors provide important pieces of information that should be considered in addition to scientific knowledge when evaluating which measures may be cost-effective or proportionate,[43] but they do not substitute for such measures.

The European Community's *Communication from the Commission on the Precautionary Principle* (*Communication*) provides a good description of implementing cost-effectiveness in a manner that incorporates both stakeholder participation and risk averseness. The *Communication* states that "the measures envisaged must produce an overall advantage as regards reducing risks to an acceptable level."[44] It, thus, clarifies that absolute risk averseness is not a necessary outcome, but that a reduction of risk is necessary. It further suggests, however, that risks must be minimized in the context of not only an economic cost-benefit analysis but also in the context of non-economic considerations, which may materialize from stakeholder and public participation. Because it recognizes economic as well as non-economic considerations, the *Communication* suggests an appropriate model for determining cost-effectiveness in the NRM context.

### 2. The Burden of Proof Shifts to Project Proponents

The *EMS* interpretation of burden shifting is truly perplexing; it conforms neither to Cooney's interpretation nor common practice. The *EMS* states that "ultimate proof only comes once biodiversity is lost. Hence insistence on assigning the burden of proof to those tasked with averting risks to biodiversity effectively renders their task impossible." Thus, the *EMS* summarily concludes that "it is not reasonable to place the burden on conservation agencies to provide 'proof' that population management is necessary to prevent loss of biodiversity."[45]

The first problem with the *EMS* is its refusal to accept any burden at all. As noted in Section II, the precautionary principle shifts the burden from opponent of development to project proponents. As Cooney notes, placing the burden on the project proponent is a specific policy tool for implementing the precautionary principle.[46] The exact nature of the burden is often disputed but may entail identifying measures that minimize or avoid environmental harm from the proposed project.

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[40] Cooney, *supra* note 4, at 29 (stating that stakeholder participation "raises the potential for precaution to be implemented through local and community level resource and wildlife management, and to be conceived not only as an element in 'top-down' regulatory strategies.").
[41] *Id.* at 34.
[42] *Id.* at 36.
[43] *Id.* at 42.
[44] *EC Communication on the Precautionary Principle*, *supra* note 19, at §6.3.4.
[45] *EMS*, *supra* note, 1, at 6.
[46] Cooney, *supra* note 4, at 29-30.

Against that background, SANParks clearly does have the burden. It is the agency proposing that biodiversity must be protected from elephants. It justifies the culling of elephants based on the precautionary principle.

Second, the *EMS* suggests that SANParks should not have the burden because it could never meet its burden—the loss of biodiversity can be proved only after it has been lost. However, the project proponent does not need to prove that the harm will in fact occur. Because the precautionary principle expressly recognizes that there may be scientific uncertainty as to environmental harm, the first step in implementing the precautionary principle is to identify that a *risk* exists. Thus, SANParks must provide some indication that biodiversity is at risk. To the extent that SANParks believes that elephants cause that biodiversity loss, it must provide some indication that elephants are indeed causing the loss of biodiversity. The authors of this legal opinion make no judgment about whether elephants are in fact causing a loss of biodiversity. However, we note that the *EMS* does not appear to provide information upon which to make that assessment. Although the *EMS* includes some information about the possible impacts of elephants on other species, it is not clear whether that information relates to (1) habitat or species similar to those occurring in South Africa, (2) elephant populations of the same size. Further review of the literature referenced is necessary to determine the extent to which the *EMS* identifies a risk to biodiversity.

We do, however, agree with the *EMS* that application of population management "is context and situation specific, and needs to be addressed on the level of individual protected areas."[47] That is, whether population management is needed in any particular area will require specific biological findings that indicate that elephants are harming biodiversity. In that regard, the *EMS* has failed to show that any *specific* park or area is at risk of biodiversity loss (although possibly other documents do).

Third, the *EMS* fails to meet its burden of showing that measures will minimize environmental harm. As discussed more in the following section, SANParks has the burden of showing that its proposed measures will minimize harm to biodiversity and that they will minimize harm to elephant populations.

To the extent that the *EMS* relies on Cooney to support its position on burden shifting, the *EMS* mischaracterizes Cooney's analysis. Cooney does not suggest that a government agency proposing activities should not bear a burden simply because the burden is a difficult one to bear. Rather, she suggests that, *where project proponents* are poor, local communities, they should not be inequitably tasked with bearing a burden they do not have the resources to prove.[48] She also states that "[f]or precaution to contribute to, rather than conflict with, sustainable development, the burden of the precautionary principle must be borne by those most able to afford it."[49] Based on her interpretation, the *Guidelines* state that "either [the burden] . . . should be placed on relatively more powerful groups, or financial/technical support should be provided."[50]

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[47] *EMS*, *supra* note, 1, at 27 (emphasis in original).

[48] Cooney, *supra* note 4, at 38. Accommodating equitable concerns raises difficult issues for the precautionary principle that merit further discussion. The burden shifting in the precautionary principle was designed to protect the environment. To the extent that environmental concerns are pitted against the interests of poor people, poor people may be significantly disadvantaged. Where poor people are project proponents, they may have difficulties demonstrating that their project will not significantly harm the environment. In these cases, shifting the burden or providing technical and other resources may be justifiable. Poor, local communities may also oppose government and other projects. In these situations, they may benefit from the burden shifting. However, a rule that shifts the burden depending on the relative wealth or power of the parties may simply shift the debate to who is wealthier or more powerful at the expense of environmental protection. Perhaps it is possible for these concerns to be addressed under the rubric of cost-effectiveness.

[49] *Id.* at 37.

[50] *Guidelines*, *supra* note 39, at Guideline 8.

The *EMS* mischaracterizes Cooney's position in two ways. First, it fails to recognize that SANParks is, in this case, the project proponent. Thus, the precautionary principle places the burden on SANParks. Second, SANParks is the most powerful group in this process. To the extent that the government agencies like SANParks are the voice of poor communities, they are the financial and technical support the *Guidelines* suggest should help bear the burden of proof.

Instead, the *EMS* states that this "appears to be a good case for assigning the burden of proof to those who are against elephant population management rather than those who support its adoption."[51] To the extent that elephant population management may cause environmental harm, the burden is appropriately the proponent's, not the environment's or those who speak for the environment. This is the exact purpose of the precautionary principle. Neither Cooney nor international environmental law suggests the interpretation the *EMS* proposes.

### 3. The *EMS* Fails to Apply the Precautionary Principle to a Multiple Risk Scenario

Uncertainty is particularly pervasive in NRM. Because biodiversity is dynamic and complex, outcome predictions can be impossible or, at least, variable, making them highly unreliable.[52] In addition, NRM involves a choice of strategies with each strategy carrying distinct environmental risks—"the choice is between risk and risk."[53] For example, elephants, in large numbers, may pose a risk to plant diversity in a particular area; therefore, removal of some of the elephants may preserve biodiversity and avert an environmental risk. However, the removal of elephants, if undertaken by culling, will cause a separate environmental risk to elephant populations and to other species that depend on the disturbance regime created by elephants.[54] That is, NRM, due to its multiple environmental-risk potential, requires multiple, and often competing, applications of the precautionary principle.

While these multiple-risk scenarios are typical of NRM, the *EMS* does not characterize or evaluate its proposal in this way. As noted in the preceding section on burden of proof, the *EMS* appears to assume that there is harm to biodiversity and that elephants cause it. Moreover, it never analyzes the potential risks to elephant populations or species dependent on elephant populations.

Decisionmaking in NRM certainly presents decisionmakers with difficult policy choices. It is worth bearing in mind that it may not be possible in NRM to avoid all environmental harm; minimization of environmental harm may be sufficient. When minimizing environmental harm in multiple-risk situations, balancing risks will be necessary.[55] This balancing and the need to

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[51] *EMS*, *supra* note 1, at 26.
[52] *Id.* at 26.
[53] *Id.* at 27 (emphasis in original).
[54] Cooney describes a situation where a prohibition of medicinal plant harvest in a forest causes resentment and later opposition to further conservation efforts. *Id.* at 28. Although this may be a likely scenario, it does not capture the entire nature of multiple risks in NRM for two reasons. First, since the intent of the precautionary principle is some level of immediate environmental protection, Cooney mischaracterizes the risks in multiple-risk NRM as including community reaction. Second, because community reaction and its implications are important to NRM decision-making, they should be considered; however, they deserve consideration in determining the cost-effectiveness of various measures rather than as presenting opposing environmental risks. In other words, community reaction is essentially a cost, not a risk, when implementing the precautionary principle.
[55] *Id.* at 35. Cooney states that "[d]ecisions and management on precautionary grounds carry consequences not only for conservation, but for social, economic, development, food security, and livelihood interests. Implementing precaution will usually need to respond to and balance these frequently competing priorities and objectives." *Id.*

consider community interests should weigh into the cost-effectiveness of the various NRM options. Nevertheless, "[t]he weight given to economic, social, livelihood and environmental factors in applying precaution will depend crucially on the context," meaning that "it appears plausible that the more 'purely' conservation oriented a decision-making arena is, the 'harder' a version of precaution will be adopted, the less weight competing economic or social objectives will be given, and the less environmental risk will be considered acceptable."[56]

Several possible policy tools exist to assist with balancing different risks and competing interests and objectives, including ecosystem-based management, adaptive management, environmental impact assessment and risk assessment, among others. A central component of the precautionary principle, however, is the need to define threats, options, and consequences. Decisionmakers should recognize all threats, including direct and indirect threats, and they should identify all relevant options for addressing the threats and evaluate the consequences of each identified option.[57] The *EMS* clearly has not done this with respect to impacts on elephant populations.

The *EMS* proposes science-based risk assessment as well as adaptive management as its specific policy approaches.[58] As Cooney provides, however, while these approaches "can be implemented in a precautionary fashion, they do not necessarily translate to precautionary management."[59] The *EMS*, itself, does not provide sufficient information to gauge whether these approaches will lead to precautionary management. The *EMS* does not suggest that any risk assessment—a scientific determination of the risk posed—has been conducted.

Nor does the *EMS* summarize the monitoring and management measures through which SANParks will implement its adaptive management approach. Adaptive management is a rigorous management approach. As the *Guidelines for Applying the Precautionary Principle* state, adaptive management includes the following "core elements":[60]

- monitoring of impacts of management or decisions based on agreed indicators;
- promoting research, to reduce key uncertainties;
- ensuring periodic evaluation of the outcomes of implementation, drawing of lessons and review and adjustment, as necessary, of the measures or decisions adopted;
- establishing an efficient and effective compliance system.

On the other hand, the *EMS* does provide a summary of the results of the stakeholder consultations.[61]

## IV. Conclusion

The *EMS* fails to accurately reflect the precautionary principle as reflected in international environmental agreements and declarations as well as Cooney's *Issues Paper* for several reasons. First, despite many examples from international environmental agreements and from Cooney's *Issues Paper,* the *EMS* treats the precautionary principle as merely a procedural, rather

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[56] *Id.* at 28.
[57] *Guidelines*, at Guidelines 6 & 7.
[58] *EMS*, *supra* note 1, at 6, 27.
[59] Cooney, *supra* note 4, at 42.
[60] *Id.* at Guideline 12.
[61] *EMS*, supra note 1, at 22-24. Cooney notes that, in recognizing the multiple interests at stake, particular attention must be paid to the poor because the precautionary principle may deny wholly dependent people their way of life by denying them access and use of natural resources. Cooney, *supra* note xyz, at 29.

than substantive, obligation.[62] However, the precautionary principle calls for measures to minimize and avoid environmental harm. It also calls for cost-effective measures or measures that are proportionate to the potential harm. Although the outcome standard of cost-effective environmental protection is subjective and relatively discretionary, it does, nonetheless, require some analysis and suggests at least a baseline for a substantive result.

Second, the *EMS* suggests that neither local communities nor government conservation officials should bear the burden of proof. With respect to elephant management, however, SANParks is the project proponent and bears the burden to show that elephants are causing a loss of biodiversity and that the proposed policy to cull elephants minimizes harm to biodiversity and that it minimizes harm to elephant populations or other species that depend on elephants.

The *EMS*, from the outset, makes general statements regarding the role of elephants in harming biodiversity and, in particular, whether elephant culling will effectuate South Africa's biodiversity conservation policy. The *EMS* states that "it has to be accepted in principle that it is legitimate to apply population management as a precaution."[63] That is not necessarily true. To the extent that SANParks promotes culling as a means to stem the loss of biodiversity, it must identify elephants as posing a risk to biodiversity. Elephant culling results in irreversible, direct loss of biodiversity, and, as such, warrants application of the precautionary principle. The *EMS* makes no attempt to show how that policy minimizes harm to elephants or other species. In NRM, where multiple environmental risks exist, precautionary principle implementation should aid decision-makers to make choices that balance each risk-versus-caution scenario, resulting in an overall cost-effective, environmentally protective decision. The *EMS* never assessed the various risks and thus never evaluated proportionate or cost-effective measures.

[62] If it is true that Cooney argues for a purely procedural interpretation of the precautionary principle, then her interpretation is not grounded in international environmental law, as all versions of the precautionary principle relating to biodiversity that require at least some level of environmental protection.
[63] *EMS*, *supra* note 1, at 26.

# Appendix III-B: Legal opinion on SANParks' use of the precautionary principle

## Summary of legal opinions by

## Dr David Bilchitz, Ed Couzens & Prof. Jeremy Ridl

***Details of these documents can be found in the accompanying 'Background Information'***

The decision to cull is a policy question. Such a policy decision must be made only after a legal processes have been followed, which include the consideration of scientific evidence. The policy decision must also be in conformity with the environmental management principles, and administrative law principles required by legislation and must involve a justifiable decision that is both reasonable and rational.[1]

The National Environmental Management Act 107 of 1998 lays out principles relating to environmental management that bind all organs of state, including the Minister. One of the principles is that "degradation and pollution of the environment are to be avoided or, where they cannot altogether be avoided, are minimized and remedied".[2] The culling of elephants could certainly be seen as "degradation" of the environment in terms of NEMA. Elephants perform important functions in the environment and the impact they have is part of the cyclical functioning of an eco-system. SANParks argues that "degradation" means harm to biodiversity that could be caused by elephants. The problem is that the Minister is being called onto decide something which scientist have been unable to decide: how then can a politician hope to resolve this issue?

The Minister has to concede that experts cannot resolve this issue.[3] Section 2(4)(a)(vii) then becomes binding on the Minister, which is a formulation of what is known as the precautionary principle: "that a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions". SANParks invokes the precautionary principle to support its case for the culling of elephants. This is in fact a mistaken application of the precautionary principle and there are five main arguments against the manner in which SANParks employs the principle which will be explored below.

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[1] See Promotion of Administrative Justice Act 3 of 2000, National Environmental Management Act 107 of 1998 and the *Pharmaceutical Manufacturers Association of SA: In re Ex parte President of the Republic of South Africa* 2000 (2) SA 674 (CC).

[2] Section 2(4)(ii)

[3] In the recent SANPark's Report to the Minister on an Elephant Management Strategy, it is admitted that "given the lack of knowledge and the inherent complexity of natural systems, it is difficult to predict in advance whether degradation of biodiversity will occur in a particular park" at 18.

## The Precautionary Principle

The precautionary principle was developed to deal with human decision-making under conditions[4] of uncertainty.[5] The origins of the precautionary principle date from the 1970's in German and Swedish law[6]; the principle has in the last two decades gained increasing recognition in a range of national, regional and international legal instruments including the Rio Declaration of 1992 and within the European Union. The principle has lacked however one specific formulation and differs from instrument to instrument. The content thereof ranges from a "weak" formulation which merely holds that scientific certainty is not required to act to prevent harm to the environment or human beings to a "strong" version which would prohibit any activities that endanger the environment. This has caused confusion and limited the usefulness of the principle.

Despite this, there are certain broad elements which are shared by the various formulations which are enumerated below:

- The principle applies where considerable scientific uncertainties exist
- There is a need for scientific analysis of risks; fantasy or crude speculation is not sufficient to trigger the precautionary principle; the grounds for concern must generally be reasonable;
- Application of the precautionary principle is limited to harms that are serious and irreversible;
- Interventions must be required before the possible harm occurs;
- Interventions should be proportional in that interventions must be related to risks of harms occurring as well as the seriousness of the harms concerned;
- A range of interventions should be considered;
- There is a need for ongoing systematic research in order to acquire better evidence of the threatened risks.[7]

It is acknowledged that whilst there is still debate concerning the exact nature and content of the principle, the attempt to actually apply the principle to real-life situations is in its infancy. This has led the IUCN, for instance, to attempt to develop practical guidelines for the application of the principle.[8] It is important therefore to note – and this will be explored in more depth in the following sections - that the application of the principle to the issue of culling is dogged with controversy from the start. It is perhaps for this reason that the scientific workshop held by SANParks at Luiperdskloof concluded that the principle was of limited usefulness: "The precautionary principle has been widely touted and used in conservation circles but is largely a value judgement suitable for data poor situations. A general feeling is that any reasoning behind it can now be better tested scientifically with current ecological knowledge and modelling expertise."[9] The workshop moreover sought to "lessen dependence on the Precautionary principle".[10]

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[4] See the formulation above.
[5] Cooney at p.1
[6] World Commission on the Ethics of Scientific Knowledge and Technology (COMEST). March 2005. "The Precautionary Principle" at 9.
[7] Ibid. at 13-15.
[8] See http://www.pprinciple.net/PP%20Guidelines_english.pdf
[9] K Rogers "Elephants and Biodiversity" Outcomes of the Science Workshop, Luiperdskloof, March 2005 Report at p.15n on file with author.
[10] Appendix 3 of SANParks Report K. Rogers "Outcomes of Science Workshop" at 44.

Given this conclusion of this scientific workshop on the lack of usefulness of the precautionary principle in this area, it is surprising that SANParks places so much emphasis on the principle. This appears to confirm the suspicion that the use of this principle masks the scientific ignorance concerning the purported harms that elephants cause to biodiversity. A more detailed critique of the misuse by SANParks of this principle is conducted below.

## Criticism 1: There is a need for reasonable scientific evidence of the risk of harm to trigger application of the Precautionary principle

One of the common elements of the precautionary principle is the fact that it does not dispense with the need for any form of scientific analysis: concerns that trigger the application of the principle must be scientifically plausible and reasonable.[11] When discussing the implementation of the precautionary principle, many authors place an emphasis on the "initial scientific assessment of risks as a basis for decision-making".[12]

It is thus not possible to dispense with science in applying the precautionary principle and there has to be a clear scientific grounds for concern to trigger its direct application in particular circumstances. The IUCN guidelines on the application of this principle also emphasize the importance of using the best scientific information available. The guideline states that "Efforts should be made to ensure evidence and information is independent, free of bias, and gathered in a transparent fashion. This can be facilitated by ensuring it is gathered by independent and publicly accountable institutions without conflict of interest. In addition, taking into account multiple sources of information can help minimise bias."[13]

These principles suggest two important points of critique against SANParks arguments: first, there is so much uncertainty concerning the impact of elephants on biodiversity that it is unclear that reasonable evidence of harm to biodiversity exists that is sufficient to trigger the application of the precautionary principle. Such reasoning would favour suspending any actions until a better understanding is obtained of the impact of elephants upon biodiversity. Secondly, the current information that is being used is largely from SANParks where many of the scientists were original proponents of culling. Most of the external scientists disapprove of culling and this suggests that there is a need to obtain independent information free from the institutional bias of SANParks scientists in favour of culling.

*A Research Programme?*

There have been very few papers produced on the impact of elephants on biodiversity.[14] This is borne out by the document produced by SANParks for the Minister: it admits that "given the present state of knowledge, it is clearly not possible to generalize regarding the impact of elephants on biodiversity".[15] The scientific evidence thus fails to provide evidence that there is any trigger for employing the precautionary principle. Such a principle comes into effect when there are reasonable scientific grounds for the view that there is likely to be serious and irreversible damage to the environment. No such scientific grounds currently exist and thus further research is warranted prior to the invocation thereof.

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[11] COMEST paper at p. 13.
[12] Cooney at p. 21.
[13] IUCN Guidelines for applying the precautionary principle to biodiversity conservation and natural resource management (found at ???) at p.5
[14] R.J. Van Aaarde et al."Elephants and Their Management in the Kruger National Park".
[15] SANParks document at p. 18.

Currently, none of the so-called thresholds of probable concern[16] have been reached and thus there is no short-term need for interventions such as culling prior to the completion of such a research programme. The scientific workshop held by SANParks conclude and supports "a credible process to further develop and scrutinize the Kruger National Park elephant management plan before finalizing decisions. The proposal provides a way of taking "bite-sized" steps on the way forward towards consensus on elephant management within a biodiversity context. [17] It thus seems that any decision to resume culling cannot be supported by the precautionary principle and is premature. It is unclear as a result why SANParks is proposing such measures prior to the conclusion of the research that is to be conducted by the independent research group that was proposed by the very meeting of scientists it held.

### Criticism 2: The Department does bear a Burden of Justification

One of the key pillars of SANParks argument in its report to the Minister was its attempt to argue that it does not bear a burden of proof to show that there is a reasonable risk that elephants may harm biodiversity prior to the adoption of culling as a method to control elephant numbers.

However, despite the flawed nature of SANParks arguments concerning the burden of proof, the whole focus on this argument seems to be mistaken given the new South African laws relating to the accountability of public bodies.

One of the central changes in post-apartheid South Africa is the move from a culture in which government authority was respected for its own sake, to a culture in which decisions of public authorities are only respected if they can be justified.[18] The Constitutional Court has in a number of cases held that all exercises of public power must be capable of being justified.[19] A number of acts enacted by the government after apartheid have expressly stressed the importance of the reasonableness of government action and the need for transparency and accountability. Relevant here are the National Environmental Management Act, the Promotion of Administrative Justice Act, and the Promotion of Access to Information Act.[20]

SANParks is a creature of statute in terms of the Protected Areas Act 57 of 2003. As such, it is an organ of state performing a public function. Its actions must thus be capable of scrutiny in light of the principles that have been distilled for the evaluation of action by public bodies. The decision whether or not to allow culling in the Kruger National Park must thus be taken in light of the principles for justifiable decision-making that have emerged in post-apartheid South Africa. These principles represent general ethical standards for good decision-making; they also can have a legal impact. If they are not complied with, decisions that are made may be liable to being struck down by the courts; even if this does not happen, the actions taken in terms of such decisions will contravene the democratic ethos of the new South Africa.

The starting point for a consideration of these principles is the bill of rights. Section 24 of the Constitution provides that everyone in the country has the right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that, amongst other things, promote conservation and secure ecologically sustainable development. Thus, where decisions are made in connection with the environment

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[16] This is itself a contestable concept and the meeting of scientists called for more research into this concept and its application.
[17] Appendix 3 of SANParks report at p.45.
[18] E. Mureinik 'A Bridge To Where? Introducing the Interim Bill of Rights' SAJHR 10: 32
[19] See, for instance, *Pharmaceutical Manufacturers Association of SA: In re Ex parte President of the Republic of South Africa* 2000 (2) SA 674 (CC).
[20] For instance, see the National Environmental Management Act 107 of 1998, the Promotion of Administrative Justice Act 3 of 2000, and the Promotion of Access to Information Act 2 of 2000.

and conservation citizens can expect that the measures adopted by state bodies meet the standard of reasonableness. Moreover, section 33 of the Constitution provides that all administrative action is required to be lawful, reasonable and procedurally fair. The actions and policies of SANParks are likely to be regarded as administrative action. Thus, these actions and policies must be justified. The same is true of norms and standards issued by the Minister. How exactly are we to assess the reasonableness of decisions by state bodies?

The exact nature of the reasonableness enquiry is still being developed in South African law. It is possible nevertheless thus far to distill from the decisions of the courts two crucial enquiries that must be met for a decision to be reasonable. First, in terms of the *Pharmaceutical Manufacturers* case, the decision must be rational.[21] This means that there must be a rational connection between the purpose of the power that a state body exercises, and the decision that is taken. Moreover, there must be a rational connection between the means adopted by the state body and the purposes it wishes to achieve.

Secondly, an important principle in law when assessing the reasonableness of a decision is that we must not in the words of the Constitutional Court use a "sledgehammer to crack a nut".[22] There must not be disproportionality between the adverse and beneficial consequences of the action to be taken, and consideration must be given to whether there are less restrictive or drastic means to achieve the desired purpose.[23]

These tests are also borne out by the National Environmental Management Act 107 of 1998 and the principles it lays out for decision-making relating to the environment. The act requires that the disturbance of ecoystems and loss of biological diversity be avoided, or where this is not possible minimized and remedied; that negative impacts on the environment and people's environmental rights be anticipated and prevented and where they cannot be prevented, be minimized and remedied. In terms of section 24, an environmental impact assessment is required when decisions are taken that significantly affect the environment. That assessment must report gaps in knowledge, and investigate mitigation measures that keep the adverse impacts on the environment to a minimum. This Act thus essentially requires that environmental management decisions be taken that are both rational and reasonable and prescribes methods for establishing that this is so. There are a number of other acts which involve the application of similar principles, the foremost of which is the Promotion of Administrative Justice Act 3 of 2000.

What this analysis shows is that legally SANParks is required to have a rational and reasonable justification for its decision to cull. Its attempt to shift the burden of proof to others is an attempt to shirk its responsibilities to justify its management decisions. Such an attempt can no longer succeed in South African law as it is required to bear the burden of justifying its decisions. The

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[21] Op cit. Note 3.

[22] See *S v Manamela* 2000 (3) SA 1 (CC) para 34. See also the recent decision of *Bato Star Fishing v Minister of Environmental Affairs* 2004 (4) SA 490 (CC) where the Constitutional court holds that "factors relevant to determining whether a decision is reasonable or not will include the nature of the decision, the identity and expertise of the decision- maker, the range of factors relevant to the decision, the reasons given for the decision, the nature of the competing interests involved and the impact of the decision on the lives and well-being of those affected."

[23] The notion of proportionality was linked to reasonableness in the decision of *Roman v Williams* 1998 (1) SA 270 (C) and the less restrictive means requirement is embodied in the section 36(1) of the Constitution in outlining what constitutes a reasonable limitation on a right. There is some unclarity about how the dicta in *Government of South Africa v Grootboom* 2001 (1) SA 46 (CC) relates to this generally accepted part of the reasonableness test. The court stated that " a court considering reasonableness will not enquire whether other more desirable or favourable measures could have been adopted, or whether public money could have been better spent" (at para 42). It is possible to reconcile these requirements by arguing that the court should not consider in the abstract whether the government should have adopted other measures, but should still consider whether there are less restrictive means of achieving the same purpose

scientific evidence placed above suggests that the decision by SANParks to cull may not even be rational. The discussion below considers reasonableness and particularly the notion of proportionality. Moreover, requiring SANParks to bear an onus of proof seems just: the government and SANParks has the resources and expertise that should be able to provide such a justification if necessary. It is unclear that other bodies will have such resources available to them to be able to reach any such determinations as are required in this case. The IUCN Guidelines for applying the precautionary principle make it clear that those bodies with the most power, wealth and access to expertise should bear the burden of providing evidence. [24]

## Criticism 3: Proportionality

It is important to recognise that in terms of the legal framework mentioned above the measures SANParks takes must be proportional. This requirement involves considering whether the means adopted are not overly drastic in relation to the purpose to be achieved. To repeat the Constitutional court's colourful language, we should not use a sledgehammer to crack a nut. This is not, however, a requirement of South African law alone: it is a requirement in fact of the precautionary principle itself.[25] The question then is whether, given the scant evidence as to the threats that elephants pose to biodiversity, culling them in the short-term is warranted.

The decision to cull elephants is a drastic one. It involves the total destruction of a large number of elephants. Elephants are highly intelligent creatures with rich emotional lives. They have complex social structures, and exhibit altruistic behaviour. They have traditions, memories and display highly sentient forms of awareness.[26] Destroying such animals is a very serious matter. Recent ethical theory strongly concludes that we are obliged to treat elephants with respect.[27] As such, we have an obligation to ensure that they have an environment in which they can flourish, and we have an obligation not to hurt or harm them. Even proponents of culling, such as Ian Whyte admit to "disturbance of nearby related groups of elephant populations coming from the operation itself and the longer term effects of the loss of family members and bonds."[28] [29]

The fact that there are several viable alternatives to culling renders attempts to justify it untenable. Two alternatives are briefly considered below:

### (i) Transfrontier Parks

As is well known, SANParks has embarked upon the ambitious project of extending the boundaries of the Kruger National Park into Mozambique and Zimbabwe with the Greater Limpopo Transfrontier Park venture.[30] This means that the boundaries of the Kruger National Park are going to be vastly increased. The fences are coming down and elephants will no longer be restricted to the borders of the Kruger Park.[31] Why then is a cull even being contemplated? The areas of Mozambique have been sparsely populated by elephants and thus a number of

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[24] Op cit. at 5.
[25] See IUCN Guidelines at p.6.
[26] J. Poole "Keynote Address to the 22nd Annual Elephant Managers Workshop found at…
[27] P. Singer 'Animal Liberation'; T. Regan 'The Case for animal rights'; G. Varner 2003 'Personhood, Memory and Elephant Management.
[28] I. Whyte ' The feasibility of current options for the management of wild elephants populations' found at http://elephantpopulationcontrol.library.uu.nl/paginas/txt20.html
[29] It would be regarded as monstrous were 'culling' to be considered a solution to human overpopulation. Why should it be considered ethically acceptable to employ such brutal methods to control populations of elephants, which have been shown to display so many complex characteristics that resemble our own?
[30] See http://www.parks-sa.co.za/frames.asp?mainurl=aboutus/aboutus_main.htm
[31] We are worried about the fact that this new venture has entailed forced removals, and has not been properly planned, with people still living in areas where wild animals are being allowed to roam in.

elephant herds can be transferred there. As far as we could ascertain, only 100 elephants were translocated to Mozambique from Kruger from 2001 to 2003.[32] This may add a further element of irrationality and incoherence to SANParks policy: it makes no sense to claim that culling is necessary as a precautionary measure because the Kruger National Park is a closed system when SANParks has taken the decision to open the system and increase the availability of land for wild animals.

### (ii) Contraception

Furthermore, in recent years, much research has been done on the possibility of using immunocontraception to prevent an increase of elephant numbers. Audrey Delsink together with a group of local and international researchers concluded that through responsible management, immunocontraception can "successfully control and manipulate population numbers in the future". Moreover, the use of such contraception is safe, effective, reversible and ethically acceptable. If SANParks is truly worried about elephant numbers, and seeks to maintain respect for these beautiful creatures, then it should be a pioneer in introducing a widespread contraceptive programme for elephants in its various national parks.[33]

The precautionary principle requires that precautionary measures that are adopted are proportional to the threat of harm that is likely to be caused. As has been seen, the proposed use of culling involves drastic measure that itself may have a severe impact on elephants, their societies and their overall evolutionary fitness. There is very little evidence that elephants pose a major threat to biodiversity and in many cases where there has been short-term destruction, over the longer-term these areas have recovered. The harm is thus unlikely to be serious or irreversible. Moreover, there are less drastic alternatives to culling two of which were discussed here: transfrontier parks[34] and contraception. In light of this, it appears that the decision to cull is not only premature but would be lacking in proportionality. This means that such a decision could not be justified in terms of the precautionary principle nor in terms of wider environmental and administrative law legislation of South Africa.

## Criticism 4: It is necessary to adopt a precautionary approach towards culling itself

The fourth criticism that needs to be considered here is the fact that it is always important to decide in relation to what precautionary measures must be taken. What exactly must be cautious about? As Cooney points out in her discussion of the precautionary principle, the biodiversity

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[32] Paper of Markus Hofmeyer at EMOA conference, ' Translocation of elephants to the Limpopo National Park as part of the restocking of the Greater Limpopo Transfrontier Park'.

[33] It may be argued that contraception is too expensive: yet, according to one expert (Douw Grobler) contraception would only cost R600 per animal, whereas culling costs around R3000-5000 per animal. We worked out that based on these figures, contraception of 4200 elephants would amount to 2.52 million per year, whereas culling of 500 elephants would cost 2 million. The vaccine must be applied twice in the first year and then have an annual booster each year thereafter. It is estimated that 35 percent of the total population – that is 75 percent of breeding females- would have to be vaccinated. If elephant numbers are around 12000 at present, then that would mean that 4200 animals would have to be vaccinated. The total cost of doing so would come to 2.52 million per year. Only the first year, would involve double this cost of 5.4 million. On the other hand, if only five hundred elephant are culled per year, the cost would amount to 2 million rand. The difference in cost is not therefore huge. It is possible that international animal welfare organizations would help sponsor such a programme, and we already have had indications of this. The difference in impact upon elephant populations would be huge.

[34] This could be linked to the idea proposed by Van Aarde et al of megapopulation.

conservation context differs from the technological context in which the precautionary principle was initially applied. In the latter context, the contrast was between “risk” and “caution”. However, in the context of biodiversity conservation, there are usually risks on both sides of the picture: the contrast here is between “risk and risk”:[35] this makes the application of the precautionary principle more difficult: which risks should be guarded against and which risks should not be guarded against? A prior determination has to be made concerning which risks should be guarded against and which should not be. The existence of multiple risks in the biodiversity context make the principle particularly difficult to apply.

Take the case of elephant culling. SANParks focuses on the risks to biodiversity that may be caused by the population growth of elephants (for which it provides scant evidence). The possibility of this risk coming to realisation seems to be minimal given current scientific evidence. On the other hand, there are a number of risks involved in culling itself. Those inherent risks include the drastic nature of the interventions, the increase in aggressive behaviour of elephants, and the impact on population fitness in the long-term. Other major risks could be the negative impact on conservation of elephants (by promoting an ethic whereby killing elephants in huge numbers is allowed); and most importantly, the impact on the South African economy. The latter should not be minimised as there is likely to be a major impact on the South African image of pictures of culls being transmitted around the world. This may lead to a tourism boycott or but may also lead to t a reduction in numbers of tourists given the adverse impact on the image of South Africa. This suggests that a precautionary approach may well be mandated towards culling itself in that the major risks associated with culling seem larger than the small risks that SANParks has been unable to demonstrate even exist.

## Criticism 5: Actions and Omissions

The distinction between actions and omissions[36] is one of the important distinctions that lies behind the precautionary principle. The precautionary principle was originally developed in the context of new technology. A precautionary approach was necessary before *doing* something new which was potentially risky. In relation to the measures to be adopted in biodiversity conservation, greater precautions need to be exercised before actively intervening rather than passively allowing nature to take its own course. This has direct relevance to the case of elephant culling: a precautionary approach needs to be adopted to the actual active intervention of culling which itself has a number of risks for biodiversity and the economy of the country. It is not clear that the precautionary principle has as strong a weight in relation to omissions rather than actions: thus, it seems that the precautionary principle applies less to the notion of leaving nature to its own course than to interventions in nature.

This understanding of the precautionary principle and its basis suggests that SANParks has failed to apply the precautionary principle correctly and should have considered its impact on the various interventions in nature rather than the risks of not intervening. In fact, it seems that the whole elephant management plan of SANParks is a highly ambitious attempt to engineer the environment in the manner desired by their scientists. The Kruger Park would be divided in zones that do not arise naturally but are fundamentally manipulated. This appears to be throwing caution to the wind rather than applying a cautious approach to intervention.

The existing policy of the government is that culling should not happen. This predates the Minister’s term of office. At this point, therefore, the precautionary principle requires that nothing be done t interfere with the status quo. Intervention should only be possible where it is clear that degradation will not follow intervention.

[35] Cooney at pp.27-28.
[36] Discussed in the COMEST report at 18.

## Conclusion

**The Minister is required in terms of law and, in particular, the new environmental legislation to justify any policy decisions that are taken.**

- **He must take action to prevent degradation of the environment: yet, culling may itself constitute degradation of the environment.**
- **Where clear degradation occurs, the Minister must: it is not, however, always clear scientifically what is degradation or part of the natural cycles of an ecosystem.**
- **Where there is uncertainty as to whether degradation is occuring (as relates to elephants currently), the Minister must adopt a precautionary approach.**
- **SANParks argues the precautionary approach supports culling.**
- **This argument was criticized on five grounds as being a mistaken application of the precautionary principle:**
    - **first, there is a lack of sufficient reasonable scientific evidence even to trigger the principle; a research programme needs to be entered into investigating the impact of elephants on biodiversity before any scientific conclusions can be drawn;**
    - **secondly, SANParks bears a burden of justification to make a credible case that elephants are in fact harming biodiversity prior to invoking this principle: it has failed to do so;**
    - **the introduction of culling is not a proportional measure that would be sanctioned by the precautionary principle: it is a drastic measure and less drastic alternatives exist such as trans-frontier parks and contraception;**
    - **the precautionary principle in fact supports a precautionary approach be adopted towards the introduction of culling itself rather than towards the approach of more cautious, ethical and scientifically motivated interventions in ecosystem management.**
    - **the precautionary principle generally requires higher levels of precaution to be adopted in relation to actions that may cause harm to the environment rather than omissions; this suggests that the Minister should adopt a precautionary approach in relation to drastic interventions such as culling rather than in relation the status quo.**

# Appendix IV: Perception of pain and fear in animals

## 1. Pain Perception in Animals

The evidence that animals feel pain and seek to avoid it is overwhelming (for definitions see Zimmerman, 1983; Broom and Johnson, 1993; for reviews see Bateson, 1991, 1992; Smith and Boyd, 1991; Short and Poznak, 1992). Nociceptive systems (responsible for pain perception) with their anatomical, physiological and biochemical elements (receptors, neuronal pathways, specific transmitters) are present in most animals, including man (Rovainen & Yan, 1985; Verheijen & Bulwalda, 1988; Brambelll Report, 1965). All vertebrates have such a system, which varies little from one mammalian species to another, and even invertebrates possess some components. Such evidence "*suggests strongly that pain can be experienced by all animals*." (Fraser & Broom, 1990). Fish, too have a nociceptive system, which is very similar to that in other vertebrates, including mammals (e.g., Echteler and Seidel, 1981; Busch 1992) and under exposure to painful stimuli modify their behaviour accordingly. Thus, by avoiding noxious stimuli, fish show a reluctance to resubmit themselves to them. They also learn to associate neutral stimuli with painful ones (see Kestin, 1994).

Kestin (1994) explains how much of our understanding of pain in animals has been aided to observations in neonate humans, who like animals, express the perception of pain without access to language (see e.g., effects of analgesia on behaviour). She points out that until the 1980s many paediatric anaesthetists believed that new-born children are unable to feel pain and thus did not provide them with analgesics. Recent experimental research on several mammalian species (including man) has confirmed that the pain thresholds for thermal stimuli and pressure are approximately the same for all species examined (Ley et al., 1989; Chambers et al., 1993).

Phylogentic distance from our own species can affect our ability to interpret an animal's response to pain (Morton & Griffith, 1985; Fraser & Broom, 1990). Because of the functional significance of pain in evolutionary terms, species-specific differences between behavioural responses to pain are to be expected (e.g., carnivores, co-operative species, and herbivores). Reliable interpretation of pain-related behaviour thus requires detailed behavioural information. For example, although sheep exhibit little immediate response, they show altered posture and a strong avoidance of people who had carried out routine surgical husbandry without anaesthesia. Their cortisol secretions too increased in line with the severity of a procedure (Shutt et al. 1987).

Similarly, Wemelsfelder & van Putten's (1985) study on the effects of castration in piglets illustrates how it is possible, through careful observation, to provide compelling evidence not only for the existence of pain but also for quantitative differences in its effect on animals. The authors examined the frequencies of screams in piglets that were handled normally (3500Hz), when the first cut was made (4500Hz) and at the second cut (4857Hz). Furthermore, the piglets' screams spanned a wider spectrum of frequencies

and showed changes in sound distribution over the frequency range with time. Subsequent to the procedure, the animals were less active and exhibited more trembling and vomiting, as well as other behavioural peculiarities, which persisted for some time.

Although in some cases, naturally occurring analgesic opioids (e.g., b endorphin and enkephalines; Hughes et al., 1975) can mediate the effects of extreme adrenal responses to intense pain, which in themselves can be harmful, the activation of the natural opioid system *per se* indicates severe conditions (Broom & Johnson, 1993).

## 2. Fear Perception in Animals

Fear can be understood in terms of sensory inputs, which are related to previous experiences or the unknown (e.g., Brambell Report, 1965; Rushen, 1986a, b; 1990; Broom, 1985). The neuro-pharmacological system implicated specifically in the control of fear and anxiety is the benzodiazepine receptor system. Treatment of anxiety-related psychological disorders in humans focuses on manipulating its activities. Research into the phylogenetic distribution of benzodiazepine receptors not only found that they occurred in all vertebrate species except for the agnatha (lamprey and hagfish), but also that they were present in many fish species in the same concentrations found in mammals and possessed high binding affinity.

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## APPENDIX V: Excerpt from Cynthia Moss's book 'Elephant Memories', published in 1988.

Torn Ear was just reaching for a small succulent herb that was nestled in amongst the grass when a quick movement to her left caught her eye. She whirled toward the movement and there were two men only 30 yards away. Without hesitation she put her head down and charged toward them. She did not even hear the explosion before the bullet ripped through the light airy bone of her forehead and penetrated deep into her brain. She was dead by the time she fell forward onto her head and tusks and skidded along the ground for several feet from the momentum of her charge. Her son was hit next, first in the shoulder, which made him scream with pain and rage and then through his side into his heart.

The instant Torn Ear had seen the men, even before the shot rang out the rest of the herd knew there was extreme danger because Torn Ear had uttered an alarm call just as she charged. All the others heard it and knew who made it and acted accordingly. Most of the elephants immediately began to run away from the source of the danger, but Torn Ear's bond group immediately came to her aid. They ran toward her and even when they heard the shots and saw her fall they kept coming. The men turned and began to run but let off one volley of shots, missing most of the elephants but catching Tina in the chest with a shot that went into her right lung. These shots turned the Ts and they too began to run away from the danger. In the meantime, the rest of the herd ran to the north, which is what the poachers had hoped for, and two more men were waiting there. The WA family was in the front, led by their matriarch, Wendy, closely followed by the next oldest female, Willa. Wendy ran straight into the guns, but these men were not as experienced as the others, and it took seven shots in her head and neck and shoulders before Wendy fell and died. Willa behind her veered off and caught a bullet through her tail, severing it in half except for one bit of skin that kept the lower portion from falling off.

The whole aggregation was now tightly bunched and running at full speed. The mothers were literally pushing their babies forward to keep their pace up. They ran to the north and then to the east, skirting around the wet slippery lake bed. The Ts, having been farthest west and delayed by trying to aid Torn Ear, were at the rear and Tina was the very last. Her family knew she was hurt; they could smell the foamy pink blood dripping from her mouth. She managed to keep up until she got to the ridge, but the incline slowed her down and she groaned with the pain. Her mother, Teresia kept dropping back to run beside her, reaching over and touching her with her trunk, but finally Tina had to slow to a walk. The rest of her immediate family, the TDs, and Slit Ear's family, the TCs, slowed down as well letting the remainder of the aggregation run on, including the rest of Torn Ear's and Tania's families. The TAs and TBs were totally confused and panicked by the loss of Torn Ear and they just ran blindly within the large aggregation.

Teresia took them to the far side of Meshanani, a small hill up on the ridge above the lake. There were some protection here, and Tina could go on no farther. The blood

pouring from her mouth was bright red and her sides were heaving for breath. The other elephants crowded around, reaching for her. He knees started to buckle and she began to go down, but Teresia got on one side of her and Trista on the other and they both leaned in and held her up. Soon, however, she had no strength and she slipped beneath them and fell onto her side. More blood gushed from her mouth and with a shudder she died.

Teresia and Trista became frantic and knelt down and tried to lift her up. They worked their tusks under her back and under her head. At one point they succeeded in lifting her into a sitting position but her body flopped back down. Her family tried everything to rouse her, kicking and tusking her, and Tallulah even went off and collected a trunkful of grass and tried to stuff it into her mouth. Finally Teresia got around behind her again, knelt down, and worked her tusks in under her shoulder and then, straining with all her strength, she began to lift her. When she got to a standing position with the full weight of Tina's head and front quarters on her tusks, there was a sharp cracking sound and Teresia dropped the carcass as her right tusk fell to the ground. She had broken it a few inches from the lip well into the nerve cavity, and a jagged bit of ivory and the bloody pulp was all that remained.

They gave up then but did not leave. They stood around Tina's carcass, touching it gently with their trunks and feet. Because it was rocky and the ground was wet, there was no loose dirt; but they tried to dig into it with their feet and trunks and when they managed to get a little earth up they sprinkled it over the body. Trista, Tia, and some of the others went off and broke branches from the surrounding low bushes and brought then back and placed them on the carcass. They remained very alert to the sounds around them and kept smelling to the west, but they would not leave Tina. By nightfall they had nearly buried her with branches and earth. Then they stood vigil over her for most of the night and only as dawn was approaching did they reluctantly begin to walk away, heading back toward the safety of the park. Teresia was the last to leave. The others crossed to the ridge and stopped and rumbled gently. Teresia stood facing them with her back to her daughter. She reached behind her and gently felt the carcass with her hind foot repeatedly. The others rumbled again and very slowly, touching the tip of her trunk to her broken tusk, Teresia moved off to join them.

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