BEARDED VULTURE POPULATION AND HABITAT VIABILITY ASSESSMENT

(Gypaetus barbatus meridionalis)

Sterkfontein Dam, Harrismith, Free State Province,
South Africa
6 - 10 March 2006

Endangered Wildlife Trust
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Maloti Drakensberg Transfrontier Project

CONSERVATION BREEDING SPECIALIST GROUP
SOUTHERN AFRICA

EZEMVELO KZN WILDLIFE
Conservation, Partnerships & Ecotourism

BEARDED VULTURE
(*Gypaetus barbatus meridionalis*)

POPULATION AND HABITAT VIABILITY ASSESSMENT IN SOUTHERN AFRICA

6 - 10 March 2006

WORKSHOP REPORT

Convened by:

CONSERVATION BREEDING SPECIALIST GROUP SOUTHERN AFRICA
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Thank You!
June 2006

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6 - 10 March 2006

Sterkfontein Dam, Harrismith, Free State Province, South Africa

WORKSHOP REPORT

SECTION 1

EXECUTIVE SUMMARY AND CBSG WORKSHOP PROCESS

EXECUTIVE SUMMARY

BACKGROUND

With an estimated global range of 10^6 to 10^7 km^2 and a population of 10^4 to 10^5 individuals, it is thought that the population of Bearded Vulture (*Gypaetus barbatus meridionalis*) is declining worldwide but not at a sufficiently fast rate to rank its status as anything but of 'Least Concern' (BirdLife International 2004). There is, however, considerable concern surrounding the decline in the distribution and number of the Bearded Vulture in southern Africa over the last century. This reduction in range can largely be attributed to the loss of natural ungulates, superior animal husbandry practices and improved animal hygiene that has led to a reduction in the food supply (*e.g.* Boshoff *et al.* 1983). Other threats facing the species include direct persecution, collection for traditional medicine and witchcraft and disturbance at nesting and vulture restaurants. Based on the Bearded Vulture's small and declining population size, restricted range, range contraction, and susceptibility to several threats in Lesotho and South Africa, it is regionally classified as Endangered (Barnes 2000).

In southern Africa, Bearded Vultures are currently restricted to Alpine, Sour and Mixed Grasslands on rugged mountains and escarpments, all >1 500 m, though this was not the case in the past. They forage along ridges and valleys in protected areas but range out over communal and commercial lands with adult birds more frequently avoiding human habitation, while birds of all ages can visit vulture restaurants (Brown 1997a).

There are two isolated populations of Bearded Vultures in Africa, one in Ethiopia (ca. 4000 pairs) and Kenya, Uganda and Tanzania (ca. 50 pairs), another in southern Africa (<200 pairs). The study population for this Population and Habitat Viability Assessment (PHVA) is taken as the entire South African population.

There are less than 50 individuals in six Important Bird Areas (IBAs) in Lesotho however, *all* Bearded Vultures in Lesotho breed *outside* of protected areas (Barnes 1998a). Considering that Lesotho is the main stronghold of this species in southern Africa (with about 60% of the local breeding deme) this is a serious issue. In South Africa there are Bearded Vultures in IBAs in KwaZulu-Natal: six IBAs with 30 pairs and 61 to 102 individuals and in the Free State two to five individuals, but no breeding pairs in three IBAs (Johnson, Barnes and Taylor 1998). Of the 15 IBAs in which Bearded Vultures have been recorded only six have had any breeding observed (Barnes 1998b). Even if these figures sound reasonable, less than 24% of breeding pairs and less than 25% of all individuals are within IBAs. This in fact conveys a false sense of protection because Bearded Vultures wander far and wide in their daily foraging and could thus spend most of their day outside protected areas (Piper 2006).

The Conservation Breeding Specialist Group (CBSG), an IUCN (World Conservation Union) Species Survival Specialist Group, utilises a series of scientifically-based tools to undertake risk assessment and species management decision-making. These tools include the Population and Habitat Viability Assessment (PHVA) process, which uses population and conservation biology, human demography and the dynamics of social learning in intensive, problem-solving workshops to produce realistic and achievable recommendations for more effective wildlife and habitat management.

The goals of the workshop were to set a conservation target for the southern African population of Bearded Vulture and determine the priority conservation interventions required to achieve the target over a ten year period.

THE CBSG PHVA WORKSHOP PROCESS

Twenty-seven participants from three countries including South Africa, Lesotho and Ethiopia participated in the multi-stakeholder PHVA workshop. Organisations represented at the workshop included the conservation Non-government Organisation (NGO) community, various academic institutions, SANParks, Ezemvelo KZN Wildlife (EKZNW), provincial conservation departments from South Africa and Lesotho, Maloti Drakensberg Transfrontier Project (MDTP) from South Africa and Lesotho, as well as the German Development Service. A Briefing Document was made available to all workshop participants a week prior to the workshop which afforded participants the opportunity to get up-to-date information on Bearded Vulture biology, ecology, population dynamics and trends, distribution, threats and conservation status in southern Africa.

The workshop ran for three and a half days. The morning of the first day was dedicated to presentations covering the current status of Bearded Vulture research and monitoring, traditional use of vultures and its potential impacts and the current status of Bearded Vultures in South Africa, Lesotho and Ethiopia. Thereafter the workshop progressed as outlined below.

The standard PHVA workshop process comprises a series of plenary and working group sessions in which working groups work through tasks designed to facilitate free thinking, brainstorming, discussion and debate and finally, consensus building. After an initial group brainstorming session, a list of the key issues facing the survival of the Bearded Vulture in southern Africa was derived and this gave rise to the establishment of the following five working groups:

1. Surveying and Monitoring Working Group
2. Resource Availability and Habitat Loss Working Group
3. Political, Legal, Education, Awareness, Social and Economic Working Group
4. Unnatural Mortality Working Group
5. Population Modelling and Dynamics Working Group

Working groups spent the three days tackling issues specific to their group, and systematically worked through the tasks assigned which included drafting a situation overview, compiling problem statements, developing and prioritising solutions and goals and finally, working out detailed action plans and steps that will contribute to achieving the identified goals.

Plenary discussion sessions enabled working groups to present the results of their discussions to the whole group and obtain the input of all participants, which resulted in additional debate and insight from members of other working groups.

SUMMARY OF KEY ISSUES AND PROPOSED INTERVENTIONS

Listed below are a summary of the issues and interventions proposed by the five working groups:

1. Surveying and Monitoring Working Group

There is a lack of sufficient understanding of the current population demography of the Bearded Vulture and no strategy to develop this understanding into the future. Causes of mortality and the variance in mortality in space and time are also currently not known. Projects were therefore proposed to provide a reliable assessment of the causes of mortalities and specifically the rates of juvenile mortality in high density areas of the

population through a comprehensive marking and monitoring programme. A long-term marking project of birds of various age groups was therefore identified as crucial. Proactive monitoring was also deemed to be relevant for determining specific causes of mortality such as trade, power-lines, poisoning (direct and indirect, deliberate and accidental), persecution, disturbance, pollution and fire.

The need to determine the size and distribution of the breeding population as well as the current breeding and foraging range was also identified. It was suggested that all existing information should be collated to create a foundation of existing baseline data. This should then be followed up with a survey of the breeding range of the species to determine and monitor occupancy of existing and historical breeding sites. The population structure can then be verified to determine the ratio of non-breeding to breeding individuals.

The lack of information on the fecundity of the species was identified as a further problem and breeding success data linked to data on vulture restaurants were deemed to be a priority. Thus, monitoring all nests in KwaZulu-Natal (KZN) and the Free State and a representative sample of nests in Lesotho and the Eastern Cape is suggested.

There is a lack of knowledge pertaining to the genetic heterozygosity and genetic status of the species, a project to analyse genetic samples from current and historic populations of the species was proposed as a joint venture between Lesotho, South Africa, Ethiopia, Kenya, Uganda and Tanzania.

2. Resource Availability and Habitat Loss Working Group

Significant habitat change (resulting in reduced food availability) has taken place throughout the Bearded Vulture's range, driven by large scale transformation of natural grassland for agriculture, afforestation, housing developments and large scale modification and degradation of the grasslands. Of major concern in southern Africa is the shift from extensive grazing to more intensive grazing systems or even to monocultures such as maize or trees. The dynamics are however not fully understood and the impacts of development and habitat transformation on food availability are poorly understood. Expert opinion is however that in South Africa carcass availability is likely to be declining and that Bearded Vulture populations will have to be managed through an intensive feeding programme, *i.e.* restaurants. Protected areas have a strong role to play in this feeding programme as they represent relatively safe feeding areas for the birds. Therefore, it is proposed that vulture restaurants are established strategically across the foraging range of the Bearded Vulture. Bearded Vulture conservation must also be taken into account when changes to existing land-use planning systems are proposed and also in EIA processes and stewardship programmes.

To resolve the issue of reduced food availability, it was proposed that a focused extension programme encouraging farmers to make carcasses available to existing or planned formal restaurants instead of burying or burning them be implemented. In Lesotho, a managed feeding programme through formal restaurants will also be required. Restaurants should also be fenced off to prevent scavenger and dog access where this is a problem. Guidelines for the correct location and management of restaurants need to be published and distributed, including issues such as the provision of a range of bone sizes. Restaurant owners should be encouraged to register their restaurants and develop a formal management plan. A database of all restaurants also needs to be developed and maintained.

Access to carcasses that have been treated with detrimental veterinary products is of major concern. In response to this, it is necessary to collate all information on problem veterinary products and other chemicals so as to source and promote vulture-friendly alternatives. A multi-pronged awareness campaign aimed at pharmaceutical companies, veterinary product distributors and users, government departments, extension services, restaurant managers

and suppliers of carcasses is required. Information about new problem medicines and chemicals must be widely distributed to all role-players through an established network.

Finally, the group considered the potential impacts of climate change and global warming which may further reduce habitat quality and quantity. It was suggested that a programme to monitor specific indicators to reveal the true impacts is required.

3. Political, Legal, Education, Awareness, Social and Economic Working Group

The group discussed the various social, political, legal and economic factors influencing the Bearded Vulture as well as issues around education and awareness. Of greatest concern was the lack of partnerships with traditional healers and 'muthi' traders, government departments, NGOs (local and international), private enterprise (including landowners and developers), provincial conservation authorities, the media and educational institutions.

To address these it was suggested that: relationships be established with traditional medicine practitioners (TMPs) associations; that there is agreement on and adoption of actions to ensure Bearded Vulture conservation between the five relevant conservation authorities (EKZNW, Free State Nature Conservation, Eastern Cape Nature Conservation, SANParks, Lesotho) specific to a Bearded Vulture management plan; that awareness of the problem is created and "buy-in" is obtained to proposed solutions from local and district municipalities, traditional authorities, provincial and national departments of environmental affairs and health, national departments of foreign affairs and trade and industry, and relevant NGOs; that dedicated media slots to promote Bearded Vulture awareness are negotiated to improve the public's perception of the vulture; that awareness among large corporations and landowners of the problems associated with Bearded Vulture use is created; that appropriate educational materials are developed and distributed to schools and that tertiary institutions are involved in Bearded Vulture conservation work where appropriate.

The lack of knowledge and understanding of economic and cultural reasons for traditional use and the extent and impact of utilisation should be addressed through the development of a research programme using questionnaire surveys in rural areas of Lesotho and South Africa.

It has been determined that the legal status of Bearded Vultures is not uniform across its range. This will be addressed by identifying the legal inconsistencies between the three provinces in South Africa and in Lesotho. Tourism opportunities were seen as one possible solution to addressing the need to create incentives for Bearded Vulture conservation.

4. Unnatural Mortality Working Group

Human-induced mortalities in the Bearded Vulture form a real threat to the species and include collisions and electrocutions on power-lines, indirect persecution by poisoning, direct persecution by shooting and trapping, inappropriate development for tourism, communication masts and other structures and the consumptive use of vulture parts for medicinal and traditional use.

The indiscriminate use of poisons and the potential poisoning from veterinary medicines was dealt with by recommending the improvement of law enforcement to ensure that poison users comply with legislation; a review of the statutes regarding use of agrochemicals for problem animal control (PAC) in Lesotho; an awareness campaign of the ramifications of poisons and veterinary medicines and the control and management of vulture restaurants to ensure that they remain secure from intentional and / or accidental poisoning. Prevention of direct persecution also requires the improvement of law enforcement.

Programmes should be implemented to educate farmers that Bearded Vultures do not pose a threat to livestock. Mortalities as a result of power-line interactions should be addressed through the recommendation that comprehensive EIAs are undertaken for the placement of all new power-lines and structures and that mitigation measures are implemented on existing lines in high risk areas. Bearded Vultures must be a prime consideration during the EIA process, so as to reduce disturbance at feeding and breeding sites. Buffer zones must be identified and managed close to all breeding sites and only low impact developments should be permitted.

Trade in, and consumption of Bearded Vulture parts can only be dealt with by improving the data available on this issue, stepping up law enforcement and increasing education and awareness of the impacts of additional bird mortalities. It was recommended that a Memorandum of Understanding between Lesotho and South Africa be developed regarding the control of access to live birds or parts thereof.

Additional research is need to determine whether there are any negative impacts from pollution, along with the escalation in the frequency of veldt fires on the breeding success of the birds.

5. Population Modelling and Dynamics Working Group

Participants at this workshop used the most current data and other expertise and resources to develop a baseline population model that appears to be a reasonable model for the southern African population of Bearded Vultures. This model is based upon the best current estimates of population parameters / dynamics and threats. Because our understanding of Bearded Vulture population biology and current status may be incomplete, or because conditions are not likely to remain constant, it is difficult to produce accurate population projections over long time frames. However, models can be useful in predicting population trends and evaluating the relative effectiveness of different management interventions.

The conservation objectives for the Bearded Vulture in southern Africa, as adopted at this workshop, is to halt the population decline and stabilise the population at the current estimated population size of approximately 420 birds (145 breeding pairs) over the next ten years (2006 – 2016), and then to start growing the population to a realistic carrying capacity as determined by the prevailing conditions. The objective of the modelling exercise was to determine the conservation interventions required in order to achieve these conservation objectives.

The baseline model indicated a negative growth rate of about -2% per annum with a probability of extinction of 0.0080 over 100 years and with an expected first time to extinction being 97 years. The reason for the underlying negative growth rate of the baseline model is due to the parameters used in the model been collected during a time when the population was in a decline. Several participants at the workshop were of the opinion that the population was likely to have been in decline in the early 1980s when the mortality rates and other key parameters were estimated. It was therefore agreed that the model was a reasonable representation of the wild Bearded Vulture population in southern Africa, even though no recent estimates of key population parameters exist.

The only natural catastrophic event that may impact on the population and for which realistic parameters could be estimated was thought to be rare extreme snowfalls. The frequency and severity of this impact is unknown but a scenario of one event per 20 years impacting on 30% of the population range and resulting in moderate chick mortality and death of old adult birds was considered realistic. This magnitude of impact had little effect on the population with a slightly lower population size at 100 years (37 individuals compared to 48 individuals

in the baseline model). This outcome suggests that the population can probably withstand natural catastrophes as long as their impact on survival and reproduction is slight.

The limited data that is available suggests that poisoning potentially accounts for 70% of all Bearded Vulture mortalities (Brown 1997a). Mass poisonings were modelled as a harvest of eight birds (common group size at some vulture restaurants) consisting of two adults and six juveniles of equal sex ratio. The probability of extinction over 100 years increased from 0.008 in the baseline model to 0.102 for a single mass poisoning every ten years. A significant increase in the probability of extinction occurs if a single mass poisoning occurs every five years. It is evident that mass poisonings could result in a rapid decline of the population and could cause it to go extinct if mass poisonings do occur on a regular basis.

Because the actual rates of mortality are unknown the impacts of reducing mortality were modelled using supplementation of individual birds into the population. A significant difference exists between decreasing adult mortality compared to that of juvenile. By decreasing mortality of adults by four birds per year, the stochastic growth rate increases from the baseline (-0.024) to -0.001, an almost stable population with an annual decline of only 0.1%. By decreasing mortality by six adults, the stochastic growth rate becomes positive r = 0.004 and increases to r = 0.009 if mortality is decreased by eight birds per annum. Decreasing juvenile mortality, on the other hand, by eight birds per year, increases the stochastic growth rate to r = -0.008. Adult mortality thus has more of a significant impact on population growth. Several scenarios were tested using a combination of reduced adult and juvenile mortality. Of note is that by reducing mortality by four adults and four juveniles per annum, the stochastic growth rate becomes a positive r = 0.001.

The southern African Bearded Vulture population is clearly in decline. Although Vortex predicts a low probability of the population going extinct in the next 100 years, the conservation objectives for the species highlight the need for a stable population and it is thus imperative that the mortality rates are reduced. As more accurate information on key population parameters is collected and as management actions are implemented the model can be re-run to review the most effective interventions.

Participants in the Bearded Vulture PHVA Workshop, 2006

BEARDED VULTURE POPULATION AND HABITAT VIABILITY ASSESSMENT

6 - 10 March 2006

Sterkfontein Dam, Harrismith, Free State Province, South Africa

WORKSHOP REPORT

SECTION 2

PRESENTATIONS

THE 2005 BEARDED VULTURE (*GYPAETUS BARBATUS MERIDIONALIS*) GROUND SURVEY: SOUTH AFRICA

SONJA KRÜGER, EZEMVELO KWAZULU-NATAL WILDLIFE

Introduction

During September 2005, EKZNW organized an intensive ground survey in the uKhahlamba Drakensberg Park World Heritage Site (UDP WHS) and its surroundings to determine the status of the Bearded Vulture in the Park as indexed by the number of active breeding pairs. The survey team constituted ecologists, reserve managers, field rangers and honorary officers from EKZNW and a group of Spanish biologists and ornithologists.

The ground survey was conducted over a 14 day period, covering 250 km of the Drakensberg escarpment from Golden Gate National Park (GGNP) (Free State) in the north to Bushman's Nek in the UDP WHS (KwaZulu-Natal) in the south. Several potential lowland sites were also surveyed in southern KZN and the extreme northern parts of the Eastern Cape. In addition, four vulture restaurants were visited namely; GGNP and Sterkfontein Dam in the Free State, and Waterford Farm and Giant's Castle in KwaZulu-Natal.

Results and Discussion

Overall, 117 observations were made of 137 Bearded Vulture along the escarpment of which 57 were individually recognisable birds (12 juveniles, five sub-adults, 40 adults). Eight observations were made of 12 birds in the lowlands of which one was a juvenile, one was a sub-adult and eight were adults.

A total of 11 active Bearded Vulture nests were identified along the escarpment (including one abandoned nest) and two were identified in the lowlands. In addition, six territories were identified that were occupied by non-breeding pairs along the escarpment and two in the lowlands. These territories are considered potential nesting pairs because although nests were located in some instances, these were not active at the time of the survey. Two roosting places were identified that had more than two adult birds namely; Garden Castle (three adults and two juveniles) and GGNP (one adult, two sub-adults and five juveniles).

A total of 16 individual Bearded Vultures were recorded at vulture restaurants. One adult and six juveniles were recorded at GGNP; four juvenile birds were recorded at Waterford Farm, three adults were recorded at Giant's Castle and two adults were recorded at Sterkfontein Dam.

In order to determine the current status of the species, results were compared with known rather than estimated nesting pairs from C.J Brown's data from the 1980s (Brown 1992). Overall, a total of 26 pairs of Bearded Vulture were known to Brown in the area covered during the 2005 survey. The recent survey data therefore suggests that there has been a 54% decline in the number of breeding birds. If the number of non-breeding birds identified during the 2005 survey is included, the decline is reduced to 31%.

These results suggest that there are several threats to the population, which have resulted in a continued decline in their numbers. The main threats to Bearded Vulture in South Africa and Lesotho that were identified in the 1980s included direct and indirect poisoning, shooting, power-line collision and electrocution and habitat loss. Threats that have recently emerged and may be impacting on the species include food shortage, disturbance at nests

by climbers and helicopters, indirect poisoning of carcasses with veterinary drugs and harvesting living birds for use in traditional medicine.

Conclusion

The intensive Bearded Vulture ground survey undertaken in 2005 has provided the best information on the status of the species in KZN since the mid 1980's. A formal monitoring programme for Bearded Vulture throughout its range will be developed and adopted following the Population and Habitat Viability Assessment to be conducted in March 2006. The programme will include the monitoring of the non-breeding population at feeding and roosting sites to provide an indication of juvenile survival rates, and will place emphasis on elucidating the causes of deaths and identifying priority areas of threat to adult and juvenile Bearded Vulture.

PRELIMINARY REPORT ON A SURVEY OF BREEDING SITES OF BEARDED VULTURES IN LESOTHO

DAVID ALLAN, DURBAN NATURAL SCIENCE MUSEUM, AND ANDREW JENKINS, PERCY FITZPATRICK INSTITUTE OF AFRICAN ORNITHOLOGY, UNIVERSITY OF CAPE TOWN

1. Introduction

This report has two primary aims:

a. it attempts to summarize all available information on the breeding sites of Bearded Vultures *Gypaetus barbatus meridionalis* in Lesotho; and
b. it presents the results of a two-day (29-30 September 2005) helicopter survey of Bearded Vulture breeding sites in parts of the northwestern region of the Lesotho highlands.

2. Bearded Vulture

2.1 Review of existing information

Brown (1992) presented the most recent estimate of the number of breeding pairs of Bearded Vultures in southern Africa. He estimated a total of 204 breeding pairs, 122 (60%) in Lesotho and 82 (40%) in South Africa. Brown stated that a total of 27 breeding sites were actually known to him in Lesotho. The exact localities of these nests, however, were not divulged.

For the purpose of this study, information on suspected and confirmed Bearded Vulture localities in Lesotho (both historical and current) were extracted from:
1) Allan 1996;
2) Allan *et al.* 1996;
3) Maphisa 1998;
4) Ambrose and Maphisa 1999;
5) Allan 2001;
6) Maphisa 2001;
7) Kopij 2002;
8) British Schools Exploration Society (BSES) 2003; and
9) unpublished data obtained from David Ambrose (Roma University) during a visit to the campus on the afternoon of 29 September 2005.

These sources provided information on 32 Bearded Vulture sites in Lesotho, 26 confirmed and six suspected. The extent to which these sites overlapped with those of Brown is unknown but is likely to be only slight. Two of the confirmed sites were known to have been deserted by the mid-1980s. A detailed database including exact geographical co-ordinates, has been compiled covering these sites. Table 1 provides summarized details on these 32 sites drawn from the database. Exact locality information, however, has been excluded from this appendix until a formal protocol on how best to protect such nests from possible disturbance has been agreed upon.

Table 1: Details of the 32 confirmed (n=26) and suspected (n=6) Bearded Vulture sites in Lesotho known prior to the September 2005 helicopter survey.

Site no.	QDS	Status summary	Source	Comments
1	2928AA	Confirmed 1995	Allan *et al.* 1996	from helicopter
2	2928AA	Confirmed 1995	Allan *et al.* 1996	from helicopter
3	2928AA	Confirmed 1995	Allan *et al.* 1996	from helicopter
4	2928AA	Confirmed 1995	Allan *et al.* 1996	from helicopter
5	2928AB	Confirmed 1991-2000	Allan 2001	
6	2928AB	Confirmed 1996-2000	Allan 2001	
7	2928BA	Confirmed 2000	Allan 2001	
8	2928BA	Confirmed 1996	Allan 2001	
9	2927BD	Confirmed, Deserted 1983	Ambrose and Maphisa 1999	deserted 1983 after ad trapped
10	2928AC	Confirmed 1995	Allan *et al.* 1996	from helicopter
11	2928AC	Suspected 1995	Allan *et al.* 1996	
12	2928AC	Confirmed 1995	Allan *et al.* 1996	
13	2928AC	Confirmed 1995	Allan *et al.* 1996	from helicopter
14	2928AC	Confirmed 1995	Allan *et al.* 1996	
15	2928AD	Confirmed 1991-2000	Allan 2001	
16	2928AD	Confirmed 1995	Allan *et al.* 1996	from helicopter
17	2927DA	Confirmed 1970s, Deserted subsequently	Ambrose	
18	2927DB	Confirmed 1998	Maphisa 2001	
19	2928CA	Confirmed 1998	Maphisa 2001	
20	2928DB	Confirmed 1998	Maphisa 2001	
21	2928CC	Confirmed 1982-1998	Maphisa 1998, 2001	
22	2928CD	Confirmed 1996	Allan 1996	
23	2928DC	Suspected	Ambrose	very vague
24	2928DC	Suspected	Ambrose	
25	2929CC	Confirmed 2001	Kopij 2002	
26	3027BA	Suspected 1998	Maphisa 2001	
27	3027BB	Confirmed 1996	Allan 1996	
28	3028AA	Suspected	Ambrose	"large raptor nest"
29	3027BD	Confirmed 2001	Gerrit Vyn per Ambrose	
30	3028AC	Suspected	BSES 2003	
31	2929CA	Confirmed current		
32	2928DD	Confirmed 1998	Maphisa 2001	exact location unclear

2.2 September 2005 helicopter survey

The 29-30 September 2005 helicopter survey in parts of the northwestern Lesotho highlands garnered information on 22 confirmed or suspected Bearded Vulture breeding sites (18% of Brown's estimated 122 Lesotho pairs). Thirteen of these were previously known sites (12 confirmed and one suspected) and nine were new sites (five confirmed and four suspected) – taking the total number of recorded sites up to 41 or some 34% (41 / 122) of Brown's estimated Lesotho total, although only 31 (25%; 31 / 122) of these are confirmed and two of these 31 disappeared before the mid-1980s. Details are presented in Table 2 (with precise localities again obscured, although the full details, including precise geographical co-ordinates (using a Global Positioning System (GPS)) have been entered in a formal database; in addition, the localities of all known Bearded Vulture sites have been plotted on a set of 1: 50 000 maps).

Table 2: Results of the 29-30 September 2005 helicopter survey of Bearded Vultures localities in the north-western highlands of Lesotho, including a summary of previous information on these sites where relevant.

Site no.	QDS	Status pre 2005	Source	Status 2005
1	2928AA	Confirmed 1995	Allan *et. al* 1996	Confirmed
4	2928AA	Confirmed 1995	Allan *et. al* 1996	Suspected
5	2928AB	Confirmed 1991-2000	Allan 2001	Confirmed
6	2928AB	Confirmed 1996-2000	Allan 2001	Confirmed
7	2928BA	Confirmed 2000	Allan 2001	Deserted
8	2928BA	Confirmed 1996	Allan 2001	Deserted
10	2928AC	Confirmed 1995	Allan *et. al* 1996	Suspected
11	2928AC	Suspected 1995	Allan *et. al* 1996	Deserted?
12	2928AC	Confirmed 1995	Allan *et. al* 1996	Confirmed
13	2928AC	Confirmed 1995	Allan *et. al* 1996	Confirmed
14	2928AC	Confirmed 1995	Allan *et. al* 1996	Confirmed
15	2928AD	Confirmed 1991-2000	Allan 2001	Deserted?
16	2928AD	Confirmed 1995	Allan *et. al* 1996	Confirmed
A	2828CD	Not known	This study	Confirmed
B	2828DC	Not known	This study	Confirmed
C	2928AA	Not known	This study	Confirmed
D	2928AA	Not known	This study	Suspected
E	2928AA	Not known	This study	Confirmed
F	2928AA	Not known	This study	Suspected
G	2928AB	Not known	This study	Confirmed
H	2928AB	Not known	This study	Suspected
I	2928AC	Not known	This study	Suspected

The results of this survey were quite encouraging. In addition to the new sites located, occupancy of previously known sites was quite high. The species clearly shows relatively high site fidelity, rendering long-term monitoring more efficient and reliable. One pair were still breeding on the same cliff 14 years after being first found there, at least five pairs were doing likewise 10 years on, and another pair nine years later. Of 12 pairs confirmed breeding 1991-2000, at least seven were confirmed still breeding in 2005 and an additional two were suspected to still be breeding at their sites. Of the remaining three, two sites definitely appeared deserted and the third may have been deserted – but our survey was time-constrained and we were not able to comprehensively search for possible alternate sites in these areas. As another measure of population stability, part of our survey covered the same section of the west-facing main Front Range as covered during an August 1995 helicopter survey. During that survey, four confirmed sites and one suspected site were located, while during the September 2005 survey three confirmed and two suspected sites were found. In addition, of five sites previously known in the Katse area two were confirmed still breeding in September 2005 (the other three appeared deserted), and in the interior highlands at Mohale all four of the previously confirmed sites were still active. Overall, these data suggest little in the way of a substantial decrease in Bearded Vulture numbers in the Lesotho highlands, at least in the north-western region.

3. Acknowledgements

We are grateful to Tsepo Lepono of the MDTP, for making this study possible, and for accompanying us on a major part of the helicopter surveys. David Ambrose, of Roma University, kindly gave us unfettered access to his extensive database on Lesotho's biodiversity. Jessica Hughes, of Maloti Drakensberg Ecological Consultants, is thanked for her hard work and organisational skills, which served to make any logistical problems vanish. Thuso Green is thanked for providing maps. Finally, we thank our helicopter pilot, Ramotso, for making the surveys as efficient and safe as possible.

TRADITIONAL USE OF VULTURES: SOME PERSPECTIVES

STEVE MCKEAN, EZEMVELO KWAZULU-NATAL WILDLIFE

This short paper is concerned with traditional use and its potential impacts on vultures. It briefly discusses species and parts used, value and purpose of vulture parts. Poisoning trends from 1984 to the present, based on Poison Working Group of the Endangered Wildlife Trust (EWT) data, are analysed and discussed. Potential impacts of trade for traditional use on vulture populations in southern Africa (South Africa, Namibia and Botswana) are examined. Some suggestions for actions to address the challenge of commercial use of vultures for traditional purposes are made.

Existing data suggest that all vulture species are used. Despite reports that "poisoned" vultures lose the clairvoyant properties for which they are killed, poisoning is the main method of capture. Poisoning is indiscriminate and thus any species killed through eating from a poisoned carcass will be used. Most parts, particularly heads, feet, vertebrae and hearts are used.

Data on values of parts sold and turnover rates are extremely difficult to obtain due to the secrecy of the trade, the illegal nature of trade, random sizes of pieces sold and a history of mistrust between the traders and conservation authorities. However, personal observations suggest that a vulture carcass could be sold for R1000 or more in the larger urban informal markets.

Vultures are used in many African cultures for the prediction of future events. It is difficult to obtain specific information but there are reports that vulture brain is used as part of a "isibunge" mix by Zulu Traditional Healers to attract customers. Bones are reported to be used for making racehorses run faster. The many reports of vultures being used to predict winning "Lotto" numbers, major horse race winners and the outcomes of important football matches could be stimulating demand. Demand is likely to fluctuate with events like important football matches, elections *etc*. Use of vultures for traditional purposes is dynamic. Seldom is any use done away with, but new uses are added.

Poisoning appears to be having a dramatic effect on vulture populations with approximately 5% of the annual population increase being lost. This is likely to be an under-estimate. Demand for vultures is being driven by traditional belief systems coupled with a rapidly expanding urban demand which is supported by individuals who have no other form of livelihood but collection and sale of animal parts for traditional purposes.

Suggestions for further action include research on the underlying causes of vulture use, the extent of trade and the impact of trade on vulture populations. A widespread and focused awareness and education campaign coupled with reduced access to poisons and increased law enforcement is suggested to address the issue.

THE CURRENT STATUS OF BEARDED VULTURE IN ETHIOPIA

ALASTAIR NELSON, FRANKFURT ZOOLOGICAL SOCIETY

This is a very short synopsis, as despite questioning of the federal wildlife authorities, and the Birdlife partner in Ethiopia (the Ethiopian Wildlife and Natural History Society), very little is currently known about the status of Bearded Vultures in Ethiopia. Anecdotal reports from ornithologists living and working in Ethiopia report that they are numerous in the Simien Mountains in the north (in and around the Simien Mountains National Park), the Bale Mountains in the south (in and around the Bale Mountains National Park (BMNP)), as well as the highlands and escarpments along the western wall of the Rift Valley in the north-west. They are also reported from the Abuna-Yosef highlands to the north of Lalibela in north-central Ethiopia.

Threats to Bearded Vultures in Ethiopia are unknown, however, opportunistic poisoning does occur in these areas targeting hyaenas and jackals which are responsible for the majority of livestock depredation. Further, carcasses typically disappear very quickly in these areas with high densities of hyaenas, jackals and domestic (livestock guarding) dogs. Although this might lead to a decrease in food availability for Bearded Vultures, the birds are often seen around pastoralist settlements where there are bone deposits. This link between human settlement and food availability for Bearded Vultures requires further investigation.

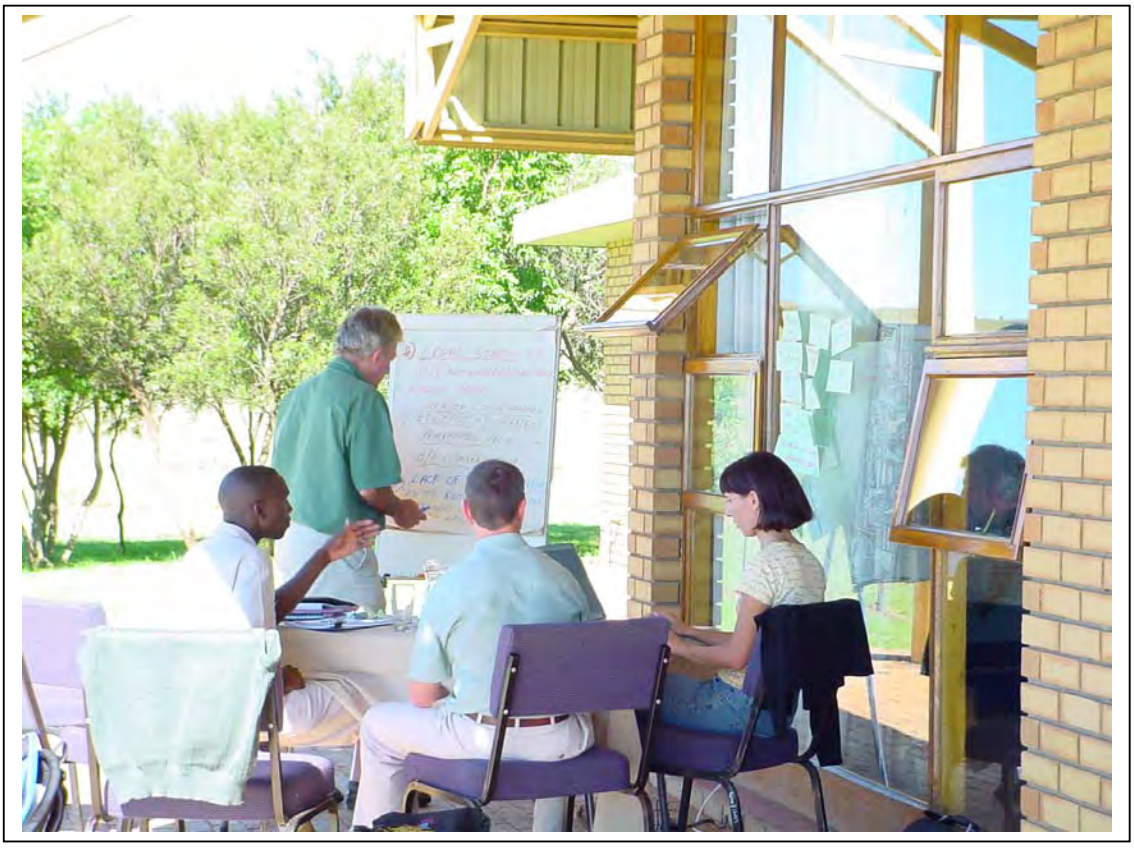
Finally, it should be noted that a large raptor (including Bearded Vultures) monitoring programme will begin in the BMNP in the foreseeable future – within the next year. Further, the expertise and capacity to monitor Bearded Vultures on a larger scale does exist in Ethiopia, but these highly competent ornithologists are often extremely busy with there being many other conservation priorities in Ethiopia. Establishing a wider monitoring programme for Bearded Vultures in Ethiopia, or even undertaking an initial status survey, could be easily arranged and the capacity exists for it to be successful.

BEARDED VULTURE POPULATION AND HABITAT VIABILITY ASSESSMENT

6 - 10 April 2005

Sterkfontein Dam, Harrismith, Free State Province, South Africa

WORKSHOP REPORT



SECTION 3

WORKING GROUP REPORTS

List of Acronyms

ADU	Avian Demography Unit
BEEP	Biodiversity Environmental Education Programme
BoPWG	Birds of Prey Working Group of the Endangered Wildlife Trust
BMNP	Bale Mountains National Park
BVIG	Bearded Vulture Interest Group
CITES	Convention on International Trade in Endangered Species
CBSG SA	Conservation Breeding Specialist Group Southern Africa
Co-ops	Central Cooperative
DED	Deutscher Entwicklungsdienst (German Development Service)
DEAT	Department of Environmental Affairs and Tourism
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
EV	Environmental Variation
EWT	Endangered Wildlife Trust
FCBV	Foundation for the Conservation Bearded Vulture (Europe)
GGNP	Golden Gate National Park
GIS	Geographical Information System
GPS	Global Positioning System
GSM	Global System for Mobile Communications
IBA	Important Bird Areas
INR	Institute for Natural Resources
KZN	KwaZulu-Natal
LBWG	Lesotho Biodiversity Working Group
LEC	Lesotho Electricity Corporation
LHDA	Lesotho Highlands Development Authority
LMPS	Lesotho Mounted Police Service
LPWG	Law and Policy Working Group of the Endangered Wildlife Trust
MCSA	Mountain Club of South Africa
MDTP	Maloti Drakensberg Transfrontier Project
MTEC	Ministry of Tourism, Environment and Culture (Lesotho)
NES	National Environmental Secretariat
NGO	Non-government Organisation
NRF	National Research Foundation
PAC	Problem Animal Control

PWG	Poison Working Group of the Endangered Wildlife Trust
QWDT	Quthing Wildlife Development Trust (Lesotho)
SAIEA	Southern African Institute of Environmental Assessors
SANBI	South African National Biodiversity Institute
SAFRING	South African Bird-ringing Unit
SAPS	South African Police Service
SAVA	South African Veterinary Association
SANParks	South African National Parks
S&T	Sustenance and Travel
TMP	Traditional Medicine Practitioners
UDP WHS	uKhahlamba Drakensberg Park World Heritage Site
VSG	Vulture Study Group
WESSA	Wildlife Environment Society of Southern Africa
WWF-SA	World Wildlife Fund (South Africa)

Surveying and Monitoring Working Group

WORKING GROUP PARTICIPANTS

1.	Eduard Goosen	EKZNW
2.	Sonja Krüger	EKZNW
3.	Steven Piper	Ornithological Support Services
4.	Andrew Jenkins	Percy FitzPatrick Institute
5.	Alastair Nelson	FZS (Bale Mountain Conservation Project)
6.	David Allan	Durban Natural Science Museum
7.	Thulo Qhotsokoane	Department of Environment Lesotho

Introduction / Situation overview

Researchers are faced with an endangered species which historical breeding range has contracted by 38% over the last two centuries and population size may have decreased by 20 - 50% during the past two decades. The suspected decline is based on data from KwaZulu-Natal, Lesotho and the Free State. No recent data exist for the Eastern Cape population. There is generally a lack of knowledge of the population demographics and genetics to ensure effective conservation of the species. The group comprised persons interested in Bearded Vulture from South African, Lesotho and Ethiopia.

PROBLEM STATEMENT 1
UNDERSTANDING OF BEARDED VULTURE POPULATION DEMOGRAPHY IS INADEQUATE AND THERE IS NO STRATEGY IN PLACE TO DEVELOP THIS UNDERSTANDING.

PROBLEM STATEMENT 1.1
THE CAUSES OF MORTALITY ARE NOT KNOWN, AND THE WAY IN WHICH MORTALITY VARIES IN SPACE AND TIME AND WITH AGE IS NOT UNDERSTOOD.

Mortality studies are crucial for more accurate results from the modelling package, Vortex. Results show that reducing mortality would have the most significant positive impact on the population. The modelling group found that reducing the loss of adults was more important than reducing the loss of juveniles. More information is required on juvenile mortality with respect to density dependence *i.e.* rates of juvenile mortality in high density areas of the population.

Solution 1
A rapid more reliable assessment of mortality is needed and this will be achieved by identifying individual birds by using one or a number of marking techniques.

Notes: Marking methods include the use of satellite and / or Global System for Mobile Communications (GSM) tracking device attached to individuals, patagial tags, rings or bleaching feathers. Catching methods include ringing chicks on the nest, trapping juveniles (between fledging and six months) or adults with canon nets and / or padded jaw gin traps or baited cage traps.

Action Step 1: Formulate and submit a project proposal to trap, mark and track at least 10 first year birds per annum for three years. Attempt to secure the funding.	
Resources needed:	Time (for author).

Responsibility:	Andrew Jenkins.
Timeline:	End July 2006.
Collaborators:	Sonja Krüger, Steven Piper, David Allan and Birds of Prey Working Group of the Endangered Wildlife Trust (EWT / BoPWG).
Obstacles:	None.
Measurable outcomes:	Proposal submitted.

Action Step 2: Undertake the project to mark and track individual birds (as per above proposal).	
Resources needed:	Funding and observers.
Responsibility:	Andrew Jenkins or other identified professional researcher, EKZNW representative.
Timeline:	Starting time depends on funding and observers. Project duration - a minimum of 3 years.
Obstacles:	▪ Depends on funding and suitable candidate for field work. ▪ Mortality of birds or problem with birds as a result of marking method used. ▪ Possible inadequate sample sizes and over-interpretation of data.
Collaborators:	Foundation for the Conservation of the Bearded Vulture - Europe (FCBV). Further collaborators will be identified as required.
Measurable outcomes:	▪ Mortality and movement / distribution of different age classes. ▪ Mortality data captured into the database.

Solution 2
Long-term marking project of birds of various age groups.

Action Step 1: Capture all individually accessible Bearded Vulture using a standardised method mark each bird with at least a SAFRING-ring and insert a transponder into each bird caught. Firstly, undertake a literature review of current capture and marking methods to determine the best method to use.	
Resources needed:	Literature, time, transport, capture and marking equipment, mountain climbers with equipment, some funding.
Responsibility:	Steven Piper – literature review. Lesotho Department of Environment (with MDTP and David Allan, Andrew Jenkins). EKZNW (James Wakelin). Eastern Cape - André Boshoff.
Timeline:	September 2006 for literature review. Project starts in KZN and Lesotho in January / February 2007.
Obstacles:	▪ Possibility of desertion if marking is done at nests. ▪ Problems with marking procedure or device used. ▪ Possibly handling and catching experience. ▪ Access to equipment.
Collaborators:	Steven Piper, SAFRING, EWT / BoPWG and FCBV
Measurable outcomes:	▪ Marked birds re-sighted / recovered. ▪ The information will provide data on survival rates, longevity, dispersal and habitat association. ▪ Causes of mortality and the relative importance of these causes.

Solution 3
Undertake proactive / direct methods of monitoring of causes of mortality; where the causes are trade, power-lines, poisoning (direct and indirect), persecution, disturbance, pollution and fire.

Action Step 1: Determine historical causes of mortality by using existing sources of data (*e.g.* Poison Working Group of the Endangered Wildlife Trust (EWT / PWG), EWT / Eskom Partnership, Chris Brown's information), a questionnaire survey and various sources of media.	
Resources needed:	Communication mechanisms and time.
Responsibility:	All data to Database Manager (Sonja Krüger)
Timeline:	July 2006.
Obstacles:	No consensus on database structure therefore database not finalised.
Collaborators:	South Africa BirdNet, South Africa bird forum, bird club newsletters, newspapers, radios, articles in birding magazines (*e.g.* Africa Birds and Birding), Steven Piper, SAFRING, EWT / BoPWG and FCBV.
Measurable outcomes:	▪ Returns received and captured. ▪ Data on historical mortality. ▪ More information on the causes of mortality.

PROBLEM STATEMENT 1.2
THERE IS A NEED TO DETERMINE THE SIZE AND DISTRIBUTION OF THE BREEDING POPULATION (WILL PROVIDE INFORMATION ON THE BREEDING RANGE) AND NON-BREEDING POPULATION (WILL PROVIDE INFORMATION ON THE FORAGING RANGE), SPATIALLY AND TEMPORALLY.

Solution 1
Collate all of the existing information and establish a baseline database.

Action Step 1: Write historical review	
Resources needed:	Literature review.
Responsibility:	David Ambrose, David Allan, Chris Brown, Robin Guy and Andrew Jenkins, Grzegorz Kopij, Sonja Krüger, Tsepo Lepono, David Maphisa, Steven Piper, Douglas van Zyl and Wigbert Vogeley.
Timeline:	First draft of a paper in June 2006.
Obstacles:	None.
Collaborators:	As above.
Measurable outcomes:	▪ Draft manuscript. ▪ The review will highlight the gaps in our knowledge and inform future survey work.

Action Step 2: Develop a Bearded Vulture database so as to record all the data of the species throughout its range.

Data required includes: nest and roost site locations, incidental observations, photographs, site description register, life history data, individual identification data, observers' names, monitoring effort. The database will ensure that standardised survey data sheets are used (observations and nest sites).

Resources needed:	Funds have been provided by EWT / BoPWG for the development of the database. Expertise exists and a database developer has been appointed and work is underway.
Responsibility:	Sonja Krüger (Douglas van Zyl) - Need to ensure that database is all encompassing (email to all collaborators for comments).
Timeline:	December 2006 for developing the database. June 2007 for populating the database.
Obstacles:	▪ Accessing data throughout the range of the species. ▪ Conditions of use (protocol) of the database. ▪ Agreeing on who will house the database (which institution *e.g.* South African National Biodiversity Institute (SANBI), EWT).
Collaborators:	National University of Lesotho, EKZNW, Lesotho Department of Environment and MDTP (Tsepo Lepono), Lesotho Highlands Development Authority (LHDA), Nelson Mandela Metropolitan University (André Boshoff), Steven Piper and Helen Lechmere-Oertel.
Measurable outcomes:	▪ Operational and populated database. ▪ Functioning access protocol. ▪ Database informs decisions regarding species management. ▪ The database will ensure that standardised survey data sheets are used (observations and nest sites).

Solution 2
Survey the breeding range of the species to determine occupancy of existing and historical breeding sites. Future monitoring will be covered under fecundity below.

Action Step 1: Survey known sites for current occupancy and search for new sites in ***Lesotho*** (Strategy informed by outcomes of Problem Statement 1.2, Solution 1).	
Resources needed:	Helicopter, 4x4 vehicle, survey equipment (scopes, binoculars, digital camera, maps and GPS).
Responsibility:	Department of Environment, MDTP, David Allan, Andrew Jenkins, David Maphisa and Wigbert Vogeley.
Timeline:	Survey will be undertaken between May and October 2006. Report and data available for database by December 2006.
Obstacles:	Weather.
Collaborators:	David Ambrose, EKZNW, Steven Piper. Custodians of nest sites.
Measurable outcomes:	▪ Survey report ▪ Data captured into database. ▪ Understanding of population size. ▪ Complete population from which to select a sample for future long-term monitoring of nest sites (see *fecundity* below). **Note:** Zone the regions within the breeding range of the species, *i.e.* quarter degree squares. **Minimum:** Monitor a representative sample size (sub set samples; at least 20%).

Action Step 2: Survey known sites for current occupancy and search for new sites in ***South Africa*** (Strategy informed by outcomes of Problem Statement 1.2, Solution 1, and differs between provinces). A baseline survey of the Eastern Cape is critical to provide information

on population status.	
Resources needed:	Observers for ground survey, helicopter (Eastern Cape, Qwa-Qwa, site specific in KZN), survey equipment (scopes, binoculars, digital camera, maps and GPS).
Responsibility:	Eastern Cape: André Boshoff (Sonja Krüger). KZN: Sonja Krüger. Free State: Albert Smith and Brian Colahan (Sonja Krüger).
Timeline:	Survey will be undertaken between May and December 2006. Report and data for database by March 2007.
Obstacles:	▪ Weather. ▪ Apathy. ▪ Funding for helicopter survey in Eastern Cape. ▪ Lack of partnerships between provincial conservation bodies.
Collaborators:	MDTP (South Africa and Lesotho), custodians of nest sites, provincial conservation agencies and environmental affairs departments.
Measurable outcomes:	▪ Survey report. ▪ Data captured into database. ▪ Understanding of population size and breeding distribution. ▪ A complete population from which to select a sample for future long-term monitoring. **Note:** Zone the regions within the breeding range of the species (linear zonation in KZN and Free State, quarter degree squares in Eastern Cape). **Minimum:** Monitor all nests in KZN and Free State and a representative sample size (sub set samples) in Eastern Cape (at least 20%).

Solution 3
Monitor nest site occupancy.

Action Step 1: See actions under *fecundity* below

Solution 4
Verify the population structure so as to determine the proportion of the non-breeding individuals (sub-adults, immatures and juveniles) to breeding individuals (adults).

Action Step 1: Record all incidental observations of the species according to a standardised protocol.	
Resources needed:	Communication facilities, time, standardised forms.
Responsibility:	Database Manager (Sonja Krüger).
Timeline:	Ongoing.
Obstacles:	▪ Communication and coordination. ▪ Small sample size.
Collaborators:	All possible observers.
Measurable outcomes:	▪ Incidental observations captured into database. ▪ Data / knowledge on population structure and range.

Action Step 2: Conduct road counts on specific routes throughout the entire range of the species. To be done as a trial in Lesotho, Eastern Cape and KZN. Specific methods to be

coordinated between responsible people.	
Resources needed:	Observers, vehicles, communication facilities, time, standardised forms.
Responsibility:	Lesotho: 1000-2000 km (David Allan, Andrew Jenkins, Steven Piper). KZN: Athol Marchant. Eastern Cape: André Boshoff.
Timeline:	October 2006 - tried, evaluated and refined.
Obstacles:	▪ Mileage and time. ▪ Small sample size.
Collaborators:	As per above (responsibility). To be incorporated into the possible raptor project that might be coordinated by Avian Demography Unit (ADU) and EWT / BoPWG. Possible Lesotho Defence Force.
Measurable outcomes:	▪ Road count data incorporated into database. ▪ Methods evaluated and refined. ▪ Implement the method widely if it is found to be effective. ▪ Implemented by all responsible people.

Action Step 3: Institute systematic observations (regular and standardised) at vulture restaurants and known roost sites, which have more than two birds, across the range.	
Resources needed:	People (trained observers), time, standardised observation forms, signs at vulture restaurants accessible to the public.
Responsibility:	Steve Piper and Sonja Krüger (coordinators), Officer-in-Charge of reserves with restaurants and Officer-in-Charge of nearest reserves / District Conservation Officer, for restaurants outside protected areas in South Africa. Wigbert Vogeley in Lesotho.
Timeline:	End June 2006 forms being used. Each restaurant monitored monthly. Roost sites monitored monthly (where possible *e.g.* Golden Gate) and quarterly where not possible (*e.g.* Garden Castle).
Obstacles:	▪ Communication and coordination between provincial and national organisations. ▪ Reliability of aging information. ▪ Poor management of restaurants. ▪ Small sample size.
Collaborators:	SANParks, Free State, Department of Environmental Affairs and Tourism (DEAT), private restaurant operators, Honorary Officers.
Measurable outcomes:	▪ Standardised forms being used, returned and captured. ▪ Improved knowledge on juvenile survival and age distribution across the range of the species. ▪ Knowledge of seasonal use of restaurants.

PROBLEM STATEMENT 1.3
HOW FECUNDITY VARIES IN SPACE AND TIME IS NOT KNOWN. THE BREEDING SUCCESS DATA NEED TO BE LINKED TO DATA ON VULTURE RESTAURANTS.

Note: Fecundity is the number of live young produced per breeding pair in the whole population; egg to fledgling.

Solution 1
Need to monitor breeding success.

Minimum: All nests in KZN and a representative sample (*i.e.* 20%) in Lesotho, Eastern Cape and Free State.
Maximum: Monitor all nests at least three times during the season throughout the range.

Action Step 1: Determine a representative sample of nest sites to be monitored based on the outcomes of breeding site survey (see Problem Statement 1.2, Solution 2).	
Resources needed:	Results and map from the breeding site survey.
Responsibility:	Lesotho: Department of Environment, MDTP, David Allan, Andrew Jenkins, David Maphisa and Wigbert Vogeley. Eastern Cape: André Boshoff (Sonja Krüger). KZN: Sonja Krüger. Free State: Albert Smith and Brian Colahan (Sonja Krüger).
Timeline:	April 2007.
Obstacles:	Dependent on breeding site survey (Problem Statement 1.2, Solution 2).
Collaborators:	Lesotho: Department of Environment, MDTP, David Allan, Andrew Jenkins, David Maphisa and Wigbert Vogeley. Eastern Cape: André Boshoff (Sonja Krüger). KZN: Sonja Krüger. Free State: Albert Smith and Brian Colahan (Sonja Krüger).
Measurable outcomes:	A list of representative nests for long-term monitoring.

Action Step 2: Monitor nests at the beginning (egg laid) and end of the breeding season to determine the number of large nestlings / fledglings produced. Also determine which territories had an adult pair which could have bred but did not.	
Resources needed:	Observers for ground survey, helicopter (Eastern Cape, Qwa-Qwa, site specific in KZN), survey equipment. 4x4 vehicle.
Responsibility:	Lesotho: Department of Environment, MDTP, David Allan, Andrew Jenkins, David Maphisa and Wigbert Vogeley. Eastern Cape: André Boshoff (Sonja Krüger). KZN: Sonja Krüger. Free State: Albert Smith and Brian Colahan (Sonja Krüger).
Timeline:	May 2007 for baseline survey to start. Monitoring is ongoing.
Obstacles:	▪ Weather. ▪ Funding for ongoing helicopter surveys. ▪ Lack of partnerships between provincial conservation bodies.
Collaborators:	Cadre of interested volunteers. Lesotho: Department of Environment, MDTP, David Allan, Andrew Jenkins, David Maphisa and Wigbert Vogeley. Eastern Cape: André Boshoff (Sonja Krüger). KZN: Sonja Krüger. Free State: Albert Smith and Brian Colahan (Sonja Krüger).
Measurable outcomes:	▪ Possibly incidental information on causes and timing of breeding failure. ▪ Site occupancy. ▪ Spatial and temporal variation in site occupancy, proportion of pairs that are attempting to breed (eggs laid) and fecundity.

Action Step 3: Need to determine the proportion of females that are breeding annually through road and point counts and monitoring of nest sites (covered in population size, Problem Statement 1.2, Solution 2, Action Step 1 and 2).

Action Step 4: Reactive monitoring of breeding success in relation to any potentially catastrophic events such as extreme snow falls and extensive exposure to major fires, mass poisoning incidents *etc*.	
Resources needed:	Available observers at short notice, transport.
Responsibility:	Lesotho: Department of Environment, MDTP, David Allan, Andrew Jenkins, David Maphisa and Wigbert Vogeley. Eastern Cape: André Boshoff (Sonja Krüger). KZN: Sonja Krüger. Free State: Albert Smith and Brian Colahan (Sonja Krüger).
Timeline:	As and when required.
Obstacles:	Non availability of observers at short notice.
Collaborators:	Cadre of interested volunteers. Lesotho: Department of Environment, MDTP, David Allan, Andrew Jenkins, David Maphisa and Wigbert Vogeley. Eastern Cape: André Boshoff (Sonja Krüger). KZN: Sonja Krüger. Free State: Albert Smith and Brian Colahan (Sonja Krüger).
Measurable outcomes:	Better understanding of the impacts of catastrophic events on the breeding performance of the population.

PROBLEM STATEMENT 2
THE GENETICS OF THE POPULATION ARE NOT UNDERSTOOD:

- **IT IS NOT KNOWN WHETHER THE SOUTHERN AFRICAN POPULATION IS GENETICALLY DIFFERENT FROM THE EAST AFRICAN POPULATION.**
- **THE CURRENT LEVELS OF HETEROZYGOSITY ARE NOT KNOWN RELATIVE TO PAST LEVELS.**
- **THERE IS NO KNOWLEDGE OF GENETIC DRIFT OR INBREEDING DEPRESSION.**

Genetic data will provide information on gender which will to add value to the information on population demographics (see Problem Statement 1).

Solution 1
Analyse genetic samples from current and historic populations of the species in Lesotho, South Africa, Ethiopia, Kenya, Uganda and Tanzania. The solution is a joint venture between Lesotho, South Africa, Ethiopia, Kenya, Uganda and Tanzania.

Note: Genetic samples include blood (ideally) and non-invasive methods such as feathers (which is the only option for determining past heterozygosity). Ensure that samples for South Africa are logged with the National Research Foundation (NRF) gene bank (Wildlife Biological Resource Centre (wBRC).

Action Step 1: Obtain genetic samples from ***current*** populations of the species in Lesotho, South Africa, Ethiopia, Kenya, Uganda and Tanzania.	
Resources needed:	Collection protocol, materials and storage facilities.

Responsibility:	Lesotho: Department of Environment, MDTP, David Allan, Andrew Jenkins, David Maphisa and Wigbert Vogeley. Eastern Cape: André Boshoff (Sonja Krüger). KZN: Sonja Krüger. Free State: Albert Smith and Brian Colahan (Sonja Krüger). BMNP Ethiopia: Alastair Nelson Kenya, Uganda and Tanzania: Simon Thomset and Munir Virani (Sonja Krüger).
Timeline:	December 2007 (this is not a priority action however if insufficient material has been collected by the deadline then the task will be actioned more proactively rather than incidental sampling as is currently the case).
Obstacles:	▪ Bureaucracy (to export materials). ▪ Contamination of samples (incorrect collection of sample and incorrect handling).
Collaborators:	Lesotho: Department of Environment, MDTP, David Allan, Andrew Jenkins, David Maphisa and Wigbert Vogeley. Eastern Cape: André Boshoff (Sonja Krüger). KZN: Sonja Krüger. Free State: Albert Smith and Brian Colahan (Sonja Krüger). Customs, Convention on International Trade in Endangered Species (CITES), Oromia Government Ethiopia: Alastair Nelson Kenya, Uganda and Tanzania: Simon Thomset and Munir Virani (Sonja Krüger).
Measurable outcomes:	A minimum of 10 different feathers / blood samples (wet samples) collected per sub region although geneticists will advise on ideal minimum sample size. *<u>Note:</u> Chris Brown has feathers and blood samples (stained with gentian violet) that could be used as samples. Geneticists need to advise whether stained blood samples are useful and what types of feathers need to be collected, which part of the feather, how to collect it, and how the samples should be stored. Refer to the wBRC booklet outlining the process and sample collection.*

Action Step 2: Obtain genetic samples from ***historic*** populations of the species in Lesotho, South Africa, Ethiopia, Kenya, Uganda and Tanzania.	
Resources needed:	Museum specimens, time and effort to solicit and secure material.
Responsibility:	Sonja Krüger.
Timeline:	December 2007.
Obstacles:	▪ Lack of cooperation from museums. ▪ Bureaucracy (to export materials). ▪ Contamination of samples (incorrect storage historically and incorrect handling).
Collaborators:	Museum curators, Customs, CITES.
Measurable outcomes:	A minimum of 10 different feathers collected per sub region although geneticists will advise on ideal minimum sample size.

Action Step 3: Develop a proposal for the analysis of genetic samples from past and current populations of the species in Lesotho, South Africa, Ethiopia, Kenya, Uganda and Tanzania.	
Resources needed:	Time and effort to establish links with South African geneticists (and

	foreign if necessary) and draft a proposal.
Responsibility:	Sonja Krüger.
Timeline:	December 2006.
Obstacles:	▪ Lack of collaborators. ▪ Work overload of molecular laboratories.
Collaborators:	University of California, Los Angeles, local link (Rauri Bowie – Terry Robinson).
Measurable outcomes:	Completed and submitted proposal.

Resource Availability and Habitat Loss Working Group

WORKING GROUP PARTICIPANTS

1.	John Crowson	EKZNW
2.	Athol Marchant	EKZNW
3.	Oscar Mthimkhulu	EKZNW
4.	Wigbert Vogeley	German Development Service, Lesotho
5.	Mohammednur Jemal	BMNP, Ethiopia
6.	Richard Lechmere-Oertel	MDTP, South Africa

Introduction / Situation overview

There is broad recognition that significant habitat change has taken place throughout the Bearded Vulture range. In South Africa, the change is driven by large scale transformation to arable agriculture, afforestation and housing developments. In Lesotho, development pressures are less, but large scale degradation of the grasslands has taken place. The link between habitat loss and vulture population dynamics is primarily through food availability, with the prediction that the intensification of land-use and increased use of natural mammal populations results in declined carcass availability. Based on the assumption that food availability may be a limiting factor to the population, factors that influence the number of carcasses that remain on the landscape will be the primary drivers of population dynamics. Of major concern in South Africa is the shift away from extensive grazing to more intensive grazing systems or even to monocultures such as maize or trees. The latter represents an irreversible removal of vulture feeding habitat and source of carcasses. Intensification of grazing may not be too detrimental in that it will still provide carcasses, but the management of these will be more intensive and the probability of the use of detrimental medicines will be higher than in extensive systems.

Climate change and global warming may exacerbate the situation, but not very much is known about these dynamics. However, the large populations of livestock through the bioregion would suggest that many carcasses are likely to be exposed for vultures, either deliberately or incidentally. This is a double-edged sword because, although there may be more food available for the vultures, some of the carcasses are likely to have been treated with medical substances that are known to have a detrimental effect on vultures. The exposure of Bearded Vultures to dangerous carcasses can be a result of ignorance or lack of interest by the farmer. Furthermore, the placement of these carcasses is not strategic and may not have the desired effect on the vulture population, *e.g*. may not be near a place where juveniles gather and therefore may not contribute to increased juvenile survivorship.

PROBLEM STATEMENT 1
HABITAT LOSS IN SOUTH AFRICA RESULTING FROM DEVELOPMENT (*E.G*. HOUSING ESTATES, TOURISM INFRASTRUCTURE, INFORMAL VILLAGE EXPANSION, *ETC*.) AND A SIGNIFICANT INCREASE IN MONOCULTURES (*E.G*. AFFORESTATION AND ARABLE LANDS) IS THE PRIMARY REASON FOR THERE BEING FEWER ANIMALS (INDIGENOUS OR LIVESTOCK) DYING. HOWEVER THE DYNAMICS ARE NOT FULLY UNDERSTOOD AND MAY EVEN RESULT IN AN INCREASE IN FOOD AVAILABILITY UNDER CERTAIN CONDITIONS (MORE RESEARCH IS NEEDED).

Solution 1
In South Africa, natural carcass availability is likely to decline in response to habitat loss / change and Bearded Vulture populations will have to be managed through an intensive feeding programme, *i.e*. restaurants. The siting and management of these restaurants needs to be strategic and well planned (Problem Statement 6). The protected areas have a strong role to play in this feeding programme as they represent safe feeding areas for the birds (*i.e*. less chance of poisoning or collision deaths). In the protected areas there may be opportunity to simulate natural conditions by shooting or dropping animals more randomly across the landscape, and not at a single restaurant site. For example, a single poisoned carcass in Oribi Gorge reduced the breeding population of Cape Vulture by 80% in a single event.

Vortex models indicate the value of minimising the probability of mass poisoning as a mechanism to prevent extinction, emphasizing the need for the provision of safe sites for restaurants. Indeed, the value of every adult bird was highlighted by the modelling, further suggesting that any intervention that minimised mortality, such as safe breeding sites, would be most effective.

Land-use change away from livestock management may result in reduced food availability, even with formal restaurants, if it occurs at a large enough scale. There is no real solution at this scale as this is driven by macro-economic and other national forces.

In Lesotho, habitat loss through development is not a significant issue. Even land degradation is not a major concern to vultures as it occurs primarily below 2000 m, which is outside their main feeding range. This creates an unnatural situation because arable agriculture occurs mainly below 2000 m and livestock range management occurs above 2000 m.

Minimum: Establishment of a restaurant within every PA in the foraging range of Bearded Vultures.
Maximum: Approximately 80 restaurants strategically spread across the foraging range of Bearded Vultures.

Action Step 1: Review the database of restaurants and determine which are still active and being used by the vultures. Evaluate their suitability against a set of criteria by conducting an inventory (on site) of these sites.	
Resources needed:	A dedicated person to visit all known sites outside of KZN (where District Conservation Officer fulfil the function) and conduct on-site analysis of suitability. Will need an operational budget (c. 3 000 km, 20 days S&T @ R100 per day) and one months salary (c. R6 000 per month). Total = approximately R10 000.
Responsibility:	Richard Lechmere-Oertel, Tsepo Lepono and Ian Rushworth.
Timeline:	June 2006 – September 2006.
Obstacles:	Procurement.
Collaborators:	All conservation agencies, EWT / BoPWG and Quthing Wildlife Development Trust (QWDT).
Measurable outcomes:	List of suitable, active and frequented restaurants, with GPS coordinates and suitability index.

Action Step 2: Identify how many medicine-free livestock carcasses are becoming available (outside of restaurants), based on the Department of Agriculture statistics and limited questionnaires. Conduct research into the historical extent of Bearded Vulture's foraging range and determine the proportional loss due to land transformation and degradation, and

land-use changes. Try to understand these dynamics in terms of the future of the species.	
Resources needed:	A dedicated person to conduct data review. Will need an operational budget (c. 2 000 km, 20 days S&T @ R100) and two months salary (c. R6 000 pm = R12 000). Total = approx. R20 000. R8000 is available from the African Bird Club for this research.
Responsibility:	Richard Lechmere-Oertel, Tsepo Lepono and Ian Rushworth.
Timeline:	June 2006 – September 2006.
Obstacles:	None.
Collaborators:	All conservation agencies, EWT / BoPWG, QWDT and Department of Agriculture.
Measurable outcomes:	▪ Map of areas of high carcass density available to Bearded Vultures. ▪ Solid data on historic range contraction.

Action Step 3: Using the inventory of sites and carcass-availability data in Geographical Information System (GIS), conduct a strategic review of all sites in the bioregion, identifying gaps and areas of redundancy. Focus must be on those areas where juvenile birds congregate, in an effort to improve juvenile survivorship. Design an implementation plan to start new sites in gap areas (especially in protected areas) and to close redundant sites if possible.	
Resources needed:	Workshop logistics.
Responsibility:	Sonja Krüger to chair small working group (Ian Rushworth, Wigbert Vogeley, Steven Piper, Tsepo Lepono, Richard Lechmere-Oertel and André Botha).
Timeline:	October 2006.
Obstacles:	Non-availability of carcasses.
Collaborators:	All conservation agencies and EWT / BoPWG.
Measurable outcomes:	Strategic map of all restaurants (known and planned) and an implementation plan. Would need a clear answer to the question of whether food is limiting the population.

Action Step 4: Based on the strategic assessment, ensure that the Integrated Management Plan for each PA has a goal associated with the conservation of vultures through the establishment and management of a restaurant (not necessarily with a hide). Draft a letter of recommendation from the EWT / BoPWG to the conservation agencies.	
Resources needed:	None
Responsibility:	EKZNW: Oscar Mthimkhulu; Eastern Cape Parks Board: Bev Geach and Duncan Heard (Richard Lechmere-Oertel); SANParks: Albert Smith; Free State: Flip Crouse; Lesotho: Thulo Qhotsokoane; André Botha to draft a letter and send to relevant agencies.
Timeline:	November 2006.
Obstacles:	Institutional apathy and ignorance.
Collaborators:	All conservation agencies and EWT / BoPWG.
Measurable outcomes:	A restaurant in every PA where appropriate.

Action Step 5: In the interest of providing safe food within a safe environment, key restaurants in the PA network will need cold room facilities to store carcasses that become

available intermittently from neighbouring farms. This will allow regular placing of carcasses to attract the vultures.	
Resources needed:	Freezer containers (MDTP budget for 5, R380 000; EKZNW budget R45 000).
Responsibility:	Ian Rushworth, Richard Lechmere-Oertel to procure. Scoping reports – Sonja Krüger / Officer-in-Charge in EKZNW. Not sure of other provinces.
Timeline:	December 2006.
Obstacles:	World Bank procurement.
Collaborators:	All conservation agencies, EWT / BoPWG.
Measurable outcomes:	A freezer container at the predetermined restaurants.

Solution 2
Promote Bearded Vulture conservation planning into existing land-use planning systems, EIA processes and stewardship programmes. Because of the mitigation influence of restaurants, caution is needed in motivating against a development or breaking-of-ground application based on vultures alone.

Action Step 1: Increase awareness of the vulture conservation issues by circulating information to the various conservation planning departments and professional associations, *e.g.* IAIA. May need to develop a brief document describing the problem and solutions. The Western Cape has already drafted EIA guidelines based on biodiversity issues, and the same can be done for Bearded Vulture in KZN.	
Resources needed:	None.
Responsibility:	Sonja Krüger.
Timeline:	December 2006.
Collaborators:	All conservation agencies, EWT / BoPWG.
Measurable outcomes:	Document circulated to all relevant planning agencies.

PROBLEM STATEMENT 2
INTENSIFICATION OF LIVESTOCK HUSBANDRY REDUCES THE PROBABILITY OF CARCASSES REMAINING IN THE LANDSCAPE AS FARMERS WILL BE AWARE OF DEATHS AND MAY CHOOSE TO EAT, BURY OR DESTROY THE CARCASS BEFORE THE VULTURES CAN GET TO IT.

Solution 1
Implement a focused extension programme to encourage farmers to make carcasses available to existing or planned formal restaurants instead of burying or burning them. If transport or other logistics make this untenable, then encourage the farmer to place the carcasses at a suitable site for a restaurant (encourage coordination between neighbours to find a common place for a site).

An example would be from Oribi Gorge where a farmer has a restaurant on his farm and all neighbours within a 30 km radius bring their carcasses to the restaurant instead of destroying or eating it. He manages the site and cleans up the bones (sold to a bone meal company).

There may be opportunities for incentives to assist this programme, but the sustainability of these will need to be carefully thought through.
Minimum: 30 livestock owners have bought into the concept (KZN)

Maximum: 60 livestock owners have bought into the concept (KZN)

Action Step 1: Identify key areas where extension work will be focused, as an outcome of the strategic restaurant workshop (as discussed in Problem Statement 1, Solution 1 and Action Step 3). Equip the extension officers from the various conservation agencies and the Department of Environmental Affairs with sufficient information products to make farmers aware of the need for carcasses. Investigate the need for incentives for farmers to donate carcasses to a restaurant.	
Resources needed:	Information sheets (Wildlife Environment Society of South Africa (WESSA) information and discussion sheets).
Responsibility:	Richard Lechmere-Oertel to develop an information sheet. Oscar Mthimkhulu to take to Sibusiso Bukhosini (EKZNW).
Obstacles:	Extension officer absence or apathy.
Collaborators:	All conservation agencies, EWT / BoPWG.
Measurable outcomes:	Information sheet (pdf), extension officers.

In Lesotho, recognizing that carcasses are unlikely to be left specifically for vultures, a managed feeding programme through formal restaurants will be required. Most likely, such restaurants will only be successful if they are implemented through a village committee with initial outside assistance and motivation. The main incentive for such an intervention may be income-generation through tourism.

Case study Quthing District Lesotho: The QWDT, a Lesotho based NGO has established a feeding scheme in cooperation with the German Development Service (DED). Two villages have been identified where vulture restaurants are going to be established within the Quthing District. Both of these villages are supplied with 50 Mohair sheep each (funded by the German Embassy in South Africa), which are attended to by local members of QWDT. Subsequently the offspring of the breeding herd as well as the wool are going to be traded in for aged livestock, which are then going to be slaughtered and used at the vulture restaurants.

Minimum: 5 vulture restaurants being established.
Maximum: 10 vulture restaurants being established.

Action Step 2: In Lesotho, motivate community councils to create incentive opportunities to encourage the livestock owners to provide their old and dying animals to village restaurants in exchange for some benefit, *e.g.* shareholding in restaurant tourism income. Investigate and implement the possible establishment of restaurants based on the Quthing Vulture Feeding Scheme model where old and dying animals are exchanged for lambs or wool from an initial flock of sheep (c. R25 000 per restaurant).	
Resources needed:	NGO to drive the process of new restaurants.
Responsibility:	Wigbert Vogeley (Southern Districts), Tsepo Lepono for remainder.
Timeline:	April 2006 – 2014.
Obstacles:	Lack of commitment from the livestock owners.
Collaborators:	QWDT, District Councils, National Environmental Secretariat (NES), Ministry of Tourism, Environment and Culture (MTEC) Lesotho.
Measurable outcomes:	Functional restaurants being stocked by individual livestock owners.

PROBLEM STATEMENT 3
THE PLACEMENT OF CARCASSES THAT HAVE BEEN TREATED WITH VARIOUS DETRIMENTAL VETERINARY PRODUCTS AT A RESTAURANT CAN RESULT IN ACCIDENTAL MORTALITIES OR REDUCED FITNESS. INTENSIFICATION OF LIVESTOCK HUSBANDRY PROMOTES THE USE OF VETERINARY MEDICINES, SOME OF WHICH ARE DETRIMENTAL TO BEARDED VULTURES. LACK OF AWARENESS BY FARMERS, VETS AND OTHERS ABOUT WHICH MEDICINES ARE PROBLEMATIC TO VULTURES EXACERBATES THE PROBLEM.

Solution 1
Collate all information on the problem medicines and other chemicals and seek vulture-friendly alternatives currently on the market.

Action Step 1: Collate all information on vulture–harming veterinary medicines, including alternatives.	
Resources needed:	None.
Responsibility:	EWT / PWG) and Steven Piper.
Timeline:	June 2006.
Collaborators:	Conservation agencies and the Department of Environmental Affairs.
Measurable outcomes:	Information document.

Solution 2
Conduct a multi-pronged awareness campaign aimed at:

a) The pharmaceutical companies to research and develop vulture-friendly alternatives for key problem medicines.
b) The veterinary product distributors (vets and Central Cooperative (Co-ops)) regarding the potential damage to vultures by certain products.
c) The users (farmers) as to the damage they can cause by using these products, and how to mitigate against this (*e.g.* burying or destroying the treated carcasses).
d) Government departments that control the use and distribution of certain products, aiming for the banning of particularly dangerous substances (strong involvement by the EWT / PWG to implement this).
e) Extension services (conservation and agriculture) regarding the issue.
f) Restaurant managers and suppliers of carcasses regarding the seriousness of the use of treated carcasses, *i.e*. a single error could cripple the Bearded Vulture population in an area.

Minimum: Collate all the information and distribute it to the most important pharmaceutical companies, the veterinary council, all Co-ops, all recognised farmer's associations and all database restaurant managers and suppliers of carcasses.
Maximum: Full awareness campaign with active engagement of the main role-players.

Action Step 1: Hold a high-level meeting with the primary manufacturers of the products to discuss the options of warning labels and alternatives and precede with a letter of endorsement from all conservation agencies and the Department of Environmental Affairs.	
Resources needed:	None.
Responsibility:	André Botha (EWT / BoPWG) and Tim Snow (EWT / PWG). Letter

	of endorsement – Richard Lechmere-Oertel.
Timeline:	December 2006.
Obstacles:	Lack of cooperation.
Collaborators:	Conservation agencies.
Measurable outcomes:	Cooperative agreement with companies.

Action Step 2: Draft a letter and article on the products, with a strong plea for vets to inform the client not to expose animals that have been treated with certain products. Aim to have the letter placed in SAVA Vet News, and to mass mail the letter to all relevant vets on the council address list. In Lesotho – send the letter to the Veterinary Department in Maseru.	
Resources needed:	Veterinary Council mailing list (Yolan Friedmann). Print 2500 copies of letter.
Responsibility:	EWT / BoPWG and EWT / PWG with endorsement from the conservation agencies (logos). Yolan Friedmann to investigate mass mailing options.
Timeline:	June 2006
Collaborators:	Conservation agencies. EWT / BoPWG may have done a lot of this already.
Measurable outcomes:	All relevant vets receive information

Action Step 3: Design and print a colour A3 poster depicting and describing the problem with certain products. Deliver copies to all the key Co-ops and wholesalers.	
Resources needed:	Money for printing and graphic design skills.
Responsibility:	Sonja Krüger and the EKZNW design studio (or WESSA)
Timeline:	June 2006.
Obstacles:	
Collaborators:	Conservation agencies and the Department of Environmental Affairs.
Measurable outcomes:	Printed poster hanging up in relevant stores.

Action Step 4: Series of articles aimed at farmer association's newsletters, Wildside, Grassroots, local newspapers, Farmer's Weekly, Landbou Weekblad, conservancy distribution lists. The information will be available in various forms, but may need to be modified for each media type.	
Resources needed:	None.
Responsibility:	Should come from EWT / BoPWG.
Timeline:	October 2006.
Collaborators:	Conservation agencies.
Measurable outcomes:	Articles in press.

Action Step 5: Discuss with EWT / PWG the options of starting a process to ban certain substances.	
Resources needed:	None.
Responsibility:	André Botha (EWT / BoPWG) and Tim Snow (EWT / PWG)
Timeline:	June 2006
Obstacles:	May be a non-starter

Measurable outcomes:	Decision and way forward.

Action Step 6: Distribute letter to all extension staff in the conservation sector and Department of Agriculture.	
Resources needed:	None.
Responsibility:	Sibusiso Bukhosini via Oscar Mthimkhulu (EKZNW). Other provinces and Lesotho – Richard Lechmere-Oertel.
Timeline:	June 2006.
Obstacles:	None.
Measurable outcomes:	All extension officers equipped with information.

Action Step 7: Email / post same letter to all restaurant managers and suppliers on the EWT / BoPWG database.	
Resources needed:	None.
Responsibility:	EWT / BoPWG.
Timeline:	June 2006.
Measurable outcomes:	Letter with all restaurant managers / suppliers.

Solution 3
Establish a network through which information about new problem medicines and chemicals can be widely distributed to all role-players and restaurant managers.

Action Step 1: Establish a database of all people who need to know about new detrimental medical products, including all extensions staff, all restaurant managers / suppliers, SAVA newsletter, *etc.*	
Resources needed:	None.
Responsibility:	EWT / BoPWG.
Timeline:	December 2006.
Collaborators:	Conservation agencies
Measurable outcomes:	All new information being widely distributed to relevant stakeholders.

PROBLEM STATEMENT 4
COMPETITION FOR CARCASSES FROM HYEANAS (ETHIOPIA), HUMANS AND DOGS (SOUTH AFRICA AND LESOTHO) REDUCES FOOD AVAILABILITY TO VULTURES.

Solution 1
Fence off restaurants to prevent scavenger and dog access where this is a problem. Restaurants should be sited away from public roads and communally-used areas. Lesotho to establish formal restaurants, which are well managed by the community and should include management guidelines (Problem Statement 6). Fencing has problems in that it is expensive and can deter some vultures from landing. However, fencing can allay the fears of certain landowners concerning the feeding of conflict species such as jackal.

Action Step 1: Identify those restaurants that definitely need to be fenced, such as those that are often stocked. This can be done at the same time as the strategic restaurant planning session.	
Resources needed:	None.
Responsibility:	Bearded Vulture Interest Group (BVIG).
Timeline:	October 2006.
Measurable outcomes:	List of sites that need fencing.

Action Step 2: Fence the identified sites, ensuring that the fencing meets the guidelines for restaurants. On private lands, encourage landowners to fence key sites, especially if neighbours are complaining about conflict animals. Protected areas will not fence their restaurants.	
Resources needed:	Fencing material, transport and labour.
Responsibility:	Conservation agencies as part of the Integrated Management Plan.
Timeline:	October 2006.
Obstacles:	Private landowners may not want to fence sites.
Measurable outcomes:	List of sites that need to be fenced.

PROBLEM STATEMENT 5
STOCK-THEFT PROMOTES A SWITCH FROM EXTENSIVE RANGELAND GRAZING TO INTENSIVE GRAZING AND MONOCULTURES, CONTRIBUTING TO FEWER ANIMALS ON THE LANDSCAPE.

Solution 1
Work with existing security strategies and bodies to highlight the potential impacts of stock-theft on Bearded Vulture populations. Aim to increase the effectiveness of the stock-theft units and border police.

Action Step 1: Draft a letter to be sent to the Bilateral Security Working Group to highlight the link between stock-theft, land transformation and reduction in carcasses availability.	
Resources needed:	None.
Responsibility:	Oscar Mthimkhulu and John Crowson.
Timeline:	June 2006.
Collaborators:	EWT / BoPWG.
Measurable outcomes:	Issue is highlighted in the Bilateral Security Strategy.

PROBLEM STATEMENT 6
INCORRECT SITING AND MANAGEMENT OF RESTAURANTS CAN LEAD TO NON-USE BY BEARDED VULTURES OR CAN INCREASE THE THREATS TO THE BIRDS (DELIBERATE POISONINGS AND COLLISIONS). RESTAURANT MANAGEMENT IN TERMS OF BONE SIZES AND FREQUENCY AND QUANTITY OF FEEDING CAN BE DETRIMENTAL OR NON-BENEFICIAL TO BEARDED VULTURES. RESTAURANTS IN GENERAL MAY ALTER THE BEHAVIOUR OF THE BIRDS AND BE DETRIMENTAL TO FECUNDITY, DESPITE REDUCING MORTALITY. LOTS OF FOOD ALL THE TIME MAY REDUCED THE LEARNED SEARCHING BEHAVIOUR OF THE JUVENILES.

Solution 1
Publish guidelines for the siting and management of restaurants. Make this document available through the extension services and relevant websites. The EWT / BoPWG would need to be involved in the production and distribution of the guidelines. The guidelines need to be endorsed by the relevant conservation agencies (logos printed on booklet), including Lesotho NES and MTEC. Ensure the guidelines cover issues such as provision of a range of bone sizes to cater for all tastes. There may be a need to convene a small working group to pull together the guideline document.

Minimum: Electronic published guidelines as mentioned above.
Maximum: Full endorsement by all agencies and the "glossy" publication.

Action Step 1: Publish and distribute hardcopy of the Sasol Restaurant Guidelines to all relevant stakeholders.	
Resources needed:	None as sponsored by Sasol.
Responsibility:	Steven Piper and EWT / BoPWG. Distribution through District Conservation Officers and other extension staff.
Timeline:	December 2006.
Collaborators:	Conservation agencies and Environmental Affairs.
Measurable outcomes:	All restaurant managers, Officer-in-Charge, Lesotho District Councils, *etc.* have a copy (at least digital).

Solution 2
Encourage restaurant owners to register their restaurants. The database of restaurants should be maintained by a national agency or NGO, such as the EWT / BoPWG. This information should be made available to the local conservation agencies. This will be a good opportunity to collaborate with Lesotho to maintain a joint database.

Minimum: The establishment and housing of the database.
Maximum: Incorporate all restaurants into the database with access by conservation agencies.

Action Step 1: Ensure that all restaurant managers are aware of the need to and benefits of registering their restaurant and ensure that EWT / BoPWG or other national body is able to maintain this database, guaranteeing access to the relevant conservation agencies.	
Resources needed:	Database manager to service and update the database.
Responsibility:	EWT / BoPWG and District Conservation Officer do on-the ground contact.
Timeline:	Ongoing.
Obstacles:	Lack of registration interest.
Collaborators:	All conservation agencies and relevant NGOs.
Measurable outcomes:	Restaurants registered and database up-to-date and accurate.

Solution 3
Encourage the restaurant manager to draw up an approved management plan with the assistance of the authorities and / or EWT / BoPWG. Management plans should be endorsed by the local conservation authority. There will be opportunities to have a certification programme for the restaurants that may have tourism advantages. This would require site visits and monitoring by the relevant agency or other extension service.

Minimum: Each restaurant within a protected area is incorporated into the reserve's management plan.
Maximum: All restaurants have an approved and certified management plan in place.

Action Step 1: Incorporate a section on restaurant management in all Protected Area Management Plans where relevant. Generate a supporting document on restaurants that can be added to existing management plans.	
Resources needed:	None.
Responsibility:	Protected area planning teams from each conservation agency.
Timeline:	As per the Protected Area Management Plan processes.
Obstacles:	None.
Collaborators:	EWT / BoPWG.
Measurable outcomes:	Restaurant management detailed in the Protected Area Management Plan.

Action Step 2:. Generate a list of design and management criteria to achieve certification. Publish this with the management guidelines as a check list.	
Resources needed:	None.
Responsibility:	BVIG.
Timeline:	July 2006.
Obstacles:	None.
Collaborators:	Conservation agencies.
Measurable outcomes:	Certification criteria published.

Action Step 3: Process applications for certification through site visits and monitoring.	
Resources needed:	Part of the conservation agency function.
Responsibility:	District Conservation Officers and NGOs (Lesotho) to do site visits. Kevin McCann may be able to provide some training in this area.
Timeline:	Ongoing.
Obstacles:	Lack of interest, too complicated, or lost in work schedules.
Collaborators:	EWT / BoPWG.
Measurable outcomes:	Restaurants being certified.

PROBLEM STATEMENT 7
CLIMATE CHANGE AND GLOBAL WARMING MAY AMPLIFY THE EFFECTS OF HABITAT LOSS BY FURTHER CHANGING THE REMAINING INTACT HABITAT AND REDUCING AVAILABILITY OF CARCASSES. THERE MAY ALSO BE IMPACTS THROUGH SHIFTING OF CLIMATE ENVELOPES THAT FORCE THE BIRDS TO VACATE THE BIOREGION OR RESTRICT IT WITHIN THE REGION.

Solution 1
Design into the monitoring programme (link to research group) indicators that will reveal impacts of global climate change and global warming on vulture populations.

Action Step 1: Discuss the issue with Rob Simmons and Phoebe Barnard at SANBI to see if they can pick this up as part of their global climate change research.

Resources needed:	None.
Responsibility:	Richard Lechmere-Oertel.
Timeline:	June 2006.
Obstacles:	None.
Collaborators:	EWT / BoPWG and SANBI
Measurable outcomes:	Decision on how to move forward.

Political, Legal, Education, Awareness, Social and Economic Working Group

WORKING GROUP PARTICIPANTS:

1.	Raymond Zilkhali	EKZNW
2.	Steve McKean	EKZNW
3.	Doug Burden	Mondi Shanduka News Print
4.	Hayley Komen	EWT / BoPWG

Introduction / Situation overview

The group discussed the various social, political, legal and economic factors influencing the Bearded Vulture as well as issues around education and awareness.

Below please find a summary of the Problem Statements:

1. Lack of partnerships with:
   - Traditional healers
   - Muthi Traders
   - Governments – local and international
   - NGOs – local and international
   - Private enterprise (including landowners and developers)
   - Provincial conservation authorities
   - Media
   - Educational institutions – schools through to universities
2. Legal status of Bearded Vulture not uniform across its range
3. Lack of coordinated education and awareness programmes specific to the Bearded Vulture
4. Lack of understanding as to successes and failures of present and previous awareness initiatives around Bearded Vulture conservation
5. Lack of knowledge and understanding of economic and cultural reasons for traditional use. Lack of knowledge on the extent of utilisation
6. Indifference and apathy by general public and decision makers toward Bearded Vulture conservation

Tourism opportunities were seen to be a solution and each problem was ranked according to importance as follows: partnerships; education; legal; traditional use, apathy, monitoring of previous and current initiatives / successes / failures.

PROBLEM STATEMENT 1.1
LACK OF PARTNERSHIPS: TRADITIONAL HEALERS AND MUTHI TRADERS.

Solution 1
Identify nationwide TMP associations, establish contact.

Action Step 1: Identification of TMPs	
Resources needed:	Telephone, inventory of provincial associations, contact people and

	details at these associations.
Responsibility:	EKZNW social ecologist (Steve McKean to motivate).
Timeline:	1 July 2006.
Obstacles:	▪ History of mistrust and secrecy around traditional medicine. ▪ Assigning individual responsibility. ▪ Internal politics amongst TMPs. ▪ Informal industry makes it difficult to trace TMPs.
Collaborators:	TMPs, Institute of Natural Resources (INR), provincial conservation authorities, provincial department of health, traditional authorities and MDTP.
Measurable outcomes:	Comprehensive database of TMPs (including contact details) and people for KZN, Eastern Cape, Free State and Lesotho.

Solution 2
Develop working relationships.

Action Step 1: Establish a working committee consisting of relevant national and provincial stakeholders.	
Resources needed:	Senior TMP personnel from three provinces of South Africa and Lesotho, on committee. Bearded Vulture PHVA report and funding.
Responsibility:	EKZNW (Steve McKean to initiate).
Timeline:	1 November 2006
Obstacles:	▪ History of mistrust and secrecy around traditional medicine. ▪ Individual responsibility. ▪ Internal politics amongst TMPs. ▪ Informal industry makes it difficult to trace TMPs. ▪ Logistics of getting people together.
Collaborators:	TMPs, INR, provincial conservation authorities, provincial department of health, traditional authorities, MDTP, EWT / BoPWG and EWT / PWG.
Measurable outcomes:	Minutes from committee meeting.

PROBLEM STATEMENT 1.2
LACK OF PARTNERSHIPS: PROVINCIAL CONSERVATION AUTHORITIES.

Solution 1
Ensure agreement on and adoption of actions to ensure Bearded Vulture conservation between the five relevant conservation authorities (EKZNW, Free State Nature Conservation, Eastern Cape Nature Conservation, SANParks and Lesotho) specific to a Bearded Vulture management plan.

Action Step 1: Ensure that information from the PHVA is communicated to the senior staff of conservation authorities by motivating to senior staff and the EKZNW Board. Senior EKZNW staff to communicate with provincial and national conservation authorities to ensure a working relationship and commitments.	
Resources needed:	All Bearded Vulture information.
Responsibility:	Ian Rushworth as team leader, Steve McKean and Sonja Krüger.
Timeline:	1 July 2006
Obstacles:	▪ Senior EKZNW staff - do not see this as priority. ▪ Already loaded work schedules of senior staff.

Collaborators:	Senior staff, MDTP (for senior staff communication to other conservation authorities).
Measurable outcomes:	Presentation to senior staff pertaining to the PHVA.

Action Step 2: Use the existing Underberg / Mokhotlong district liaison forum to put Bearded Vulture conservation on the agenda.	
Resources needed:	Forum already exists – PHVA.
Responsibility:	John Crowson and Eduard Goosen.
Timeline:	1 July 2006.
Obstacles:	▪ Apathy on the part of certain conservation authorities. ▪ Lack of capacity amongst conservation authorities.
Collaborators:	MDTP
Measurable outcomes:	Minutes of the MDTP meetings.

PROBLEM STATEMENT 1.3
LACK OF PARTNERSHIPS: GOVERNMENTS – LOCAL AND INTERNATIONAL.

Solution 1
Create awareness of the problem and obtain "buy-in" to proposed solutions from local and district municipalities, traditional authorities, provincial and national departments of environmental affairs and health, and the national departments of foreign affairs and trade and industry.

Action Step 1: Formulate materials to promote Bearded Vulture conservation using Bearded Vulture management plan.	
Resources needed:	Funding and human resources.
Responsibility:	Hayley Komen to speak to Kevin McCann.
Timeline:	1 December 2006.
Obstacles:	Lack of funding.
Collaborators:	KZN Biodiversity Programme of the EWT, Mondi Shanduka News Print and EKZNW.
Measurable outcomes:	Materials produced.

Action Step 2: Use the materials in a formal programme to promote Bearded Vulture conservation.	
Resources needed:	Facilitators and funding.
Responsibility:	Hayley Komen to speak to Kevin McCann.
Timeline:	1 February 2007.
Obstacles:	Lack of funding.
Collaborators:	EKZNW, KZN Biodiversity Programme of the EWT, other provincial authorities, Lesotho authorities, MDTP and Mondi Shanduka News Print.
Measurable outcomes:	Record of the number of presentations to relevant municipalities, traditional leaders, *etc*.

PROBLEM STATEMENT 1.4
LACK OF PARTNERSHIPS: NGOs / CLUBS – LOCAL AND INTERNATIONAL.

Solution 1
Elicit support and understanding of this workshop product from relevant NGOs. Develop problem specific projects in conjunction with NGOs.

Minimum: Five NGOs.
Maximum: Eight NGOs.

Action Step 1: Inform relevant NGOs of the outcomes the Bearded Vulture PHVA and future projects. Encourage future participation in projects.	
Resources needed:	PHVA report, list of relevant NGOs (WESSA, EWT, KZN Biodiversity Programme of the EWT, Bergwatch, BirdLife SA, NSPCA, WWF-SA, National Conservancies Association, Mountain Club of South Africa (MCSA), hiking clubs).
Responsibility:	EWT / BoPWG, Kevin McCann (Bergwatch, BirdLife, WESSA, KZN Biodiversity Programme of the EWT), Doug Burden (Conservancy Association, NSPCA), Sonja Krüger (MCSA, Wilderness Action Group), Wigbert Vogeley (Quithing Wildlife Development Trust).
Timeline:	1 December 2006.
Obstacles:	None.
Collaborators:	All the above mentioned NGOs and MDTP
Measurable outcomes:	Record of the number of NGOs and clubs to which information has been disseminated.

PROBLEM STATEMENT 1.5
LACK OF PARTNERSHIPS: MEDIA.

Solution 1
Negotiate dedicated media slots to promote Bearded Vulture awareness (print, TV, radio, internet). Continually feed relevant information regarding Bearded Vulture conservation to the media. Improve vulture image using the media (see: Southern African Vulture Conservation Strategic Plan, 2004).

Action Step 1: Check what existing arrangements there are with the media, nationwide and slot in with existing arrangements. Example is Africa Birds and Birding with the EWT / BoPWG / SACWG arrangement where an article is published for these working groups in each issue.	
Resources needed:	None.
Responsibility:	EKZNW for KZN (media department under direction from Ian Rushworth), EWT (Hayley Komen) for national, Lesotho Department of Environment.
Timeline:	1 July 2006.
Obstacles:	None.
Collaborators:	All mentioned.
Measurable outcomes:	Record of existing arrangements; any new initiatives to be documented.

Action Step 2: Package information for distribution in order to have a uniform message: plight of Bearded Vulture; impact of nest disturbance regarding nestling mortality; positive image for vultures. Develop campaign around traditional use. Translate into isiXhosa, isiZulu, Sesotho and Afrikaans.	
Resources needed:	PHVA reports, other existing material on Bearded Vulture, outcome of an investigation into traditional use, translators, acquire media professionals to package media related content and funding.
Responsibility:	EKZNW for KZN (media department under direction from Ian Rushworth), EWT (Hayley Komen) for national.
Timeline:	Campaign on traditional medicine – after investigation completed, 1 April 2007. Packaged information by 1 July 2006. Translation by 1 September 2006.
Obstacles:	Lack of funding for translation and media professionals.
Collaborators:	Corporates such as Mondi, Sasol, SAPPI *etc.*
Measurable outcomes:	Formulated information packages.

Action Step 3: Negotiate new dedicated media slots for Bearded Vulture issues specifically.	
Resources needed:	None.
Responsibility:	EKZNW for KZN (media department under direction from Ian Rushworth), EWT (Hayley Komen) for national.
Timeline:	1 July 2006.
Obstacles:	None.
Collaborators:	None.
Measurable outcomes:	Record of amount of airtime and number of press releases and popular articles.

Action Step 4: Create space on EKZNW and EWT websites to highlight the issues of the Bearded Vulture.	
Resources needed:	None.
Responsibility:	EKZNW for KZN (Ian Rushworth) and EWT (Hayley Komen).
Timeline:	1 June 2006.
Obstacles:	None.
Collaborators:	None.
Measurable outcomes:	▪ The space available and visible details on the websites. ▪ Number of hits.

PROBLEM STATEMENT 1.6
LACK OF PARTNERSHIPS: PRIVATE ENTERPRISE, LANDOWNERS AND DEVELOPERS.

Solution 1
Create awareness among large corporations and landowners of the problems associated with Bearded Vulture use and approach them for project specific funding. Influence corporate management decisions which could impact on Bearded Vultures, for example afforestation and tourism development.

Note: Landowners and developers fall under Education and Awareness.

Action Step 1: To investigate the opportunities that exist and to exploit these for funding of necessary projects for Bearded Vulture conservation.	
Resources needed:	Personnel time.
Responsibility:	André Botha.
Timeline:	Ongoing.
Obstacles:	None.
Collaborators:	None.
Measurable outcomes:	Actual funding secured.

PROBLEM STATEMENT 1.7
LACK OF PARTNERSHIPS: EDUCATIONAL INSTITUTIONS.

Solution 1
Develop appropriate material to distribute to schools. See Problem Statement 2 below.

Solution 2
Draw up an inventory of schools most likely to impact on Bearded Vulture conservation. See Problem Statement 2 below.

Solution 3
Involve tertiary institutions in Bearded Vulture conservation work where appropriate (*e.g.* Saasveld students).

Action Step 1: Annual talks to Nature Conservation and Agricultural students to stimulate interest in and promote involvement in Bearded Vulture conservation.	
Resources needed:	Personnel time.
Responsibility:	KZN (Bill Howells), André Botha or representative.
Timeline:	Immediate and ongoing.
Obstacles:	None.
Collaborators:	Lecturers at various institutions.
Measurable outcomes:	▪ The number of talks and institutions. ▪ The number of students becoming involved in Bearded Vulture conservation, and the number of projects they are involved with.

PROBLEM STATEMENT 2
LACK OF COORDINATED EDUCATION AND AWARENESS.

Solution 1
Develop a uniform set of educational materials on Bearded Vulture conservation to be used by all relevant educators.

Action Step 1: Extract relevant materials from the Bearded Vulture PHVA (including the Briefing Document) for inclusion into Biodiversity Environmental Education Programme (BEEP).	
Resources needed:	Funding and qualified personnel.
Responsibility:	Bill Howells, Ntombifuthi Luthuli (EKZNW) and MDTP
Timeline:	1 February 2007.

Obstacles:	Lack of funding.
Collaborators:	WESSA (ShareNet) and Janis O'Grady.
Measurable outcomes:	Produced materials.

Solution 2
Train the trainers with reference to facilitation of Bearded Vulture conservation materials to ensure a uniform and correct message.

Action Step 1: Train facilitators.	
Resources needed:	Training materials and funds for travelling.
Responsibility:	André Botha, Sonja Krüger, Steve McKean, Athol Marchant and WESSA (ShareNet).
Timeline:	1 April 2007.
Obstacles:	Lack of funding.
Collaborators:	WESSA (ShareNet) and Janis O'Grady.
Measurable outcomes:	Number of people who have been trained.

PROBLEM STATEMENT 3
LEGAL STATUS OF BEARDED VULTURE NOT UNIFORM ACROSS ITS RANGE.

Solution 1
Based on the proceedings of this workshop, identify the legal inconsistencies regarding Bearded Vulture conservation across the 3 provinces and Lesotho.

Action Step 1: One person to look at legislation across the three provinces of South Africa and Lesotho and identify inconsistencies.	
Resources needed:	Copies of legislation and personnel time.
Responsibility:	Steve McKean to speak to Rod Potter (EKZNW). Steven Piper will provide Steve McKean with all the information he has.
Timeline:	1 June 2006.
Obstacles:	None.
Collaborators:	Honorary officers of the conservation authorities.
Measurable outcomes:	Document outlining inconsistencies in the legislation.

Action Step 2: Approach the relevant authorities to affect change by arranging a workshop involving South African Police Service (SAPS), conservation law enforcement officers, prosecutors and magistrates. After this, approach the Department of Environmental Affairs and Tourism (DEAT).	
Resources needed:	Personnel time.
Responsibility:	Steve McKean to speak to Rod Potter.
Timeline:	1 September 2006.
Obstacles:	Lack of participation.
Collaborators:	Honorary officers of all conservation authorities and SAPS; District Conservation Officers (EKZNW).
Measurable outcomes:	Legislation updated.

PROBLEM STATEMENT 4
LACK OF KNOWLEDGE AROUND TRADITIONAL USE.

Solution 1
Implement a research project to obtain the required information.

Action Step 1: Implement the project.	
Resources needed:	Funding and personnel time.
Responsibility:	Steve McKean.
Timeline:	1 March 2007.
Obstacles:	Possible unwillingness of traders / healers to cooperate.
Collaborators:	EWT / BoPWG and FutureWorks.
Measurable outcomes:	Final report.

Solution 2
Undertake questionnaire surveys in Lesotho and South African rural areas where Bearded Vultures occur, around vulture use with the aim of gaining information about traditional use within the rural communities.

Action Step 1: Development and implementation.	
Resources needed:	Funding and personnel time.
Responsibility:	Steve McKean and Elna de Beer.
Timeline:	1 December 2006.
Obstacles:	▪ Possible unwillingness of rural communities to cooperate. ▪ Lack of personnel.
Collaborators:	MDTP.
Measurable outcomes:	Final report.

PROBLEM STATEMENT 5
INDIFFERENCE AND APATHY

Solution 1
Influence as broad a spectrum of the general public and decision makers as possible by successful implementation of Solutions to Problems Statements 1 to 4.

Action Step 1: Ensure successful implementation of all Action Steps in Problem Statements 1 to 4.	
Resources needed:	As per Problem Statements 1 – 4.
Responsibility:	EWT / BoPWG and EKZNW.
Timeline:	1 March 2007.
Obstacles:	
Collaborators:	
Measurable outcomes:	Success / failure of individual solutions.

Solution 2
Develop an incentive-based programme to conserve Bearded Vultures.

Action Step 1: Ensure that Bearded Vulture conservation is included in the compilation of the stewardship programme currently being drawn up. Note: KZN to be a 'template' for other areas involved with Bearded Vulture conservation.	
Resources needed:	Funding and personnel time.
Responsibility:	Ian Rushworth to speak to Jean Harris (EKZNW).
Timeline:	1 July 2006.
Obstacles:	▪ Lack of political will. ▪ Lack of funding. ▪ Lack of properly trained staff.
Collaborators:	Local government, private enterprise and EWT.
Measurable outcomes:	Accepted and implemented stewardship programme in KZN.

Action Step 2: To reward successful Bearded Vulture conservation efforts by means of a signboard or certificate. This includes protecting a nesting site or establishing a certified vulture restaurant.	
Resources needed:	Signboards, certificates, certification process and funding. Linked to habitat loss and food shortage group.
Responsibility:	EWT / BoPWG.
Timeline:	1 March 2007.
Obstacles:	Lack of funding.
Collaborators:	Private enterprise, nature conservation authorities and EWT Custodian Programme.
Measurable outcomes:	Number of signboards and certificates presented.

PROBLEM STATEMENT 6
LACK OF KNOWLEDGE OF OUTCOMES OF PREVIOUS INTERVENTIONS.

Solution 1
Inclusion of monitoring protocol around initiatives.

Action Step 1: Draw up the monitoring protocol around awareness campaigns and their success or failure.	
Resources needed:	None.
Responsibility:	Doug Burden to initiate.
Timeline:	1 March 2007.
Obstacles:	None.
Collaborators:	EWT / BoPWG and conservation agencies.
Measurable outcomes:	Documented and accepted protocol.

Solution 2
Dissemination of knowledge gained through a formal documentation process.

Action Step 1: Encourage people to report incidents involving Bearded Vultures, by utilizing appropriate helplines. Utilise the media, EWT member base, BirdLife member base *etc*.

Resources needed:	Existing help-lines.
Responsibility:	Initiated by EWT / BoPWG.
Timeline:	Immediate and ongoing.
Obstacles:	Potential lack of cooperation from partners.
Collaborators:	Helpline runners, conservation agencies, conservation NGOs and SAPS.
Measurable outcomes:	Incidents reported.

Unnatural Mortality Working Group

WORKING GROUP PARTICIPANTS:

1.	Albert Smith	SANParks, Golden Gate National Park
2.	Bill Howells	EKZNW
3.	Tsepo Lepono	MDTP, Lesotho
4.	André Botha	EWT / BoPWG
5.	Addisu Assefa	BMNP, Ethiopia

Introduction / Situation overview

The group consisted of individuals from three different countries (Ethiopia, Republic of South Africa and from Lesotho), from diverse backgrounds and different institutions which include NGOs, conservation agencies and transfrontier projects. Man induced mortalities in the Bearded Vulture form a real threat to the species and includes collisions and electrocutions on power-lines, indirect persecution by poisoning, direct persecution from shooting, inappropriate development for tourism, radio / electrical and other structures and the consumptive use of vulture parts for medicinal and traditional use.

PROBLEM STATEMENTS

PROBLEM STATEMENT 1
POISONING:
POISON IS FREELY ACCESSIBLE AND INDISCRIMINATELY USED. PEOPLE COMMITTING CRIMES USING POISON DO SO WITHOUT FEAR OF APPREHENSION. POISONING BY VETERINARY MEDICINE IN CARCASSES IS A POTENTIAL THREAT WHICH HAS NOT BEEN CONFIRMED IN THE BEARDED VULTURE.

Solution 1
Step up law enforcement to ensure that poison users comply with legislation (farmers, *etc*.).

Action Step 1: Highlight the importance of environmental crime in relation to Bearded Vulture so that people take cognisance of and comply with laws governing poisonous substance use.	
Resources needed:	Awareness materials, talk packs, one representative in each agency, Lesotho Biodiversity Working Group (LBWG), EWT / PWG, SAPS, Lesotho Mounted Police Service (LMPS) to coordinate.
Responsibility:	André Botha discuss with EWT / PWG, PWG to interact with provincial agencies and LBWG.
Timeline:	Implementation immediate (May 2006), process expected to roll out by 2008, evaluation continuous.
Obstacles:	▪ Ignorance. ▪ Cross-border protocols. ▪ Slack law enforcement. ▪ Overload from other cases. ▪ Penalties inadequate.

Collaborators:	EWT / PWG, provincial conservation authorities, SAPS, LMPS, Lesotho Conservation Agency, Departments of Justice.
Measurable outcomes:	Reduce the number of poison-related court cases by 50% over five years.

Solution 2
Review the statutes regarding use of Agro-chemicals for PAC in Lesotho.

Action Step 1: Desk-top study to determine current policy and promote appropriate adjustments and improvements.	
Resources needed:	Access to policy documents, one "driver" within the LBWG Committee.
Responsibility:	Tsepo Lepono.
Timeline:	April –September 2006 (review), adjustments (end 2007).
Obstacles:	▪ Resistance to change policies and apathy from policymakers. ▪ Bureaucratic red-tape.
Collaborators:	LBWG, Ministry of Agriculture and Food Security (Lesotho), MDTP and councils.
Measurable outcomes:	Changes in policy are accepted and promulgated as law that are compatible with similar legislation in the rest of the Bearded Vulture range.

Solution 3
Create awareness of the ramifications of poison and veterinary medicine use in PAC and of veterinary medicines.

Action Step 1: Develop a joint talk-pack for presentations to target audiences.	
Resources needed:	Resource material for inclusion in talk pack, author / s, funding for production, printing and distribution, translation, training of presenters / implementers.
Responsibility:	EWT / PWG, BEEP, LBWG, provincial authorities, MDTP.
Timeline:	April 2006, roll-out mid: 2007.
Obstacles:	▪ Costs. ▪ Lack of staff to roll out awareness programme in some areas. ▪ Lack of buy-in from role-players.
Collaborators:	EWT / PWG, LBWG, provincial authorities and MDTP.
Measurable outcomes:	Protocols implemented and no inadvertent veterinary vulture poisoning incidents.

Action Step 2: Identify and promote alternative options of PAC.	
Resources needed:	Proceedings of Human-Wildlife Conflict Workshop report.
Responsibility:	EWT / PWG.
Timeline:	April – July 2006.
Obstacles:	▪ Non-agreement of appropriate techniques. ▪ Resistance to suggested alternatives. ▪ Animal rights groups.
Collaborators:	EWT / PWG, provincial authorities, MDTP, *etc*.
Measurable outcomes:	Acceptance and implementation of preferred PAC measures by farmers.

Solution 4
Vulture restaurants are controlled / managed to ensure that sites are secure from intentional and accidental poisoning.

Action Step 1: Establish a system to register and certify supplementary vulture restaurants. Create a system of recognition and accreditation of such sites.	
Resources needed:	Database, registration process, materials (certificates, plaques, *etc*.)
Responsibility:	EWT / BoPWG, provincial authorities, MDTP and QWDT.
Timeline:	In process, roll-out of incentives by end 2006.
Obstacles:	▪ Old data. ▪ Buy-in from provincial authorities and the Lesotho Department of Environment.
Collaborators:	EWT / BoPWG, provincial authorities, Lesotho Department of Environment.
Measurable outcomes:	Database updated and certificates issued to accredited sites.

Solution 5
Ensure that monitoring captures all poisoned related mortalities of Bearded Vultures and Cape Vultures.

Action Step 1: Encourage the reporting of all Bearded Vulture and Cape Vulture poison-related mortalities to the EWT / PWG.	
Resources needed:	Centralised poisoning database to collate data, EWT / PWG toll-free line, efficient reporting structures and poster campaign in strategic centres.
Responsibility:	EWT / PWG.
Timeline:	Immediate and continuous.
Obstacles:	Apathy, poor reporting structures that do not facilitate integration of data.
Collaborators:	EWT / PWG, provincial authorities, SAPS, LMPS and LBWG.
Measurable outcomes:	Capture and accessibility of optimal Bearded Vulture poisoning data.

PROBLEM STATEMENT 2
PERSECUTION (DIRECT):
DIRECT PERSECUTION OCCURS BECAUSE FARMERS PERCEIVE BEARDED VULTURE AS A THREAT TO LIVESTOCK. DIRECT PERSECUTION OCCURS BY SHOOTING AND TRAPPING.

Solution 1
Awareness.

Action Step 1: Develop a joint talk-pack for presentations to target audiences to de-mystify the species and explain the impact of persecution on Bearded Vulture populations.	
Resources needed:	Resource material for inclusion in talk pack, author / s, funding for production, printing and distribution, translation, training of presenters / implementers.
Responsibility:	EWT / BoPWG with BEEP, LBWG, provincial authorities and

	MDTP.
Timeline:	April 2006, roll-out mid: 2007.
Obstacles:	▪ Costs. ▪ Lack of staff to roll out awareness programme in some areas. ▪ Buy-in from role-players.
Collaborators:	EWT / BoPWG, BEEP, LBWG, provincial authorities and MDTP.
Measurable outcomes:	Protocols implemented and no Bearded Vulture mortalities due to direct prosecution.

Solution 2
Step up with law enforcement.

Action Step 1: Highlight the importance of environmental crime in relation to Bearded Vulture so that people take cognisance of and comply with laws governing human-wildlife conflict situations.	
Resources needed:	Awareness materials, talk packs, one representative in each agency, LBWG, EWT / PWG, SAPS, LMPS to coordinate.
Responsibility:	EWT / BoPWG to interact with provincial authorities and LBWG.
Timeline:	Implementation immediate (May 2006), process expected to roll out by 2008, evaluation continuous.
Obstacles:	▪ Ignorance. ▪ Cross-border protocols. ▪ Slack law enforcement. ▪ Overload of other cases. ▪ Penalties inadequate.
Collaborators:	EWT / BoPWG, provincial conservation authorities, SAPS, LMPS, Lesotho Conservation Agency, Departments of Justice.
Measurable outcomes:	Reduce the number of persecution-related court cases by 50% over five years.

Action Step 2: Identify and promote alternative appropriate practices of PAC.	
Resources needed:	Proceedings of Human-Wildlife Conflict Workshop report.
Responsibility:	EWT / BoPWG.
Timeline:	April – July 2006.
Obstacles:	Non-agreement of appropriate techniques, resistance to suggested alternatives, animal rights groups.
Collaborators:	EWT / BoPWG, provincial authorities, MDTP, *etc*.
Measurable outcomes:	Acceptance and implementation of preferred PAC measures by farmers.

Solution 3
Ensure that monitoring captures all persecution-related mortalities of Bearded Vultures.

Action Step 1: Encourage the reporting of all Bearded Vulture poison-related mortalities to EWT/ PWG.	
Resources needed:	Centralised poisoning database to collate data, EWT / PWG toll-free line, efficient reporting structures, poster campaign in strategic centres.
Responsibility:	EWT / PWG and EWT / BoPWG.
Timeline:	Immediate and continuous.
Obstacles:	▪ Apathy.

	▪ Poor reporting structures that do not facilitate integration of data.
Collaborators:	EWT / PWG, EWT / BoPWG, provincial authorities, SAPS, LMPS and LBWG.
Measurable outcomes:	Capture and accessibility of optimal Bearded Vulture poisoning data.

PROBLEM STATEMENT 3
POWER-LINES AND OTHER STRUCTURES:
MORTALITIES IN BEARDED VULTURE HAVE BEEN CAUSED BY ELECTROCUTION ON, AND COLLISION WITH POWERLINES AND OTHER STRUCTURES, *E.G.* CELL PHONE TOWERS, FENCES *ETC*.

Solution 1
Future EIAs for the placement of all rural electricity networks and structure sizes within the Bearded Vulture range must be non-negotiable.

Action Step 1: Acceptance and compliance by all role-players in the development of proposed power-lines / cable structures within the Bearded Vulture range in both South Africa and Lesotho.	
Resources needed:	Appropriate protocols and guidelines for the EIA process.
Responsibility:	EWT / Eskom Partnership, Law and Policy Working Group of the Endangered Wildlife Trust (EWT / LPWG), Southern African Institute of Environmental Assessors (SAIEA), Lesotho Electricity Corporation (LEC).
Timeline:	Immediate and continuous.
Obstacles:	▪ Resistance. ▪ Corruption (Contractors). ▪ Limited presence in Lesotho.
Collaborators:	EWT / Eskom Partnership, EWT / LPWG, SAIEA, LEC, DEAT.
Measurable outcomes:	Impact assessments done on all power-line / cable structure developments within the Bearded Vulture's range.

Action Step 2: EWT / Eskom Partnership to be consulted on all power-line developments, changes and expansions within the Bearded Vulture's range.	
Resources needed:	Reporting and communication structure, relevant maps and documentation, transportation to sites, site meetings with stakeholders.
Responsibility:	Tsepo Lepono to act as link between LEC and Eskom / EWT Partnership until relationship has been established.
Timeline:	Immediate, first meeting before end of June 2006 (Lesotho).
Obstacles:	▪ Time. ▪ Availability of staff at the LEC. ▪ No need for screening or EIAs for 11kVa distribution lines in South Africa at present.
Collaborators:	EWT / Eskom Partnership, LEC, Eskom, Provincial Authorities.
Measurable outcomes:	All power-line developments within the Bearded Vulture's range undergo Eskom / EWT Partnership screening prior to approval.

Solution 2
Mitigation measures for collisions and electrocutions should be implemented.

Action Step 1: Mitigation for routes, structures and power-lines is done where and when necessary on existing infrastructure.	
Resources needed:	Eskom reporting forms.
Responsibility:	Eskom, LEC through intervention by Eskom / EWT Partnership.
Timeline:	Immediate and continuous.
Obstacles:	▪ Lack of expertise. ▪ Poor reporting of and response to incidents. ▪ No patrolling of lines.
Collaborators:	Eskom, LEC, Eskom / EWT Partnership.
Measurable outcomes:	All existing potentially lethal structures within the Bearded Vulture range replaced or removed in next five to seven years.

Action Step 2: Identify and replace / safeguard potentially unsafe infrastructure such as fences, stay-wires and telecommunication towers.	
Resources needed:	GIS-based database indicating potentially damaging structures within the Bearded Vulture range, labour, alternates where necessary.
Responsibility:	BVIG to work with provincial authorities, District Conservation Officers and cellular phone service providers.
Timeline:	Implement a.s.a.p., complete removal by 2011.
Obstacles:	▪ Unwillingness to comply. ▪ Shortage of labour. ▪ Lack of alternatives.
Collaborators:	Landowners, provincial authorities, other government departments, telecommunications operators and suppliers and the military.
Measurable outcomes:	Complete removal / replacement of potential and known hazards by the end of 2011.

Solution 3
Increased and improved awareness and reporting.

Action Step 1: Implement a plan to ensure that all vulture power-line incidents are captured and included in the EWT / Eskom Partnership database.	
Resources needed:	Database already exists.
Responsibility:	Provincial agencies KZN: Bill Howells Eastern Cape: Jannie Venter / Andre Botha Free State: Brian Colahan MDTP: Tsepo Lepono
Timeline:	Immediate and continuous.
Obstacles:	▪ Lack of reporting infrastructure in Lesotho. ▪ Lack of motivation and interest from staff.
Collaborators:	Eskom / EWT Partnership, EWT / BoPWG and conservation agencies.
Measurable outcomes:	Increased rate and improved quality of reporting of all incidents that are captured on the database.

PROBLEM STATEMENT 4
DISTURBANCE BY HUMAN ACTIVITIES:
HUMAN ACTIVITIES SUCH AS TOURISM, RECREATION AND THE DEVELOPMENT OF MAJOR INFRASTRUCTURE (SUCH AS THE LHDA) CAN LEAD TO FAILURE OF BREEDING ATTEMPTS AS WELL AS CONTRACTION OF FORAGING RANGE.

Solution 1
Bearded Vultures must be a prime consideration for all EIAs of new developments throughout their range. Buffer zones allowing only low impact development must be identified and managed close to breeding sites.

Action Step 1: Bearded Vulture past and present nesting sites are recognised as a prime consideration in any future EIA's conducted within the Bearded Vulture range.	
Resources needed:	Appropriate protocols and guidelines for the EIA process.
Responsibility:	BVIG to work with EWT / BoPWG, EKZNW, MDTP, EWT / LPWG, SAIEA and LEC.
Timeline:	Immediate and continuous, full implementation by end 2007.
Obstacles:	▪ Resistance. ▪ Corruption (contractors). ▪ Limited presence in Lesotho. ▪ Understaffed.
Collaborators:	EWT / BoPWG, EWT / LPWG, SAIEA, provincial agencies and MDTP.
Measurable outcomes:	Impact assessments done on all infrastructural, tourism and recreational developments in the Bearded Vulture range.

Solution 2
Buffer zones allowing only low or zero impact development must be identified and managed close to breeding sites.

Action Step 1: Establish and run a nest site GIS database that covers and is used across the Bearded Vulture's entire range indicating buffer zones around current and historical nesting sites. Develop guidelines for development within such zones.	
Resources needed:	GIS database with historic and current data and funding for surveys.
Responsibility:	Sonja Krüger and Doug van Zyl to work with provincial agencies, MDTP, Department of Environment (Lesotho).
Timeline:	End 2006.
Obstacles:	▪ Lack of data. ▪ Coordination of data.
Collaborators:	Provincial agencies, MDTP, EWT / BoPWG, Department of Environment (Lesotho).
Measurable outcomes:	Acceptance of buffer zone principle and adherence to guidelines with reference to development within such zones.

Solution 3
Awareness of the potential impacts of inappropriate development near breeding sites must be created.

Action Step 1: Develop and enforce protocol on activities like hiking trails, research, photography, paragliding and mountaineering.	
Resources needed:	Resource materials.
Responsibility:	Ian Rushworth and Richard Lechmere-Oertel, MDTP (Tsepo Lepono) and provincial authorities.
Timeline:	12 months, implementation by April 2007.
Obstacles:	▪ Resistance from user groups. ▪ Time. ▪ Capacity to enforce protocols across the range.
Collaborators:	MDTP, provincial authorities, EWT / BoPWG, tourism authorities and establishments, MCSA and paragliding representative groups.
Measurable outcomes:	Protocol developed, implemented and enforced consistently with good cooperation from target groups. Disturbance at nesting sites due to such activities reduced or eliminated.

PROBLEM STATEMENT 5
TRADE AND CONSUMPTION IN BIRDS OR BIRD-PARTS:
EGGS ARE COLLECTED AND BIRDS ARE CAPTURED LIVE OR KILLED FOR THE USE OF BODY PARTS, PLUMAGE OR AS FOOD IN THE ILLEGAL TRADE. IMPACTS AND EXTENT OF OFF-TAKE ARE UNKNOWN.

Solution 1
Awareness (public and judiciary) and education.

Action Step 1: Develop or coordinate appropriate intelligence gathering mechanisms to determine extent and nature of Bearded Vulture trade.	
Resources needed:	TRAFFIC database.
Responsibility:	EWT / BoPWG, provincial authorities and MDTP.
Timeline:	Immediate.
Obstacles:	Lack of communication and coordination.
Collaborators:	TRAFFIC, EWT / BoPWG, provincial authorities and MDTP.
Measurable outcomes:	All reported illegal trade incidents of Bearded Vulture are reported and captured on a central database.

Action Step 2: Develop talk-packs for presentations to target audiences.	
Resources needed:	Awareness materials relevant to the target audiences, talk, one representative in each agency, LBWG, EWT / PWG, SAPS, LMPS to coordinate.
Responsibility:	EWT / BoPWG to interact with TRAFFIC, provincial agencies and LBWG, QWDT and district councils.
Timeline:	Implementation immediate (May 2006), process expected to roll out by 2007.
Obstacles:	▪ Ignorance. ▪ Cross-border protocols. ▪ Slack law enforcement. ▪ Overload from other cases. ▪ Penalties inadequate.
Collaborators:	EWT / BoPWG, provincial conservation authorities, TRAFFIC, SAPS, LMPS, Lesotho Conservation Agency, Departments of Justice and QWDT.
Measurable outcomes:	Increased reporting of cases of trade involving Bearded Vulture with improved information on purpose of trade.

Solution 2
Step up law enforcement.

Action Step 1: Treat cases with Bearded Vulture as priority cases and practice diligence in compiling case dockets and promote the same in prosecution of such cases.	
Resources needed:	Awareness materials, talk packs, one representative in each agency, LBWG, EWT / PWG, SAPS, LMPS to coordinate.
Responsibility:	TRAFFIC and EWT / BoPWG to interact with provincial authorities and LBWG.
Timeline:	Implementation immediate (May 2006), process expected to roll out by 2008, evaluation continuous.
Obstacles:	▪ Ignorance. ▪ Cross-border protocols. ▪ Slack law enforcement. ▪ Overload of other cases. ▪ Penalties inadequate.
Collaborators:	EWT / BoPWG, provincial conservation authorities, SAPS, LMPS, Lesotho Conservation Agency, Departments of Justice.
Measurable outcomes:	Reduce the number of illegal trade-related prosecutions by 50% over five years.

Solution 3
Compile a Memorandum of Understanding between Lesotho and South Africa regarding the control of access to live birds or parts thereof for any reason.

Action Step 1: Strive towards consistency in legislation and enforcement thereof.	
Resources needed:	Legal advice, diplomatic intervention and internal support.
Responsibility:	EWT / BoPWG to initiate contact with DEAT in South Africa and the Lesotho Department of Environment.
Timeline:	End 2008.
Obstacles:	Diplomatic support lacking / denied.
Collaborators:	DEAT, Lesotho Department of Environment, EWT / BoPWG, EWT / LPWG and TRAFFIC.
Measurable outcomes:	A Memorandum of Understanding in place including protocols to facilitate consistent action and penalties in the case of illegal trade in Bearded Vultures in South Africa and Lesotho.

PROBLEM STATEMENT 6
POLLUTION:
CUMULATIVE EFFECTS OF POLLUTION ON THE BEARDED VULTURE HAVE NOT BEEN DEFINED AND QUANTIFIED.

Solution 1
Scientific investigation into the potential negative impacts of pollution on Bearded Vultures.

Action Step 1: Research into the problem of Bearded Vulture ingesting foreign objects when feeding.	
Resources needed:	Dedicated researchers
Responsibility:	Unknown, priority low with no obvious candidates.
Timeline:	April 2006 to April 2010.
Obstacles:	Very difficult to collect data to prove anything.

Collaborators:	Provincial conservation agencies and MDTP.
Measurable outcomes:	Confirm or refute that the ingestion of foreign objects by Bearded Vulture is a serious problem.

Action Step 2: Investigate the availability and use of food at solid waste sites by Bearded Vultures.	
Resources needed:	Observers (many).
Responsibility:	District Conservation Officers, Reserve Officers-in-Charge.
Timeline:	Immediate and continuous.
Obstacles:	▪ Too many sites to be monitored. ▪ Lack of substantive evidence.
Collaborators:	Provincial conservation agencies and EWT / BoPWG.
Measurable outcomes:	Confirm or refute whether unprotected solid waste sites are a source of food for Bearded Vultures.

PROBLEM STATEMENT 7
FIRE:
POTENTIAL IMPACTS MIGHT EXIST BUT HAVE NOT BEEN ASCERTAINED

Solution 1
Scientific investigation into the potential negative impacts of fire on Bearded Vultures.

Action Step 1: Further research to substantiate or refute negative impacts.	
Resources needed:	Trained observers.
Responsibility:	Sonja Krüger, provincial conservation agencies, EWT / BoPWG and MDTP.
Timeline:	2006 breeding season.
Obstacles:	Extremely difficult to confirm or refute.
Collaborators:	Provincial conservation agencies, EWT / BoPWG and MDTP.
Measurable outcomes:	Confirm or refute that veld fires have negative impacts on Bearded Vulture nesting attempts.

Population Modelling and Dynamics Working Group

WORKING GROUP PARTICIPANTS:

1. Ian Rushworth EKZNW
2. Brenda Daly CBSG SA
3. Kerryn Morrison EWT

INTRODUCTION

The Bearded Vulture has recently been intensively studied in Europe (different subspecies), but only one comprehensive study on the biology and status of the southern African subspecies has been undertaken and that was in the early 1980s. Recent population estimates are, however, available for some areas and data on most parameters required for the population modelling were available from either Europe or southern Africa. Although circumstances and conditions in Europe differ from those in southern Africa, the workshop participants were reasonably confident that a number of parameters from the European population could be used where local information was not available. Several of the parameters used in the Vortex demographic model were still 'best guesses' due to the lack of reliable or current data and hence it must be noted that the model will not accurately predict the future. However, despite the limitations participants were confident that the model could reliably be used to project the current population trend and identify critical conservation interventions and actions. Key parameters critical for accurate population modelling are identified and these should be used to guide future research and monitoring activities.

Once consensus was reached among all workshop participants on the input parameters for the model *i.e*. that the baseline data best projected the *status quo* in southern Africa, this model was then used to predict the outcome of different scenarios (anthropogenic-related mortality, natural catastrophes and conservation interventions). The aim of this exercise was to identify the conservation interventions required to achieve the minimum conservation objective (as decided by the workshop participants) of stabilising the population over the next ten years at the current population size.

VORTEX SIMULATION MODEL

Demographic modelling is a valuable and versatile tool for assessing risk of decline and extinction of wildlife populations. Complex and interacting factors that influence population persistence and health can be explored, including natural and anthropogenic causes. Models can also be used to evaluate the effects of alternative management strategies to identify the most effective conservation actions for a population or species and to identify research needs. Such an evaluation of population persistence under current and varying conditions is commonly referred to as a population viability analysis (PVA).

The simulation software programme Vortex (v9.58) was used to examine the viability of Bearded Vulture populations in southern Africa. Vortex is a Monte Carlo simulation of the effects of deterministic forces as well as demographic, environmental, and genetic stochastic events on wild populations. Vortex models population dynamics as discrete sequential events that occur according to defined probabilities. The programme begins by creating individuals to form the starting population and stepping through life cycle events (*e.g*. births,

deaths, dispersal, catastrophic events), typically on an annual basis. Events such as breeding success, litter size, sex at birth, and survival are determined based upon designated probabilities. Consequently, each run (iteration) of the model gives a different result. By running the model hundreds of times, it is possible to examine the probable outcome and range of possibilities. For a more detailed explanation of Vortex and its use in population viability analysis, see Lacy (1993, 2000) and Miller and Lacy (2003).

Vortex Baseline Model Parameters

This population model was designed to investigate the viability of the southern African (South Africa and Lesotho) population of Bearded Vulture (*Gypaetus barbatus meridionalis*). The Vortex project file with these input values is available at http://www.pdflibrary.ewt.org.za/files.asp?Folder=Vortex%20Project%20Files. Vortex version 9.58 was used.

Number of iterations: 500
500 independent iterations were run for each scenario.

Number of years: 100
Life expectancy of the Bearded Vulture was agreed by the PHVA participants to be approximately 30 years (see Maximum Age of Reproduction below for explanation). Generation length was calculated by Vortex in the baseline model to be approximately 16.52 years. Although a model run for 150 years was considered, it was agreed that it be run for not more than 100 years, as simulating population dynamics beyond 100 years was considered unrealistic given variability around key parameters.

Extinction definition: Only one sex remains
Extinction was defined in the model as any point where no animals or only one sex remains.

Number of Populations: One population
The breeding distribution of Bearded Vulture in southern Africa is restricted to the Drakensberg, Maloti and Sneeuwberg Mountains and associated outcrops within the foothills of these mountains. The population ranges over Lesotho and three provinces (KwaZulu-Natal, Eastern Cape and Free State) within South Africa and is considered to be a single, interacting population.

Initial Population Size (N): 419
Best current estimates of breeding pairs in the different areas were collated from the literature and adjusted based on personal observations and conservative assumptions. The total population size was determined by assuming that breeding pairs comprised 70% of the population (Brown, 1997), and assuming that there were no non-breeding adults ('floaters') (Table 3).

Table 3: Reference used to determine the initial population size.

Area	Estimated number of pairs	Estimated population size	Source
Lesotho	100	285	There was considerable debate around the number of birds in Lesotho, with D. Allan and A. Jenkins (*pers. comm*.) estimating the current population to be 90

			– 100 breeding pairs. They based this on the available literature (Brown 1991 and Kopii 2004, W. Vogeley *unpublished data*), on intensive surveys that had been carried out in key areas and with an extrapolation to other parts of the highlands not yet surveyed.
Eastern Cape	33 less 25% =24	70	Brown's (1991) estimate, reduced by 25% in the absence of recent survey data. This was considered conservative in comparison to the estimated decline of approximately 50% in KwaZulu-Natal over the same period.
KwaZulu Natal and Free State	21	60	Krüger 2006.
Trios		3	Three adults (trios) have been observed at three nesting sites in southern Africa: at Monk's Cowl and Black Mountain (S. Krüger and S.E. Piper *pers. comm*.) and at Katse in Lesotho (D. Allan *pers. comm*.). These extra birds were added to the population estimate.
TOTAL	**145**	**419**	

It was noted in plenary that in some of the core areas where there was no apparent decline in Bearded Vulture numbers (as indexed by number of active breeding pairs) that it was possible that any birds lost were being replaced by individuals from peripheral / marginal areas (where range contraction is being recorded). This stresses the need for monitoring not only in the core populations but in the peripheral populations as well.

Carrying capacity (K): 565

It was agreed that the current population was significantly smaller than historical estimates even though there appeared to be no shortage of nesting sites. It was stressed however, that food availability was probably now the primary limiting factor due to habitat transformation and the reduction in available carcasses. Plenary agreed that the carrying capacity was probably now lower than the population size of 680 that Brown (1991) had estimated. The carrying capacity was therefore arbitrarily set to 150% of the estimated current population size of 419 *i.e*. 565.

Inbreeding depression: No

Inbreeding depression was not included in the model as no evidence of it had been seen and it was thought to have minimal impact on the population.

Concordance between environmental variation in reproduction and survival: Yes
Environmental variation (EV) is concordance between variation in reproduction and survival relating to random variation in environmental conditions. There is no information on this relationship for Bearded Vultures, but some participants felt that good years for reproduction were also likely to be good years for survival. EV for survival and reproduction were therefore linked in the model (*i.e.* good years for reproduction are also good years for survival).

Mating system: Monogamous
Bearded Vultures were presumed for the purpose of Vortex to be monogamous in southern Africa (Mundy *et al.* 1992: 213-215), even though three adult trios had been observed at nests at Monk's Cowl and Black Mountain (S. Krüger and S.E. Piper *pers. comm*.) and at Katse in Lesotho (D. Allan *pers. comm*.).

Age of first offspring for females and males: Seven years (females); seven years (males)
Vortex defines reproduction onset as the average time at which offspring are born rather than sexual maturity. Mundy *et al.* (1992) estimated that the average age of first offspring was probably around seven years for both male and female Bearded Vultures, even though one southern African bird bred as young as five years.

Maximum age of reproduction: 30 years
Vortex assumes that animals can reproduce throughout their adult life and does not model reproductive senescence. Individuals are removed from the model after they pass the maximum age of reproduction.

An adult Bearded Vulture weighs between 5.2 and 6.25 kg (Piper 2005), with a mean mass of 5.74±0.4 kg (Brown 1989). This suggests a 95% range in mass between 4.94 and 6.64 kg. Using these limits, the longevity of wild birds is estimated to be between 22 and 23 years and captive birds between 38 and 40 years. The latter figure comes close to the European experience (Frey *et al.* 2000). It was noted, however, that the mass formulas were old and based on northern hemisphere birds. It was also highlighted that subtropical species were generally larger, longer lived and had better survival rates (S.E. Piper *pers. comm*.). For the purposes of this model, it was estimated that the maximum age of reproduction was around 30 years.

Maximum number of progeny per year: One fledgling
Although between one and three eggs are laid (mean 1.7, n=38) (Maclean 1993, R.D. Jeffery *unpublished data*), at most one fledgling is produced per successful breeding attempt (Mundy *et al.* 1992). For the purposes of the model one fledging was taken to be the number of progeny per year, *i.e.* when the chick is between 120 and 130 days (Brown 1988, 1990 and 1997). For Vortex it should be borne in mind that fledging will define time zero for the model, and not hatching.

Sex ratio at birth – in % males: 50%
In a European reintroduction breeding programme, the sex ratio of newly hatched chicks was not significantly different from 50% (H. Frey *in litt*.).

Density-dependent reproduction: No
No data were available on density dependence; reproduction was assumed not to be density-independent in the model.

Percent adult females breeding: 76.5%
In this model, Time 0 was defined as the time of fledging; the percentage of adult females breeding was calculated as the product of the proportion of pairs that attempt to breed and the proportion of breeding attempts that successfully fledge a chick.

A weighted mean of 86.09% was calculated as the percentage of Bearded Vulture pairs attempting to breed from three Pyrenees studies (see box below).

In a study in the Spanish Pyrenees in 2002 there were 87 territories (61 pairs and 16 trios, *i.e.* 18% trios) and of these there were 77 breeding attempts (*i.e*. 88.5%) with 65% producing a juvenile p.a. (R. Heredia in Frey *et al*. 2000). Later, in 2004, 106 territories were located, including some with lower productivity of which 88 held breeding pairs (*i.e*. 83%) and 33 fledglings were produced from 84 'controlled' nests giving a fecundity of 0.39 fledglings per breeding attempt or 0.326 fledglings per territory (including non-breeding territories) p.a. (R. Heredia in Frey *et al*. 2004). On the northern side of the Pyrenees a total of 24 territories were monitored in 2004 (22 pairs and two trios) and 10 fledglings were produced from 20 clutches, with 91% of territorial groups breeding, a 50% breeding success and a fecundity of 0.45 fledglings per territory p.a. (M. Razine in Frey *et al*. 2004).

Brown (1988) reported that of 18 breeding attempts in southern Africa, 16 fledglings were produced: 0.8889 fledglings per pair p.a.

The percentage of adult females breeding was therefore calculated as 76.45% (0.8889 x 0.86 = 0.7645). Environmental variation was estimated as 10% of the percentage adult females breeding, due to the observed low variability in breeding attempts each year (PHVA plenary).

Percentage of adult males in the breeding pool: 90%
In a study in the Spanish Pyrenees in 2000, of the 87 territories there were 61 pairs and 16 trios, *i.e*. 18% trios (R. Heredia in Frey *et al*. 2000). This translates into approximately 83% of adult males successfully breeding in any one year. On the KwaZulu-Natal escarpment one of 15 nests was observed to have a trio which translates into approximately 94% of adult males attempting to breed successfully in any one year (S. Krüger *pers. comm*.). Since only one roots site was found on the KwaZulu-Natal escarpment and Brown (1988) suggested that there were no "floaters" in the population, it was agreed that it was unlikely that there were any adult males not in the breeding pool ('floaters'). The percentage of males in the breeding pool was therefore set at 90%, a figure between the Spanish and South African estimates.

Mortality Rates: See below
Survival of juveniles and sub-adults up to age seven years was 11% (Brown 1991); this translates into an average mortality rate of 27% per annum. However, it is extremely unlikely that the mortality rate per year is the same in each of the first seven years; mortality is likely to be disproportionately higher in the first two to three years, declining fairly rapidly to the adult mortality rate from seven years. Data from the Potberg Cape Griffon colony confirms that mortality in the first year is higher than that in the second year (Piper *et al.* 1999)

The mortality rate between years one and seven was scaled so that the mortality was higher in the younger years but that an average survival rate of 11% at between fledging and age seven was obtained. The mortality data were adjusted within Vortex so that the model output for a scenario starting with an estimated population of 681 in 1983 (Brown 1987), ended with a population size of approximately 419 as per the estimated current population size in 2006 – 23 years into the model. The adjusted annual mortality figures for the juvenile age classes are presented in Table 4.

Average annual adult survival was 95%, or 5% annual mortality (Brown 1991).

For the purpose of the model, males and females were assigned the same mortality rates. It was however noted that the recorded presence of polyandry in both the European and southern African population could indicate that: (1) females are dying faster than males as

they are more involved in incubation, are bigger, have greater stress, require more nutrients and disperse more widely thereby coming into contact with more threats; or (2) polyandry could be a strategy linked rather to enhancing nesting survival (and hence long-term genetic fitness of both males). Trios for the purposes of this model were considered to consist of two males and a female.

Table 4: Mean annual mortality rates for male and female Bearded Vulture (EV = environmental variability around the mean).

	Females		Males	
Life stage	**Mean annual mortality %**	**EV**	**Mean annual mortality %**	**EV**
Fledging to 5 years	27	5.4	27	5.4
5 – 6 years	23	4.6	23	4.6
6 – 7 years	15	3	15	3
Adult	5	0.4	5	0.4

Number of catastrophes: None
No catastrophes were included in the baseline model (a snow catastrophe and mass poisoning were modelled as catastrophes in an alternative scenario).

Harvest: No
No harvesting was included in the baseline model.

Supplementation: No
No supplementation was included in the baseline model.

CONSERVATION OBJECTIVES

The conservation objectives set for the Bearded Vulture in southern Africa, as determined in the workshop, was to halt the population decline and stabilise the population at the current estimated population size of approximately 420 birds (145 breeding pairs) over the next ten years (2006 – 2016), and then to start growing the population to a realistic carrying capacity as determined by the prevailing conditions.

BASELINE MODEL RESULTS

Deterministic Output

The demographic rates (reproduction and mortality) included in the baseline model can be used to calculate deterministic characteristics of the model population. These values reflect the biology of the population in the absence of stochastic fluctuations (both demographic and environmental variation), inbreeding depression, limitation of mates, and immigration / emigration. It is valuable to examine these values to assess whether they appear realistic for the species and population being modelled.

The values chosen for the *Vortex* Bearded Vulture model result in a deterministic growth rate (r_{det}) of -0.019 (λ = 0.982). This represents an annual *negative* growth rate of about 2%. The negative deterministic growth as determined by the model can be explained in one of two ways: (1) one or more of the parameters used in the model were incorrect; or (2) the parameters used in the model were collected during a time when the population was already in decline. One of the main factors contributing to the negative growth rate, as determined

through sensitivity testing, were the very high juvenile mortality rates. The workshop participants were of the opinion that the latter scenario was correct and that the population had been in decline since the early 1980s when the mortality rates and other key parameters were estimated. It was therefore agreed that the model was a reasonable representation of the wild Bearded Vulture population in southern Africa.

Generation time (the average age of reproduction) for male and female birds was calculated as 16.52 years.

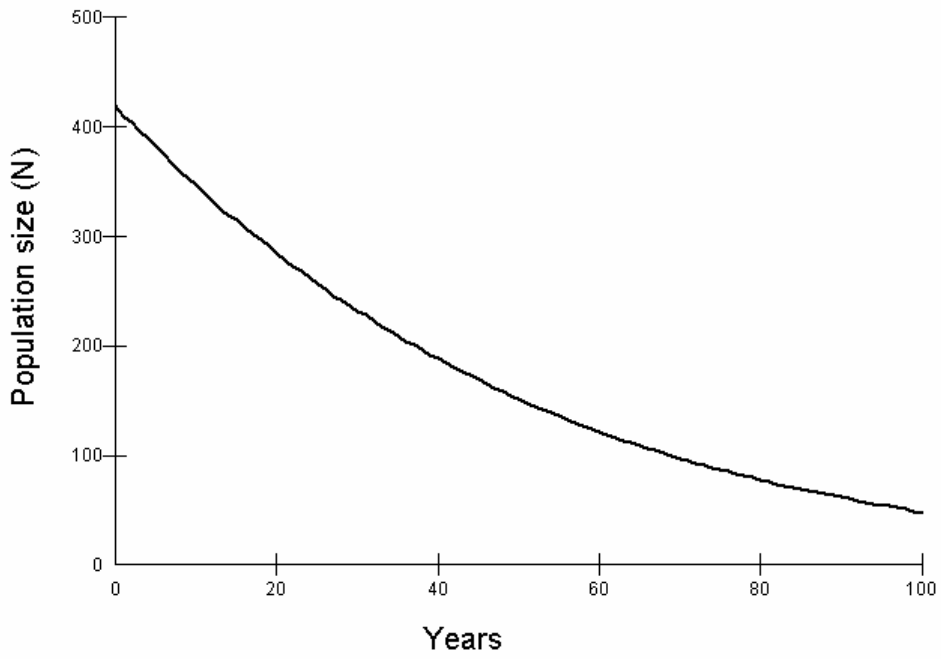


Figure 1: Baseline model for the southern African population of the Bearded Vulture; year 0 = 2006.

Despite the projected population decline, the model does not predict major losses of genetic diversity (expected heterozygosity of 92.58%). The deterministic / stochastic growth rate is -0.0236, yielding a population of 151 individuals in 50 years and a population size of 48 after 100 years. The probability of extinction (P[E]) is 0.0080 over 100 years with an expected first time to extinction being in 97.25 years.

The baseline model suggests that even though the population is in decline that there is some time still available to mitigate the threats and to improve the long-term situation for the species. In its current state, the Bearded Vulture population does not meet the objective of a stable population and zero probability of extinction.

The baseline model incorporates in its input parameters the best synthesis of current estimates of demographic rates and an understanding of the biology of the species and therefore the best projection of the future of this population. Caution should however be used in interpreting the results, and model revision is encouraged as more current and accurate data becomes available or different modelling strategies are developed.

SENSITIVITY TESTING OF THE BASELINE MODEL

The baseline model was developed using the best available published data and expert opinion at the PHVA workshop. However, given the uncertainty surrounding many of these parameters, sensitivity testing was conducted on the demographic parameters and population estimates to determine the potential effect on model results.

Demographic Parameters

Mortality rates

The juvenile mortality rates were increased by 10 and 20% and decreased by 10 and 20% across each of the age classes between zero and seven years (Figure 2), the adult mortality rate was increased by 10 and 20% and decreased by 10 and 20% (Figure 3).

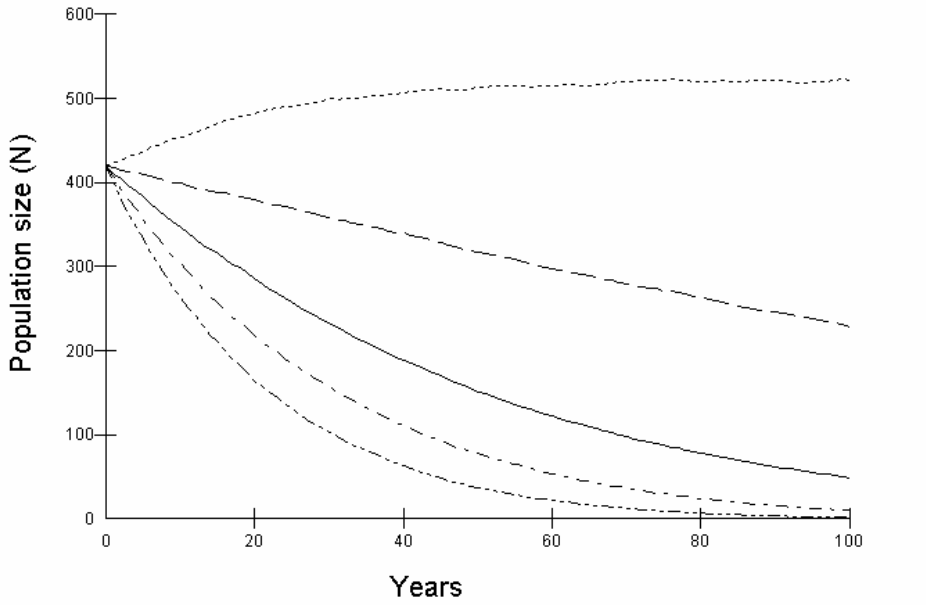
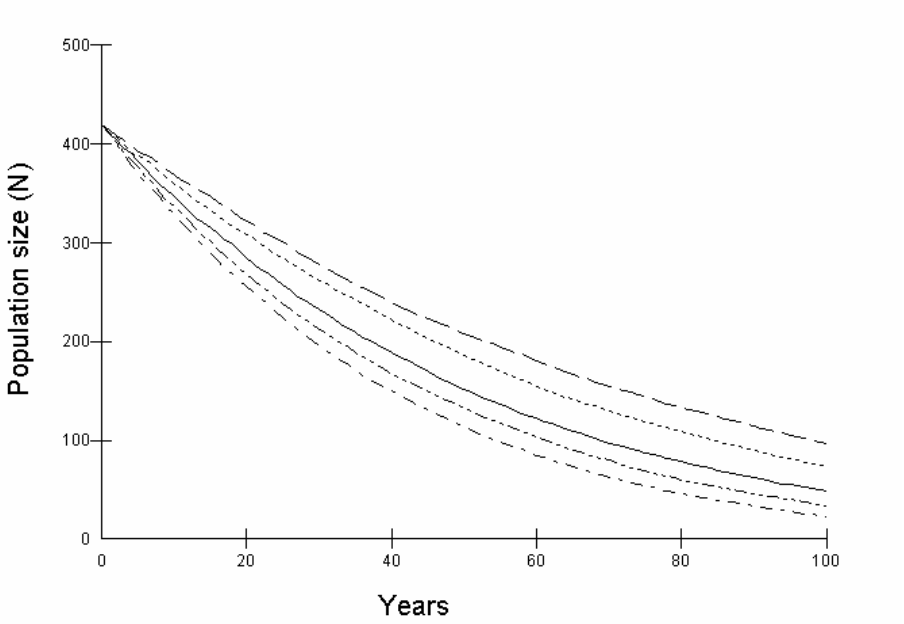


Figure 2: An increase by 10 and 20 % and decrease by 10 and 20 % of juvenile mortality across all juvenile age classes.



—— Baseline	
····· Decrease adult mortality by 10%	— — — Decrease adult mortality by 20%
— · — · Increase adult mortality by 10%	— ··—·· Increase adult mortality by 20%

Figure 3: An increase of 10 and 20 % and a decrease of 10 and 20% on adult mortality.

A 10 % or 20 % change in the adult mortality rates had relatively little impact on the population (Figure 3 and Table 5); however, a 10% or 20% change in the juvenile mortality rates had a significant impact on the population (Figure 2 and Table 5). Even a 10% decline in juvenile mortality resulted in zero chance of extinction and a population decline of less than 1% per annum.

Table 5: Results of the increase and decrease in mortality rates for adult and juvenile mortality.

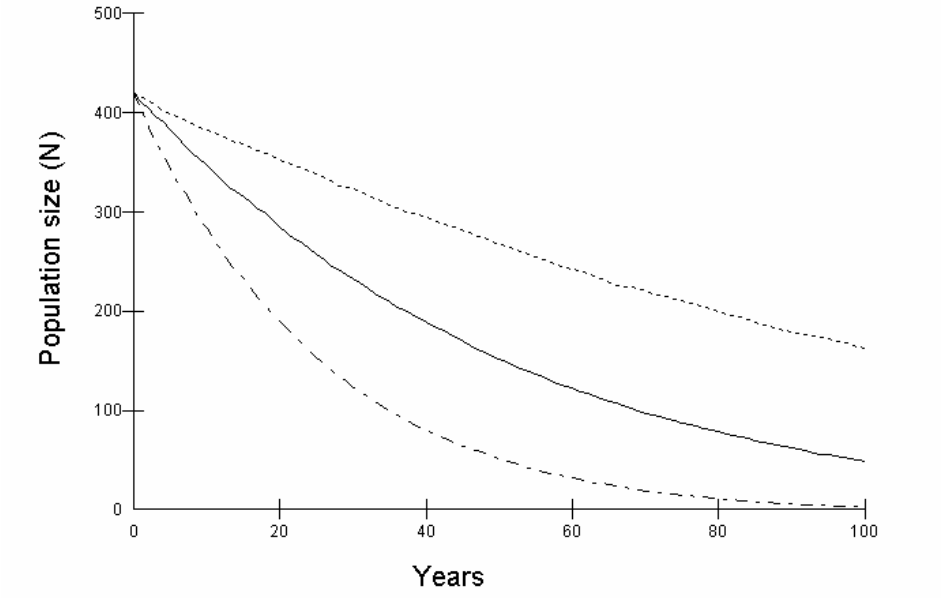
Variable	Change	Stochastic Growth rate	Population size at 100 years	Probability of Extinction
Baseline		-0.024	48	0.008
Adult mortality rate	20% increase	-0.032	23	0.066
	10% increase	-0.027	34	0.020
	10% decrease	-0.019	73	0
	20% decrease	-0.016	97	0
Juvenile mortality rate	20% increase	-0.054	2	0.786
	10% increase	-0.041	10	0.252
	10% decrease	-0.007	229	0
	20% decrease	+0.007	522	0

Reproductive values

Sensitivity analyses were carried out on the maximum age of reproduction, percentage females breeding, percentage males in breeding pool and age of first reproduction. There was little sensitivity to the variations in the percentage of females breeding or the percentage of males in the breeding pool (Table 6). Significant changes from the baseline model were observed for the age of first reproduction and the maximum age of reproduction (Figures 4 and 5), thus indicating the need to collect better information on these parameters. Any increase in the breeding period, either through earlier onset of breeding or increased longevity would likely improve the situation for the Bearded Vultures.

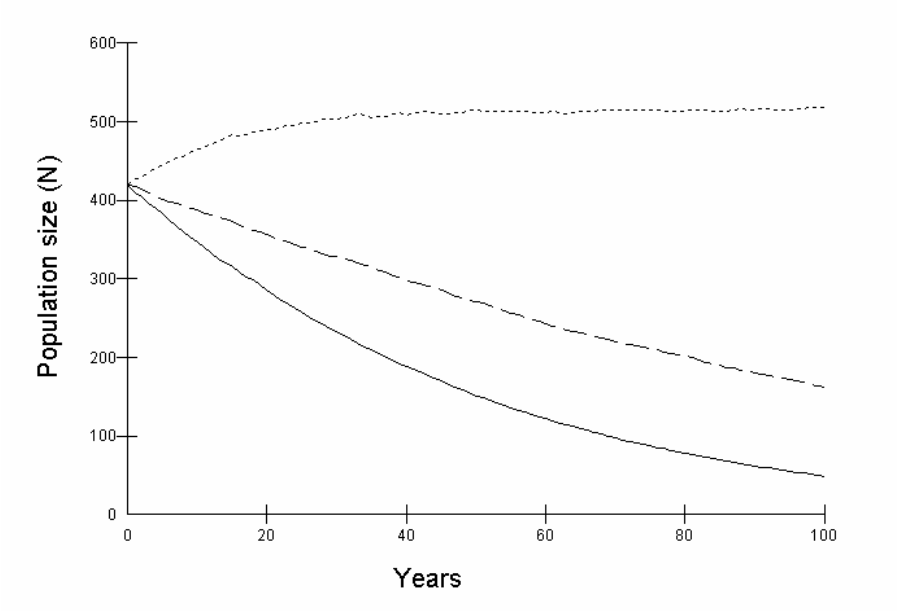
Table 6: Results of the increase and decrease in reproductive values.

Variable	Change	Stochastic Growth rate	Population size at 100 years	Probability of Extinction
Baseline		-0.024	48	0.008
Percentage females breeding	20% increase	-0.015	109	0
	10% increase	-0.019	76	0
	10% decrease	-0.030	27	0.048
	20% decrease	-0.036	15	0.136
Percentage males in breeding pool	10% increase	-0.022	58	0.002
	10% decrease	-0.026	37	0.032



——— Baseline (Maximum age of reproduction = 30)
····· Increase maximum age of reproduction to 40
— ·—·· Decrease maximum age of reproduction to 22

Figure 4: An increase in age of reproduction to 40 years and a decrease to 22 years as compared to the baseline model.



——— Baseline (age of first reproduction = 7 years)
····· Decreased age of first reproduction to 5 years
— — — Decreased age of first reproduction to 6 years

Figure 5: Decreased age of first reproduction as compared to the baseline model.

Summary

Juvenile mortality was the demographic parameter that had the greatest impact on the population when variation on the rate of mortality was used. Although juvenile mortality was very high in the baseline model, the PHVA participants agreed that this was probably correct. However, current data on juvenile mortality for the model were limited and hence the model has indicated that an improved understanding of juvenile mortality is required to better predict the future for the population. In addition, the sensitivity testing showed that a decrease in juvenile mortality improved the population's future, indicating that it was important that any conservation activities should aim at reducing juvenile mortality.

Increasing the breeding lifespan of the species, either through an earlier age of first reproduction or an increased maximum age of reproduction, improved the population outcome. The data used for the model were based on an assumed average age of first reproduction and a calculated and extrapolated maximum age of reproduction. One instance of an individual breeding at two years below the average (*i.e*. five years old) was recorded, an age in the sensitivity test that resulted in a positive growth rate for the population. This indicates that an improved understanding of the average age of first reproduction is important, and any change in this value could significantly alter the predictions currently made. Although an increase in the maximum age of reproduction from 30 to 40 resulted in an improved population growth rate, it was not significant enough to result in a positive growth rate.

In summary therefore, it is most important that data on juvenile mortality and the age of first reproduction are collected and that any conservation activities include the potential of decreasing juvenile mortality.

Population Parameters

Estimates of Size and Carrying Capacity
The initial population size was increased and decreased by 10%. The feeling of the PHVA participants was that there was almost no deviation from the baseline model, with the growth rate calculated at -0.023 and -0.024 respectively.

Sensitivity analyses were not conducted on carrying capacity as the population did not come close to carrying capacity at any point.

Summary
At this time, variability in the estimates of the size of the Bearded Vulture population will have little impact on the final outcome, unless the population is far smaller than estimated here, which is unlikely.

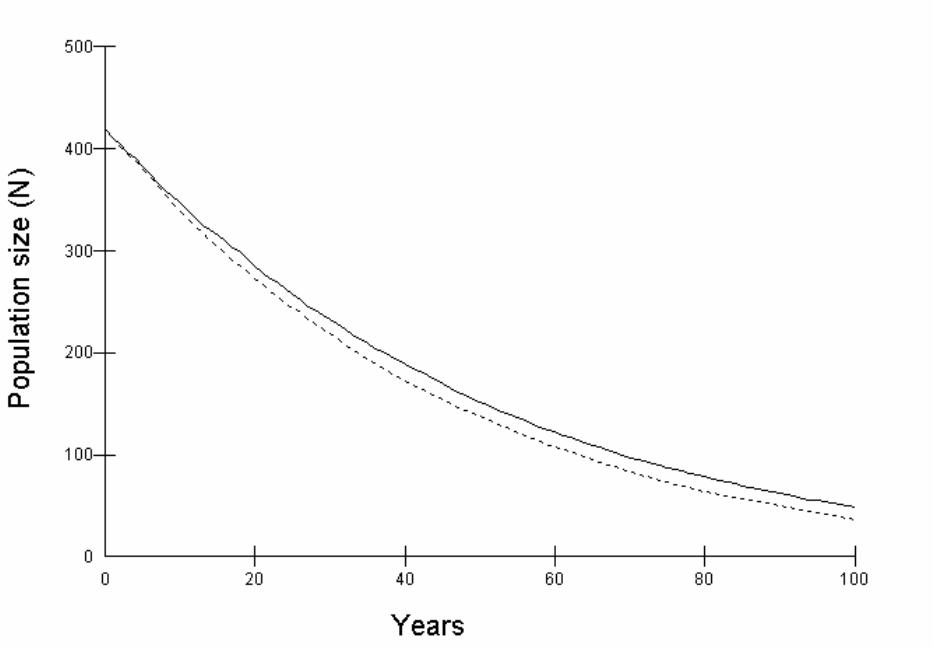
ALTERNATIVE FUTURES

No catastrophes (events that affect survival and / or reproduction beyond the normal range of environmental variation) were included in the baseline model. However the following catastrophes were modelled as scenarios.

Snow catastrophe
One possible threat to the population was suggested to be extreme snowfalls which would have a slight impact on the survival of birds and their breeding success. It was hypothesised in the face of a complete lack of data that such a catastrophe would impact on around 30% of the population

Annual risk:	5% (*i.e*. the catastrophic event occurs on average 5 times in 100 years)
Effect:	There would be a 10% reduction in reproduction through death of young chicks, *i.e*. a severity of 0.9 and there would be a 5% increase in mortality through death of inexperienced fledglings and old adults, *i.e*. a severity of 0.95.

Provided that the magnitude of the hypothesised snow fall was realistic, the inclusion of snow as a catastrophe in the model had little effect on the population except for a slightly lower population size at 100 years (37 individuals as compared to the 48 individuals in the baseline model) (Figure 6). This outcome suggests that the population can probably withstand natural catastrophes as long as their impact on survival and reproduction is slight. It was agreed that there were no known natural catastrophes which would have a large impact on either reproduction and / or survival (no attempt was made to model disease epidemics because it was impossible to predict possible impacts).



——	Baseline
·····	Snow modelled as a catastrophe

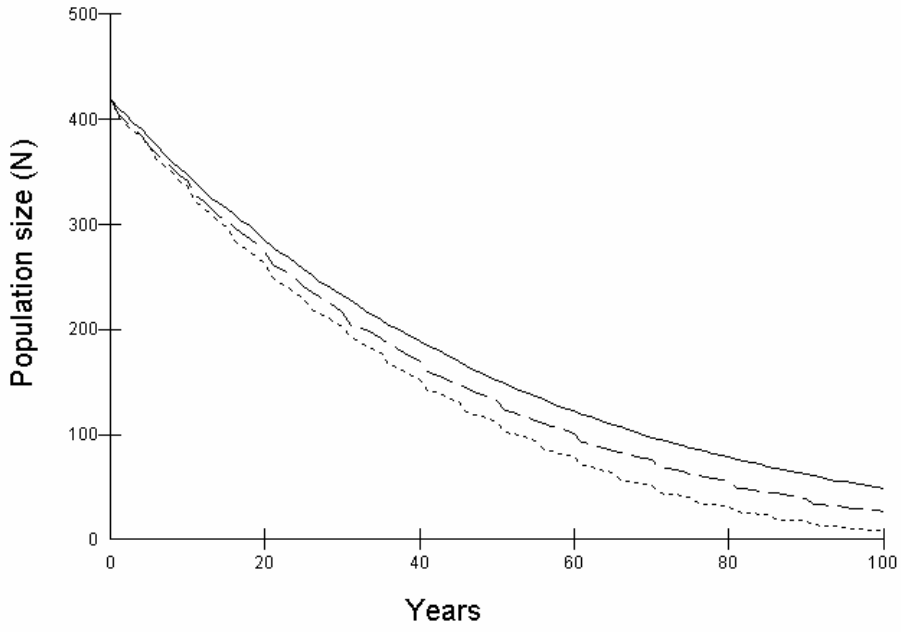
Figure 6: The baseline model compared to a model where snow is entered as a catastrophe.

Mass poisoning catastrophe

Poisoning potentially accounts for 70% of all Bearded Vulture mortalities (Brown 1997). It was assumed in the baseline model that the mortality rates entered included incidental poisonings. However, it excluded potential "mass poisonings" of vultures at for example vulture restaurants – if it were ever to happen. With the potential increase in restaurants, it was agreed that the impact of any mass poisonings on the population be investigated.

Mass poisonings were modelled as harvests, or as a number of individuals being removed from the population. It was assumed that these mass poisonings could occur hypothetically every five or ten years over the next 100 years. For the purpose of the model, three juvenile females, three juvenile males, and one adult female and one adult male were assumed to be poisoned in each instance, *i.e*. a total of eight birds per poisoning. A loss of eight individuals is not unreasonable when compared to other poisoning incidents in the sub-continent but is high if one assumes that they were all killed at the same time.

Although the long-term population trends declined only slightly (Figure 7), the probability of extinction increased from 0.008 (mean time to first extinction = 97 years) in the baseline model to 0.102 (mean time to first extinction = 90 years) for a mass poisoning every ten years. A significant increase in the probability of extinction (P [Extinction] = 0.594) was noted when the mass poisoning occurred every 5 years (mean time to first extinction = 88 years). It is evident that mass poisonings could result in a rapid decline of the population and could cause it to go extinct if mass poisonings were to occur on a regular basis. It is therefore imperative that any mass poisonings or a loss of several birds due to one or other factor be prevented. In the case of restaurants, it will therefore be important that measures are put in place to prevent any such poisoning events occurring.



——— Baseline
····· Mass poisoning every 5 years
— — — Mass poisoning every 10 years

Figure 7: The effects of mass poisonings every 5 or 10 years as compared to the baseline model

POTENTIAL MANAGEMENT OPTIONS

Working Groups were approached with the following questions:

1. How accurate should the estimate of the various reproductive and population parameters be to detect a change and to determine whether management interventions have made a difference?
2. How long should one monitor interventions on an annual basis (three to five years) to determine trends?

The output data calculated in Vortex could be used to determine the answers to questions 1 and 2 (see above), however, the data would require statistical analyses which could better be calculated in other statistical programmes. Questions 1 and 2 were therefore not answered using Vortex nor during the PHVA process.

Reducing mortality through supplementary feeding and threat mitigation

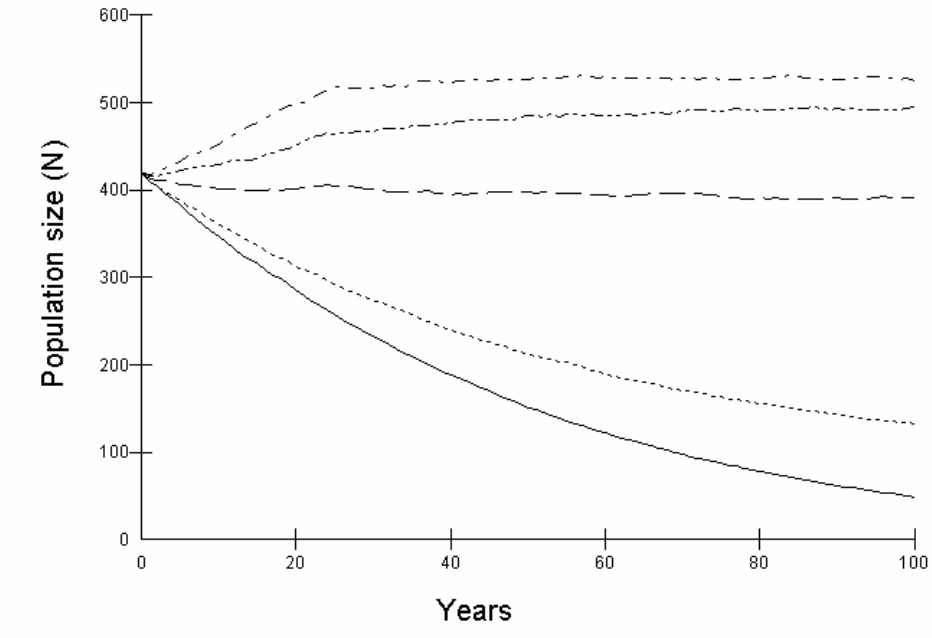
Several scenarios were run to test the effects of interventions aimed at decreasing mortality. The assumption behind these scenarios was that vulture restaurants, in increasing the reliable food available, would ensure greater survival of fledglings. However, it should be borne in mind that the survival of these fledglings to adulthood could not be ensured. In addition, adults would be drawn to the restaurants, which if placed correctly, would alleviate pressures from other threats such as poisoning, whilst also ensuring a reliable food supply. It is commonly observed that:

a) non-adult birds tend to come to vulture restaurants more frequently than adult birds
b) the more peripheral the restaurant the smaller the proportion of adult birds.

Consequently, vulture restaurants are probably an excellent tool for assisting the survival of non-adult birds.

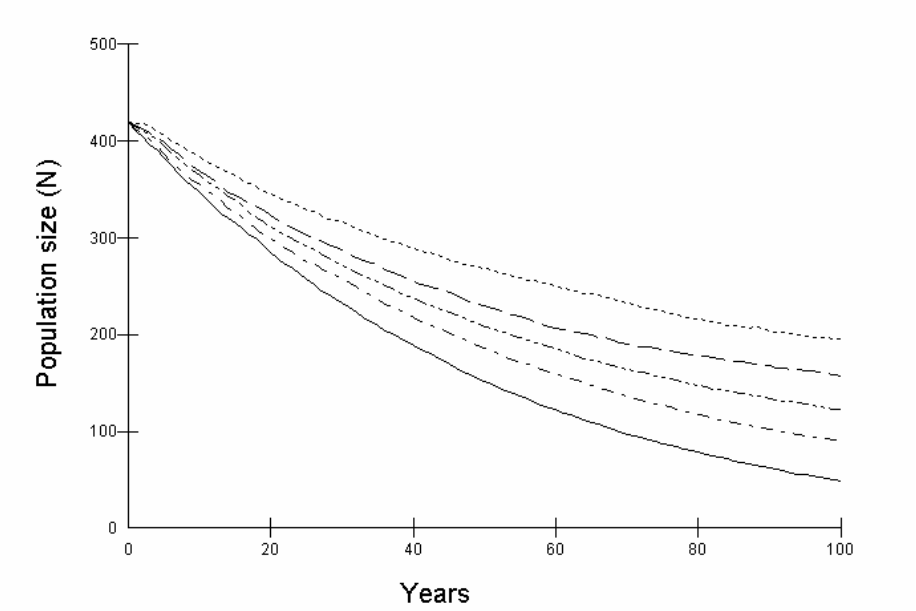
The decrease in mortality of individual birds each year was modelled using the "supplementation" function of the Vortex programme. The following scenarios were run:

- A decrease in mortality of adult birds by one, four, six and eight individuals per year (Figure 8)
- A decrease in mortality of juvenile birds in the 0 – 1 age class by two, four, six and eight individuals per year (Figure 9)
- A decrease of equal adult and juvenile birds in the 0 – 1 age class by two, four and eight individuals per year (Figure 10)
- A decrease of two adults and six juvenile birds in the 0 – 1 age class per year (Figure 11)
- A decrease of two adults and eight juvenile birds in the 0 – 1 age class per year (Figure 11)



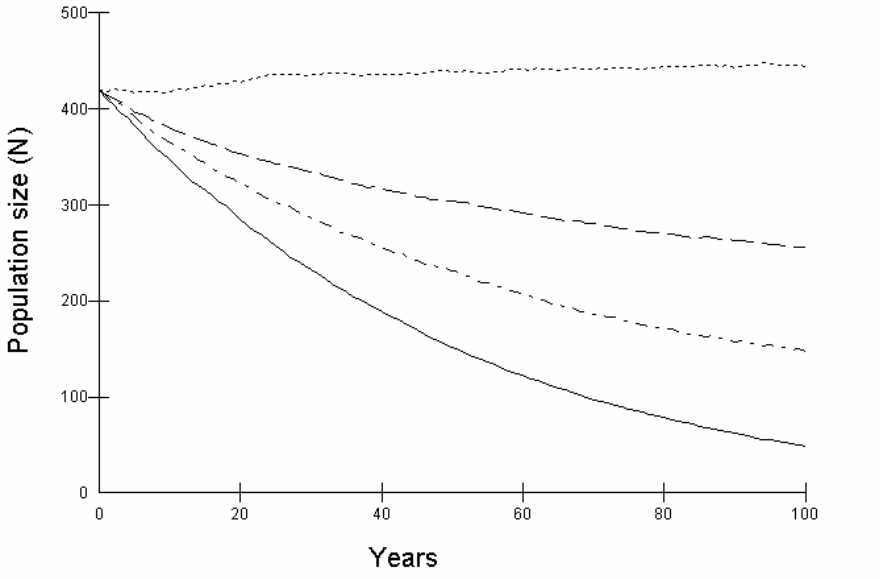
——— Baseline
····· Scenario A - Decreasing adult mortality by 1 bird p.a.
— — — Scenario B - Decrease adult mortality by 4 birds p.a.
— · — · Scenario C - Decrease adult mortality by 6 birds p.a.
— ··—·· Scenario D - Decrease adult mortality by 8 birds p.a.

Figure 8: The effects of a decrease in annual adult mortality.



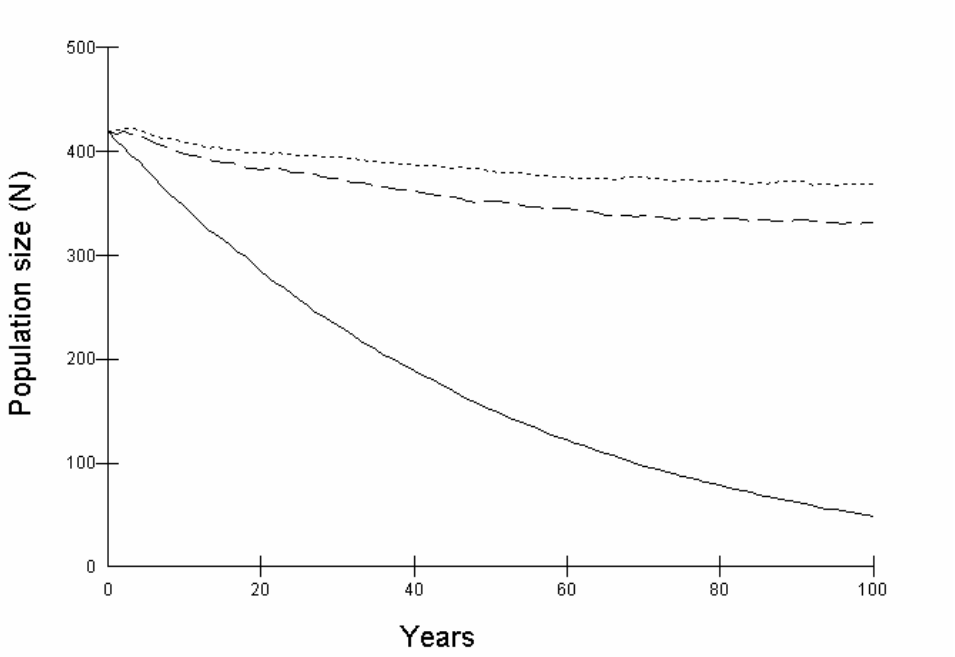
——— Baseline
····· Decreasing juvenile mortality by 8 bird p.a.
— — — Decrease juvenile mortality by 6 birds p.a.
— · — · Decrease juvenile mortality by 4 birds p.a.
— ··—·· Decrease juvenile mortality by 2 birds p.a.

Figure 9: The effects of a decrease in annual juvenile mortality



——— Baseline
····· Decreasing adult and juvenile mortality by 8 birds p.a.
— — — Decrease adult and juvenile mortality by 4 birds p.a.
— · — · Decrease adult and juvenile mortality by 2 birds p.a.

Figure 10: The effects of a decrease in annual adult and juvenile mortality



——— Baseline
····· Decreasing annual mortality by 2 adults and 8 juveniles
— — — Decreasing annual mortality by 2 adult and 6 juveniles

Figure 11: The effects a decrease in annual adult and juvenile mortality.

A significant difference can be seen between decreasing the mortality of adults (Figure 8) compared to that of juveniles (Figure 9). By decreasing the mortality of adults by four birds per year, the stochastic growth rate increases from the baseline (-0.024) to -0.001, an almost stable population with an annual decline of only 0.1%. By decreasing mortality by six adults, the stochastic growth rate becomes positive r = 0.004 and increases to r = 0.009 if mortality is decreased by eight adults. Within about 25 years, the population will reach the hypothesised carrying capacity and stabilise if eight adults are saved annually. Decreasing juvenile mortality, on the other hand, increases the stochastic growth rate to r = -0.008 if up to eight fledglings in the first year are saved.

Sensitivity testing was based on relative losses and showed that juvenile mortality had a greater impact on the population than adult mortality. Conversely, it is shown here that decreasing adult mortality by an absolute number has a significant positive impact on the population, whereas decreasing juvenile mortality by an absolute number has a much smaller impact. This can be explained by the fact that juvenile mortality is very high, with only 11% of fledglings reaching adulthood. Adult mortality is relatively low. Any individual adults which are "saved" from mortality in the population will therefore have a significant impact. Juvenile mortality on the other hand is high and hence any additional individual loss to the population will not be noted as significant.

Under natural conditions it is unlikely that mortality reduction will be restricted to either adults or juveniles only and hence several scenarios were tested using a combination of adults and juveniles. Of note is that by reducing annual mortality by four adults and four juveniles per annum (Figure 10), the stochastic growth rate becomes a positive r = 0.001. However, it is probably more realistic that the intervention of a restaurant would reduce first year mortality and less so adult mortality. For this reason, two scenarios were run whereby mortality was reduced by two adults per year and either six or eight juveniles (Figure 11). Although neither of these scenarios rendered a positive growth rate, the former scenario had a stochastic

growth rate of r = -0.001 and the latter of r = -0.002, both less than a -1% population growth rate, and probably not significantly different from a stable population.

Density-dependence

Several participants at the workshop suggested that a scenario be run which projects the effect of density-dependence. S.E. Piper (*pers. comm*.) suggested that density-dependent effects were likely to be manifest in the survival in the first year age class. D. Allan (*pers. comm.*) also noted that polyandry could be evidence that the population is currently at carrying capacity. Based on these and also on the fact that no information was available on the input data for density dependence, the participants agreed that the scenario could be omitted.

SUMMARY CONCLUSIONS

Participants at this PHVA workshop used the most current data and other expertise and resources to develop a baseline population model that appears to be a reasonable model for Bearded Vultures in southern Africa. This Vortex model is based upon their best estimates of Bearded Vulture biology and threats to the southern African Bearded Vulture population and, unless otherwise indicated, assumes that these conditions will remain constant over time. Because our understanding of Bearded Vulture population biology and current status is deficient, and because the existing conditions are not likely to remain constant, it is difficult to produce accurate population projections over 100 years. However, this model can be useful in predicting population trends and evaluating the relative effectiveness of management interventions resulting in a reduction of mortality. As more accurate information is gathered and management actions implemented, these results can be re-evaluated to promote effective conservation actions for the Bearded Vulture.

Both the deterministic and stochastic population model predict that the southern African Bearded Vulture population is in decline and although the Vortex model predicts a low probability of the population going extinct in the next 100 years, the conservation objectives for the species highlight the need for a stable population. Sensitivity testing showed clearly that accurate estimates of juvenile mortality and the breeding longevity of the species are required. An improved understanding of each of these factors is therefore required to better predict the future of the population. Although natural catastrophes with limited impacts on reproduction and survival were shown to have a minimal impact on the population, human induced mortalities such as mass poisonings would have a significant negative impact on the population.

In order to meet the conservation objective for the species, it is imperative that the mortality rates be reduced. Preventing adult mortalities will have the greatest positive impact on the population, but realistically, it is important that both adult and juvenile mortality is reduced as interventions to reduce mortality is unlikely to target age-specific segments of the population. A stable population can be achieved by decreasing the annual mortality of adults and juveniles by eight birds. This can realistically be achieved by reducing the mortality of predominantly first year birds. Vulture restaurants can provide a reliable food source for Bearded Vultures, thereby improving first year bird survival and also adult survival, to a limited extent.

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Group Prioritisation of Solutions

Each working group brought their top five solutions, chosen by means of paired ranking of their group's total list of solutions, to a plenary session where they were combined into a list of twenty (20) solutions for the whole group. Each person then went back and pair-ranked this list of twenty solutions in order to arrive at a prioritised list of solutions for effective Bearded Vulture conservation which the whole group had contributed towards and agreed upon. The results were as follows:

1. Implement measures to ensure that vulture restaurants are controlled / managed to ensure sites are secure from intentional and accidental poisoning.
2. Collate all of the existing information on population size and distribution and establish a baseline database.
3. Survey the breeding range of the species to determine occupancy of existing and historical breeding sites. Future monitoring will be covered under fecundity.
4. We need a rapid reliable assessment of mortality. This will be achieved by identifying individual birds by marking them.
5. In southern Africa, natural carcass availability is likely to decline in response to habitat loss / change and Bearded Vulture populations will have to be managed through an intensive feeding programme, *i.e.* restaurants.
6. Establish a network through which information about new problem medicines and chemicals can be widely distributed to all role players and restaurant managers.
7. Publish guidelines for siting and management of restaurants.
8. Promote Bearded Vulture conservation planning into existing land-use planning systems, EIA processes, and stewardship programmes.
9. Long term marking project of birds of various age groups.
10. Establishment of buffer zones only allowing low impact development must be identified and managed close to existing and historical breeding sites.
11. Implementation of appropriate mitigation measures for collisions and electrocutions across the Bearded Vulture range.
12. Need to monitor breeding success.
13. Implement a research project to obtain information on traditional use.
14. Conduct a multi-pronged awareness campaign.
15. Negotiate dedicated media slots to promote Bearded Vulture awareness (print, TV, radio, internet). Continually feed relevant information regarding Bearded Vulture conservation to the media. Improve vulture image using the media.
16. Future EIAs for the placement of all rural electricity networks and structure sizes must be non-negotiable.
17. Create awareness among large corporations and landowners of the problems associated with Bearded Vulture use and approach them for project specific funding. Influence corporate management decisions which could influence Bearded Vultures.
18. Develop a uniform set of educational materials on Bearded Vulture conservation to be used by all relevant educators.
19. Memorandum of Understanding between Lesotho and South Africa regarding the control of access to live birds or parts thereof for any reason.
20. Inclusion of monitoring protocol around initiatives for previous interventions.

BEARDED VULTURE POPULATION AND HABITAT VIABILITY ASSESSMENT

6 - 10 March 2006

Sterkfontein Dam, Harrismith, Free State Province, South Africa

WORKSHOP REPORT

SECTION 4

FINAL PLENARY: THE WAY FORWARD

The Way Forward for Bearded Vulture Conservation

Presently there is no focussed Bearded Vulture group which is made difficult by the species occurring across three provinces, two countries and numerous organisations. Ian Rushworth suggested that data be made available nationally which could affect commitment from government; he felt information dissemination internationally would also be important with the different countries involved. He said that steps needed to be put in place to collate information, evaluate interventions and in this way hold individuals accountable. It was obvious that a transfrontier project was needed with good collaboration between Lesotho and South Africa and standard level of interest and concern. He commented that EWT / BoPWG has an important role to play and responsibility should be taken but continuity is important and it is in this respect that they play a greater role.

It was suggested that a Bearded Vulture Interest Working Group be established that incorporates all other organisations with Sonja Krüger as the principal contact, coordinating logistics and details between the many organisations. It was requested that EWT / BoPWG take responsibility for setting up this forum and coordinate these meetings. It was proposed that either one champion be elected for the range of the species or that the two separate countries meet twice a year and in this way review progress, deal with difficult issues, share experiences and take the action plan (PHVA) forward.

The question was also posed if the forum would deal with Bearded Vulture alone or with other vulture species. Sonja Krüger suggested a focussed Bearded Vulture group and that the VSG community could handle the rest so as to circumvent conflict but that similar areas of interest should be taken into account. Tsepo Lepono suggested that the conservation actions of the species in South Africa and Lesotho be kept separate and then linked-up. Ian Rushworth disagreed, as the actions and steps taken in Lesotho effect the vultures in South Africa and that a champion from both South Africa and Lesotho be allocated and linkup. Wigbert Vogeley suggested only including the Cape Griffon in the Drakensberg area so as to keep the focus. All agreed that looking at both species where related issues were found in specific areas and responsibility should be taken by both Lesotho and South Africa and meetings would be setup to ensure follow-ups.

Andrew Jenkins stated that there are going to be independent decisions made, if focus was placed on both species and that the priority of the group should be on the Bearded Vulture. André Botha suggested that Cape Vulture data could be collected and included during surveys. Andrew Jenkins again stated that there were more than enough issues to deal with when monitoring the Bearded Vulture. Sonja Krüger agreed with Andrew Jenkins and that different people involved would make their own agenda decision. Andrew suggested that a Vulture PHVA should be done. Yolan Friedmann stated that a PHVA is a single species process. Richard Lechmere-Oertel however commented that all species overlap considerably. Yolan suggested that the group design a forum around the agenda and add to the process and see the way forward and how this issue can be resolved.

Andrew Jenkins stated that the management plan for Bearded and Cape Vultures will have similar monitoring issues and due to limited resources result in different monitoring techniques. Ian Rushworth stated that the action plan for the Cape Vulture may result in resources becoming available. Steven Piper stated that commonalities between the Bearded Vulture and Cape Vulture are vulnerability and nest sites locations. He also commented that the Bearded Vulture PHVA has made many people aware and sharpened the focus and there is no real problem other than limited resources.

All agreed that the discussions and suggestions from this workshop would be taken on to the Cape Vulture meeting. Sonja Krüger suggested at this time that the group finalise which organisations need to be involved in the project. She suggested Brian Colahan for the Free State and André Boshoff for the Eastern Cape were obvious choices but they however would need to be approached.

Andrew Jenkins stated that the VSG had the Cape Vulture as its focus and Bearded Vulture conservation slipped through the cracks, he then went on to suggested that some form of group be maintained. He stated that Cape Vulture will be found when looking for Bearded Vulture but you may not find Bearded Vulture when monitoring Cape Vultures. Ian Rushworth suggested keeping both together and see what comes out of the workshops ahead. Yolan Friedmann stated that it is up to the people involved and that it should form part of the agenda in future discussions. Bill Howells commented that lack of communication between different groups and people working in silos will result in the process falling by the way side.

Concern raised by the group was, who would take responsibility for disseminating information and keeping the communication channels open. Richard Lechmere-Oertel from the MDTP South Africa volunteered, however did raise the issue of his project coming to an end and how sustainable this would be. All agreed that Sonja Krüger (EKZNW), Richard Lechmere-Oertel (MDTP South Africa), Tsepo Lepono (MDTP Lesotho) and André Botha (EWT / BoPWG) would form part of the Bearded Vulture Interest Working Group. Athol Marchant warned that the group should not be seen as an EKZNW group or for that matter belong to any one organisation.

Sonja Krüger raised the issue of branding and linking the project as information would be disseminated from the MDTP. Yolan Friedmann suggested that co-branding under the guidance of EKZNW, MDTP, EWT / BoPWG and Lesotho be discussed. Steven Piper was of the opinion that a structured forum was needed.

Sonja Krüger raised concern about the inclusion of other organisations. Yolan Friedmann suggested that a list of collaborators must be compiled and should be as inclusive as possible. A basic start must be with those that participated in the Bearded Vulture PHVA.

BEARDED VULTURE POPULATION AND HABITAT VIABILITY ASSESSMENT

6 - 10 March 2006

Sterkfontein Dam, Harrismith, Free State Province, South Africa

WORKSHOP REPORT

SECTION 5

APPENDICES

Appendix 1: Bearded Vulture Workshop Participants List

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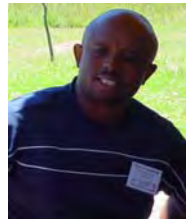
Sonja Krüger	Ezemvelo KZN Wildlife	skrueger@kznwildlife.com	P.O. Box 13053, Cascades, 3202, South Africa	033 2391516	033 2391515		
Steve McKean	Ezemvelo KZN Wildlife	steve@kznwildlife.com	P.O. Box 13053, Cascades, 3202, South Africa	033 2391512	033 2391515		
Steven Piper	Ornithological Support Services	vulture@telkomsa.net	P.O. Box 654, Underberg, 3257, South Africa	033 7011741	033 7011741	072 5997490	
Thulo Qhotsokoane	Department of Environment Lesotho	qhotsokoanesabsp@ilesotho.com	Box 10993, Maseru, 100, Lesotho	+266 (2) 2311767	+266 (2) 2313892	+266 (5) 8867274	

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Appendix 2: Workshop Programme

BEARDED VULTURE POPULATION AND HABITAT VIABILITY ASSESSMENT

6 – 10 March 2006

Sterkfontein Dam, Harrismith, Free State Province

MONDAY 6TH	**MARCH 2006**
18h30 -	Delegates arrive, registration and icebreaker
19:00 – 20:00	**DINNER**

Ice Breaker sponsored by the Birds of Prey Working Group

TUESDAY 7TH	**MARCH 2006 - DAY 1**
	BREAKFAST
08:30 – 09:00	Welcome by Yoliswa Ndlovu, General Manager uKhahlamba
09:00 – 10:30	Presentations ▪ The 2005 Bearded Vulture ground survey: South Africa (**Sonja Krüger, Ezemvelo KZN Wildlife**) ▪ Current knowledge of Bearded Vulture nesting sites in Lesotho (**David Allan, Durban Natural Science Museum**) ▪ Vultures and Traditional Medicine; Some Perspectives (**Steve McKean, Ezemvelo KZN Wildlife**) ▪ The current status of Bearded Vulture in Ethiopia (**Alastair Nelson, Frankfurt Zoological Society, Ethiopia**) (15 min each)
10:30 – 11:00	**TEA BREAK**
11:00 – 11:30	Introduction to the CBSG, CBSG Southern Africa and the workshop process
11:30 – 12:00	Introduction to Vortex
12:00 – 13:00	Plenary Session: Identify key issues
13:00 – 14:00	**LUNCH BREAK**
14:00 – 14:30	Formation of Working Groups and overview of task one
14:30 – 15:30	Working groups convene and begin on first task
15:30 – 16:00	TEA BREAK (FUTURE BREAKS SELF-REGULATED)
16:00 – 16:30	Working Group sessions
16:30 – 17:30	Plenary – First Working Group Reports
19:00 – 20:00	**DINNER**
WEDNESDAY 8TH	**MARCH 2006 - DAY 2**
07:30 – 08:30	**BREAKFAST**
08:30 – 09:30	Working groups convene to make changes to first reports
09:30 – 10:30	Plenary on goals / solutions and filters
10:30 – 11:00	**TEA BREAK and group photos taken**

11:00 – 13:00	Working groups convene and begin second task
13:00 – 14: 00	**LUNCH BREAK**
14:00 – 15:00	Plenary session to present and discuss goals / solutions
15:00 – 15:30	Working Groups convene to continue with second task
15:30 – 16:00	**TEA BREAK**
16:00 – 17:30	Working Groups convene and finalise second task
19:00 – 20:00	**DINNER**
THURSDAY 9TH	**MARCH 2006 - DAY 3**
07:30 – 08:30	**BREAKFAST**
08:30 – 09:30	Plenary session to complete task two
09:30 – 10:30	Discussion of third task: Strategies and Action plans
10:30 – 11:00	**TEA BREAK**
11:00 – 13:00	Working Groups reconvene to carry on with task three
13:00 – 14:00	**LUNCH BREAK**
14:00 – 15:00	Plenary Session to report back on task three
15:00 – 15:30	**TEA BREAK**
15:30 – 17:30	Working Groups reconvene to carry on with task three Plenary session to finalise task three
19:00 – 20:00	**DINNER**
FRIDAY 10TH	**MARCH 2006 - DAY 4**
07:00 – 08:00	**BREAKFAST**
08:00 – 10:30	Working Groups reconvene to finalise reports Group integration: Prioritise all solutions
10:30 – 11:00	**TEA BREAK**
11:00 – 12:30	Plenary session to present working group reports, discuss management recommendations and report completion
	Workshop closure and survey
13:00 – 14:00	**LUNCH BREAK**
	Departure by delegates

Appendix 3: Participants Goals and Hopes

Workshop participants were asked to write down the answers to the following two questions:

1. What do you want to accomplish at this workshop?
2. What do you think you can contribute to this workshop?

I wish to accomplish	I wish to contribute
A joint management plan for conservation of a few remaining colonies of Bearded Vulture and establish a working group to undertake monitoring of Bearded Vulture in the Maloti Drakensberg bioregion.	Available information and data on Bearded Vulture from my area.
The production of a united South African / Lesotho research, monitoring and conservation plan of action for the Bearded Vulture.	Personal knowledge of Bearded Vulture in the Lesotho Highlands.
Become enlighten about the broad understanding of the Bearded Vulture conservation processes, to better understand the subject. Share and integrate an actionable strategy for Bearded Vulture conservation among all relevant stakeholders.	Some perspective from a social point of view.
More knowledge about the Bearded Vulture, how can I improve numbers in my area.	What is happening in my area at vulture restaurants and when and how often we see Bearded Vultures.
Clear direction on how to manage the Bearded Vulture population to ensure that the population does not decrease further.	Contribute whatever knowledge I have as a manager of a sub region of the UDP, to ensure the Breaded Vulture remains as a viable population in the UDP.
To identify and initiate a programme aimed at the preservation of the Bearded Vulture habitat to ensure the survival of the species.	Development of an effective monitoring programme contributing through relevant field experience.
A working document that will enable an effective management plan to be drawn up for the future conservation of the Bearded Vulture and their required habitat.	Whatever I can to forge stronger partnerships with NGOs, corporate companies, conservancies, municipalities – with the product of this workshop.
Appreciation of practical methods for assessment of population and habitat for wildlife conservation.	Information on wildlife conservation in Lesotho and share problems encountered in effective management of biodiversity and possibly get advice on the best ways of dealing with this.
Produce a product / programme that will be practical for the benefit for Bearded Vulture conservation in the long-term.	30 years of conservation experience.
Gaining knowledge of what is restricting the breeding success and survival of Bearded Vulture. What strategies can be developed to increase the vulture population or better stop any more decrease?	Provide information on population status and possible limiting factors for southern Lesotho.
Identify the threshold (limits) that will indicate the time span to extinction so that our attention is focused on what the short-term and long-term actions need to be to prevent extinction – if that's where they are heading.	My understanding of basic raptor ecology derived from practical experience.
A conservation action plan for the species which has a list of management objectives and goals – time bound action plans with people responsible for implementing the actions	My knowledge of the species, experience in monitoring the species and ideas for a way forward based on recent work done on the species.

identified.	
Clear direction and prioritised actions to secure long-term future of Bearded Vulture in southern Africa.	Experience in developing a conservation plan and practical experience. Application of science to provide management solutions. Technical experience with modelling process.
Knowledge / research gaps on the Bearded Vulture will be identified. By constructing PHVA models, the threats that need urgent action would be identified and a management / action plan for the Bearded Vulture will be initiated / prepared regionally / nationally.	Provide suggestions on the tasks and information to my knowledge on the Bearded Vulture in Ethiopia.
Better understanding of Bearded Vulture habitat requirements.	Practical understanding and monitoring of Bearded Vulture.
Development of a workable and effective plan for Bearded Vulture conservation.	Information on threats to Bearded Vulture and suggestions for a way forward to address those threats, threats relate mainly to use of vulture for traditional purposes.
Develop a clear picture of the current status of the Bearded Vulture in southern Africa and establish a practical and effective strategy for conserving this species into the future.	General and specific experience.
Current knowledge will be synthesised to elucidate best current knowledge of status distribution of threats to Bearded Vultures in Maloti-UDP. This will allow potential management interventions to identify gaps in knowledge.	Where possible, general conservation knowledge, but personally it's largely a learning exercise to take knowledge back to Ethiopia on tried and tested techniques.
A comprehensive understanding of the problems and extent of problems facing the Bearded Vulture and a workable plan to counter these.	General knowledge from a practical conservation perspective (with a view to implementation planning).
A conservation strategy for the Bearded Vulture. Buy-in from significant role-players in KZN, Eastern Cape, Free State and Lesotho.	Wish to be involved in the monitoring programme in the southern Drakensberg and eastern Lesotho. Would like to be involved in the final editing process.
A clearer picture of the current nature and extent of threats to Bearded Vulture as well as indications and concrete plans to mitigate against these.	Contribute background and knowledge of managing habitat, monitoring and supplementation feeding for this species, in the eastern Free State so contributing to the total picture. Provide input in how EWT / BoPWG could contribute.
Create a strategy to reduce threats towards Bearded Vulture population. More information about Bearded Vulture and their distribution.	Participate in discussions.
A conservation plan for Bearded Vulture that will ensure their survival into the future. Networking and creating links and open discussion channels between projects and regions.	Modelling - using Vortex as a tool in formulating conservation plans.
A detailed action plan that will describe how we can implement conservation action, indicating the who, when, how and paid by whom. This will be based on the information generated in the PHVA.	Contribute my experience in generating the above action plans and working in transfrontier context.

The way the population of the endangered Bearded Vulture will be better conserved will be identified in this workshop. How the conservation network between the Bearded Vulture conservation areas will be established, will be identified.	
A strategic way forward towards the conservation of Bearded Vulture in South Africa.	Get to know the people and the species. Provide an accurate report.

Appendix 4: The Endangered Wildlife Trust and CBSG Southern Africa

The Endangered Wildlife Trust (EWT) is one of the largest non-governmental conservation organisations in southern Africa and was established in 1973. Widely recognised by its prominent red cheetah spoor logo, the EWT conserves biodiversity through the hands-on conservation of threatened species and their habitats, in a sustainable and responsible manner. Coordinating more than 100 field-based conservation projects and with 18 specialist Working Groups operating throughout southern Africa, Endangered Wildlife Trust programmes cover a wide variety of species and eco-systems and play a pivotal role in conserving southern African biodiversity and natural resources.

Vision Statement:

A healthy planet and an equitable world that values and sustains the diversity of all life.

Mission:

The Endangered Wildlife Trust is dedicated to conserving threatened species and ecosystems in southern Africa to the benefit of all people.

The Endangered Wildlife Trust with its access to a rich and diverse range of conservation expertise established CBSG Southern Africa in partnership with the CBSG, SSC / IUCN in 2000. Nine CBSG regional networks exist worldwide, including CBSG Indonesia, India, Japan, Mesoamerica, Mexico, Sri Lanka, Europe and South Asia. Regional CBSG networks are developed in regions requiring intensive conservation action and each network operates in a manner best suited to the region and local species. CBSG tools are adapted according to the needs and requirements of regional stakeholders and species and local expertise is utilised to best effect.

CBSG Southern Africa's mission is: *To catalyse conservation action in southern Africa by assisting in the development of integrated and scientifically sound conservation programmes for species and ecosystems, building capacity in the regional conservation community and incorporating practical and globally endorsed tools and processes into current and future conservation programmes*.

CBSG Southern Africa, operating under the banner of the Endangered Wildlife Trust is a non-profit, non-governmental organisation, serving the needs of the *in-situ* and *ex-situ* conservation community in southern Africa through the provision of capacity building courses, species and organisational Action Planning, Population and Habitat Viability Assessment (PHVA) and Conservation Assessment and Management Planning (CAMP) workshops, communication networks, species assessments and a host of other CBSG processes for species and ecosystem conservation. CBSG Southern Africa works with all stakeholders in the pursuit of effective biodiversity conservation throughout southern Africa.

Contact CBSG Southern Africa on:
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