See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/313888019

KwaZulu-Natal State of Biodiversity Report 2013

Technical Report · May 2015

CITATIONS 0		reads 477
1 authoi	:	
A state	Ian Rushworth Ezemvelo KZN Wildlife - Scientific Services 34 PUBLICATIONS SEE PROFILE	

Some of the authors of this publication are also working on these related projects:



AN ASSESSMENT OF THE POTENTIAL RISKS OF THE PRACTICE OF INTENSIVE AND SELECTIVE BREEDING OF GAME TO BIODIVERSITY AND THE BIODIVERSITY ECONOMY View project



Status and Trend of Key Indicators of Biodiversity in the Province of KwaZulu-Natal, South Africa

Ian Rushworth (Editor), Scientific Services, Ezemvelo KZN Wildlife



CHAPTER PAGE

Executive Summary	6-7
Introduction	9
State Indicators	13
1. Landscape-level Assessments	13
1.1. Extent of Natural Habitat	13
2. Ecosystem - Level Assessments	15
2.1. Terrestrial Ecosystems	15
2.2. Freshwater Wetland Integrity	15
3. Species Assessments	18
3.1. Plants	18
3.2. Butterflies and Moths	20
3.3. Fish	23
3.4. Frogs	24
3.5. Reptiles	25
3.6. Birds	27
3.7. Mammals	30
4. Genetic Assessments	33
4.1. Genetic Indicators	33
Response Indicators	35
5.1. Terrestrial Area Protected	35
5.2. Protection Levels of Terrestrial Ecosystems	37
5.3. Marine Areas Under Protection, and Protection Levels of Marine Ecosystems	38
5.4. Management Effectiveness of Terrestrial Protected Areas	40
Summary	43
Recommendations	45
Appendices	47



Executive Summary

The state of KwaZulu-Natal's biodiversity as at the end of 2013 is evaluated in this assessment at landscape, ecosystem, species and genetic levels using a framework of comparing the current state of selected biodiversity features to the desired state (the target), as well as comparing the trend of the biodiversity feature against the desired trend. It also evaluates the status and effectiveness of key response measures, such as the establishment of protected areas, being undertaken to safeguard biodiversity. This report is designed to provide the minimum set of summarised information that will allow decision makers and the concerned public to assess the state of the province's biodiversity, and, by implication, the success of the province in achieving its constitutional mandate to safeguard the environment for current and future generations.

State of Biodiversity reporting is an essential part of the adaptive management process adopted by organisations responsible for environmental management. Biodiversity objectives and targets are adopted, and then resources allocated to achieving these targets through, inter alia, mitigating threats, restoring habitats and implementing species recovery plans. The outcomes of those management interventions are then assessed by monitoring the status and trend of biodiversity features. This provides guidance as to the effectiveness of the interventions and, importantly, allows for approaches to be modified where the desired targets are not being achieved. For State of Biodiversity reporting to be effective it is essential that the full adaptive management cycle is completed with the results being used to adapt and learn.

A suite of indicators at different levels of the biodiversity hierarchy are reported on, but how representative are the indicators of the overall status of biodiversity in KwaZulu-Natal? The status of all vegetation types (ecosystems) is assessed across the whole province; however, only a very small proportion of the species that occur in KZN are monitored, assessed and reported on. The coverage is also biased towards larger vertebrates and species that are already threatened in some way; smaller vertebrates (fish, amphibians, reptiles) and, in particular, invertebrates are not adequately Many species that are considered assessed. common today will be threatened in the future if current trends continue; monitoring a sample of these currently non-threatened species would be a good indicator of general environmental health. The absence of currently more common species, the limited numbers and taxonomic spread of species, and the absence of genetic indicators are limitations of this report and of biodiversity monitoring in general.

This State of Biodiversity Report for KwaZulu-Natal (KZN) focuses only on biodiversity state and response indicators. Under this framework, 65 biodiversity status and 70 biodiversity trend state indicators were identified for analysis and reporting. Of these, there were sufficient data and resources available to evaluate 57 indicator categories for status and 50 for trend. Eight management response indicators could be identified in terms of their status and eight for trend. Of these all eight of the response indicators and six trend indicators were assessed.

The targets for most biodiversity status indicators are not achieved (61.4%% of targets not achieved). In terms of trend, most are stable or, if increasing, not increasing at the required rate to meet targets; 27.4% of indicators are showing an improving trend but a worrying 72.6% are showing a stable or declining trend. Overall, target achievement and population trends are indicating that biodiversity in KZN is under pressure despite conservation interventions.

Perhaps more worrying is the apparent failure of the provincial response to biodiversity threats, with 75% of response indicator targets not achieved, and the trends being stable or, if positive, being too slow to meet targets and timeframes. Resource limitations and failure of cooperative governance in managing buffer zones, primarily, are resulting in a decline in management effectiveness of protected areas managed by Ezemvelo KZN Wildlife.

The most important messages emerging from this assessment are:

- The indicators for the majority of biodiversity features assessed were below the desired target levels i.e. targets not achieved. Only 22 out of 57 (38.6%) targets are achieved.
- The trend of the majority of biodiversity features assessed indicated that they were declining, or had declined in the not too distant past. Fourteen out of 51 (27.4%) indicators showed a positive trend in accordance with targets, while the remaining 72.6% of indicators were stable, declining or not increasing at the necessary rate.
- The trend in the status of large mammals of conservation importance is, on the whole, improving. There are however worrying increases in poaching of several large vertebrates, especially

black and white rhino where poaching thresholds are being exceeded.

- The sea turtle conservation programme appears to be bearing fruits, with one species stable after earlier declines, and the other species increasing rapidly.
- The Province is not meeting its targets with respect to land area protected, or the protection levels of terrestrial ecosystems. Further, the rate of addition of protected areas is below the required rate to meet national and international obligations. The contribution of the State to protected area expansion has been declining since 1970, and recent increases in the protected area estate are almost entirely through the commitment of private and communal landowners facilitated through the KZN Biodiversity Stewardship programme. Options for future expansion are rapidly becoming more limited and more expensive.
- The marine environment along the KZN coast is significantly under protected (0.4% protected). No additional marine protected areas have been established since 2004.
- Ezemvelo KZN Wildlife is meeting its targets with respect to national standards for terrestrial protected area management effectiveness, but resource constraints and human activities in the landscape outside of the protected areas are threatening the ongoing achievement of this target.

While there have been some notable successes, safeguarding the province's unique biodiversity is going to require significant additional government commitment, particularly in the allocation of resources and in striving to find a balance between biodiversity development and conservation objectives. Specific management recommendations for each biodiversity feature and response measure However, the key overarching are provided. interventions required in the Province of KwaZulu-Natal to ensure that a representative sample of biodiversity is conserved and that the provision of vital ecosystem services is maintained, are:

- Formally adopt biodiversity status and trend targets for ecosystems, species and genetic integrity. These targets will allow for more informed and defendable decision making in managing the trade-offs between development and conservation, and will form the basis of systematic conservation assessments (and hence Bioregional Plans) and State of Biodiversity (and hence State of Environment) reporting.
- Develop formal monitoring documents for several biodiversity features, with the priorities probably being for terrestrial area protection, crocodile,

leopard and oribi.

- It is essential that spatial planning, delivery programmes and decision making of all spheres of government integrate better and incorporate the requirements of biodiversity and ecosystem services, possibly managed through a series of implementation protocols. The Constitution of South Africa and the resulting Intergovernmental Relations Framework Act require organs of state to communicate, collaborate and support each other's mandates. The ongoing decline in biodiversity in the province is largely a result of the failure to achieve sufficient levels of coordination and collaboration between organs of state with different mandates.
- The province has not achieved national protected area targets. It is essential that the province allocate additional resources to secure additional land through acquisition and subsequent management of additional protected areas, as well as providing additional support to the KZN Biodiversity Stewardship Programme (BSP). The KZN BSP has reached capacity to take on additional sites despite many additional landowners expressing a willingness to commit their land for the benefit of the state. An important constraint is the large number of vacant District Conservation Officer and ecologist posts within Ezemvelo KZN Wildlife: these staff are required to provide management advice (a key incentive) and ensure that stewardship sites are being properly managed.
- There are indications that resource constraints are affecting the ability of the province to achieve the national protected area management effectiveness targets. Whilst narrowly achieved in 2013, unless additional resources are allocated to protected area management, it is highly likely that the province will fall below the national minimum standard. The key requirements are to (1) provide adequate budget to allow for filling of vacant posts in Ezemvelo KZN Wildlife so that basic protected area management can be implemented and to effectively implement invasive species management, and (2) to implement measures to better coordinate the planning and activities of provincial and local government with respect to land use change in the buffer zones of protected areas.

Implementing the above recommendations would go a long way to improving the chances of the province in meeting biodiversity targets, providing a platform for growth of the Biodiversity Economy, and ultimately in ensuring a better life for all.

7

CONTRIBUTORS

Contributors to this assessment in alphabetical order are:

Dr. Adrian Armstrong, Santosh Bachoo, Dr. Clinton Carbutt, Brigitte Church, Xander Combrink, Tony Conway, Brent Coverdale, John Craigie, Dr. Peter Goodman, Rose Hamilton, Debbie Jewitt, Dr. Sonja Krüger, Tamsyn Livingstone, Sharon Louw, Athol Marchant, Ian Rushworth, Tanya Smith, Heidi Snyman.

ACKNOWLEDGEMENTS

The monitoring programmes that provide the data used in this assessment are undertaken primarily by Ezemvelo KZN Wildlife Scientific Services staff (Ecological Advice and Biodiversity Research & Assessment) in partnership with numerous protected area management staff (rangers and field rangers), and with the support of partner organisations such as Panthera, Endangered Wildlife Trust, Birdlife SA, Wildlands Conservation Trust and Wildlife ACT. The contribution of all Ezemvelo KZN Wildlife staff who submitted biological and law enforcement returns is greatly appreciated.

PHOTO ACKNOWLEDGEMENTS

The following are greatly acknowledged for providing photographs used to illustrate this report: Ian Rushworth, Clinton Carbutt, Sharon Louw, Xander Combrink, Brigitte Church, Di Martin, Andre Botha, Chris van Rooyen, Athol Marchant, Adrian Armstrong, Scott Ramsay, Hans Grobler and Sonja Krüger.

DESIGN AND LAYOUT

Diana Martin, Design Studio, Exemvelo KZN Wildlife.





8



Introduction

The diversity of life in KwaZulu-Natal, - at species, habitats, ecosystems and landscapes levels - is exceptionally high. Given the intrinsic value and socioeconomic importance of this biodiversity, citizens have a right, and decision makers an obligation, to know the state and trends of this biodiversity. The Province also has obligations in terms of its commitments to meet national biodiversity targets and objectives, which are often adopted in response to South Africa's obligations as a signatory to various international conventions.

Resources are invested in direct conservation activities and in environmental management by a range of government departments, parastatals and NGOs, but what is the outcome of this investment? Many indicators and outputs are monitored and reported on, but this is the only report that attempts to provide an overview of the outcomes of all the inputs – that is the status and trends of key biodiversity indicators in KZN. Importantly, these are assessed against identified thresholds or targets – levels at which the biodiversity features are considered relatively safe or which indicate a certain level of sustainability of the management of the environment.

Failure to achieve any targets should not be seen as failure of any single programme, entity, department or individual, but rather a failure of cooperative governance. Achieving biodiversity targets requires multiple government departments, state entities and other stakeholders working cooperatively towards common objectives. In some cases decisions have been taken – explicitly or implicitly - that other societal or economic targets are more important than biodiversity targets, and the implications of some of these decisions need to be explicit.

This report is designed to provide the minimum set of summarised information that will allow decision makers and the concerned public to assess the state of the Province's biodiversity, and, by implication, the success of the Province in achieving its mandate in terms of the Constitution and other legislative requirements to safeguard the environment for current and future generations.

Specifically, this report will summarise the current 'state' of biodiversity (the amount) in relation to what is desired (the target), as well as review the past and present trends in the state of biodiversity (are we moving toward or away from the desired state, and at what rate?). It also assesses the adequacy of the state response to safeguarding biodiversity (response indicators). It is not the place of this report to analyse the root causes of failures or successes, nor to outline detailed plans of action. However, it is intended that the results presented should prompt a review of, amongst others, strategies, decision making processes, priorities and resource allocation at multiple levels within the province.

Approach

The aim of this assessment is to review and present the status and trend of a representative suite of headline biodiversity **state indicators**, as well as to assess the adequacy of the conservation response through assessment of the **status** and **trend** of a series of **response indicators**. It does not use the DPSIR (driving force-pressure-state-impactresponse) framework typical of state of environment reports, but rather focuses only on the reporting against targets within headline indicators for biodiversity (Table 1).

The main body of the report summarises the status and trends of biodiversity state and response indicators in relation to defined targets, while more detailed reports with methods and recommendations are provided as a series of Appendices.

In the Appendices to this report the status of species in "protected areas" refers to State protected areas managed by Ezemvelo KZN Wildlife; populations in privately or communally owned nature reserves proclaimed through the Biodiversity Stewardship process in terms of the NEM: Protected Areas Act are for the purposes of this report recorded as "private or communal" and not as "protected areas". This method of reporting may change in future reports.

Rationale for identification of indicators

Only a very small proportion of species that occur in the province are assessed, largely based on the presence of existing long-term monitoring programmes; the selection not being based on any formal systematic assessment or on taxonomic uniqueness/representivity. That being said, there has been an attempt to monitor and assess across the full biodiversity hierarchy from landscapes, ecosystems, habitats, species and genes, and across as many taxonomic groups as possible. Some indicators, such as vultures, may be indicators



of broader environmental sustainability, while others, such as Satyrium rhodanthum, a Critically Endangered orchid, will likely reflect local conditions and issues. A stable or increasing vulture population requires adequate nesting and foraging areas free from persecution (awareness, law enforcement), bush encroachment (habitat management), disturbance (urban planning, buffer zones) and mortalities from power infrastructure (mitigation of power lines, suitable placement of wind farms, coordinated planning of infrastructure). All or most of these need to be in place to ensure the survival of vultures, necessitating adequate partnerships, cooperative governance and conservation input in Integrated Environmental Management processes. Accordingly, failure to conserve vultures may be the result of multiple interacting factors and it may be difficult to determine the most important causes, as well as being difficult to resolve.

For historical reasons the focus of this assessment is on the terrestrial environment; significant data are available for species within the marine environment but only a small proportion is assessed here. Future editions of the KZN State of Biodiversity Report will include more focus on marine species indicators, but reporting on marine issues is primarily the mandate of national departments.¹

The headline indicators have been broken into their component parts in the report. Not all indicators can or will be monitored or assessed each year. Where no monitoring was undertaken in 2013 then the latest monitoring data, usually 2011 or 2012, are presented as the best assessment of the current status.

No genetic indicators have yet been adopted, but baseline studies are collecting and documenting genetic diversity information for several priority species such as Bearded Vulture, black rhino and white rhino. Development and monitoring of genetic indicators is a priority going forward.

Representivity of indicators

A total of 65 biodiversity status and 70 biodiversity trend state indicators have been chosen, of which there was sufficient data to assess 57 status and 50 trend indicators. Eight status and eight trend response indicators were chosen; all eight response status indicators and six trend indicators were assessed.

How representative are the indicators of the overall status of biodiversity in KZN? The status of all vegetation types (ecosystems) is assessed across the whole province. Only a very small proportion of the species that occur in KZN are monitored, assessed and reported on (Table 2). For example, more than 600 species of birds have been recorded in KZN but only 6 are assessed, and only one of 595 species of butterflies are assessed. The coverage is also biased towards larger vertebrates and species that are already threatened in some way; smaller vertebrates (fish, amphibians, reptiles) and, in particular, invertebrates are not adequately assessed.

Many species that are considered common today will be threatened in the future if current trends continue; monitoring several of these currently non-threatened species would be a good indicator of general environmental health. The absence of currently more common species and the limited numbers and taxonomic spread of species is a limitation of this report and of biodiversity monitoring in general. Currently the increase in numbers of large antelope across the province as a success story is not documented, but neither are the continuing declines in populations of other important species such as aardvark, pangolin and several bird species.

¹ For a broader summary of trends of marine species see: Everett, B.I. (ed.). 2014. An inventory and brief description of the marine and estuarine fisheries along the KwaZulu-Natal coast. Unpublished Report. Oceanographic Research Institute, Durban.

Table 1. State and response indicator types used to assess biodiversity in KZN

Headline Indicator Type	Headline Indicator
State	Trends in extent of selected biomes, ecosystems and habitats
	Trends in abundance and distribution of selected species
	Change in status of threatened and/or protected species
	Trends in genetic diversity of selected vertebrate and plant species of
	conservation importance
Response	Coverage and representivity of protected areas
	Management effectiveness of State-managed protected areas



Table 2. Representation of species within broader taxonomic groups in the 2013 KZN State of Biodiversity assessment

Group (Class)*	Approximate number of species in KZN	Number of species assessed	Proportion assessed
Mammals	189	10	5.3%
Reptiles	167	4	2.4%
Birds	600	6	1.0%
Butterflies	595	1	0.2%
Plants	>5600	3	.005%
Frogs	74	0	0%
Freshwater Fish	86	0	0%
Estuarine Fish	107	0	0%

*Broad groups not following any particular taxonomic hierarchy

Resource constraints mean that adding additional indicators in future will be challenging. As noted previously, no genetic indicators have yet been adopted (but this must become a priority).

Currency of indicators

Most status and response indicators in this report are current to the end of 2013, and have abundance trend data going back more than five years or five monitoring events. Some data sets go back for up to 50 years (e.g. turtles). However, some indicators reported on were last monitored in 2011 or 2012, and this represents the latest assessment date for those features. These have been included in the 2013 report but it is clearly noted where the last assessment date was prior to 2013.

Desired state or targets

Critical to determining how KZN is performing with respect to biodiversity is assessing status in relation to the 'desired state' or 'targets'. Defining the 'targets' of our biodiversity is something that has been routinely undertaken at a technical level, but which is difficult to negotiate and get commitment for at a political level. There has been no formal process in KZN to adopt biodiversity targets at a strategy or political level, and this hampers both decision making regarding balancing developmental imperatives and conservation obligations. It also makes assessment of the state of biodiversity problematic. In this assessment, the state of biodiversity is assessed against targets developed by biologists and conservations scientists, some of which have been adopted by the Ezemvelo Board, and some of which are sub-sets of national targets allocated to the province. None of these have been formally accepted and adopted by the Province. In addition to the importance of adopting targets for this type of assessment, it is essential to have targets in place to allow for defendable systematic conservation assessments to be undertaken for spatial planning and for meaningful input into the IEM process.

How the State of Biodiversity report fits in with other assessments

The State of Biodiversity (SoB) report will become a contribution to the State of Environment and Biodiversity Outlook (SoE) reports of the Province. The latter reports incorporate brown issues such as pollution and water resource management, which are some of the factors influencing biodiversity outcomes. Every five years Ezemvelo will, drawing on the annual SoB reports, produce a Biodiversity Outcomes report that will identify in detail the drivers and appropriate responses to safeguard biodiversity.



State Indicators

1. Landscape-Level Assessments

1.1. Extent of Natural Habitat

The amount of natural vegetation remaining is a good indicator of the persistence of species and ongoing functioning of ecological processes.

Status

By 2011 (the last land cover assessment) the amount of natural habitat remaining in the province, once accumulated transformation was removed and old field agriculture was corrected for, was 53.6% (Appendix 1). Since this is below the connectivity threshold it is inferred that population dynamics and species interactions are being negatively affected. This is still marginally above the persistence threshold of 50% however and the provincial target is therefore **Achieved.** Based on the previous rate of change it is predicted that the extent of remaining natural habitat by the end of 2013 would be 51.2%, with the persistence threshold of 50% predicted to be breached in 2014.

Trend

The province has been rapidly losing natural habitat since formal monitoring began in 1994, with the percentages of the province remaining in a natural state declining from 73.3% (1994), 62.1% (2000), 56.8% (2005), 54.3% (2008) to 53.6% (2011) respectively (Figure 1). The average annual area transformed each year (1994-2011) is 109 906 ha.annum-1 (1.16%). This is an area of natural habitat significantly larger than Hluhluwe-iMfolozi Park lost each year. In the 1994-2008 period the average rate of transformation was 1.35% or 127 909 ha.annum-1; the average rate of transformation between 2008 and 2011 had reduced to 0.27% (Figure 2), possibly linked to the global economic slowdown more than any direct conservation interventions.

Assessment

The extent of untransformed land (natural habitat) is declining, therefore the trend is **Declining**. The target is to slow the rate of habitat transformation to zero by 2020: the annual rate of habitat transformation in the province has slowed significantly from 2.24% between 1994 and 2000, to 0.27% between 2008 and 2011. Therefore while the trend is **Slowing** the target is still **Not Achieved**.



Figure 1: Proportion of natural habitat remaining in KZN. Based on current trends the Persistence Threshold target is predicted to be breached in 2014.





Figure 2: Average annual rate of change (% loss of natural habitat) over different time periods. Note reducing rate of change over time.

Feature	Biodiversity Indicator	Target	2011 Measure	Target Assessment	Trend Assessment
Extent of natural habitat	Proportion of natural habitat remaining	>50%	53.6% (estimated at 51.2% for 2013)	Achieved	Declining
	Rate of habitat loss	0% by 2020	0.27% (2008-2011)	Not Achieved	Improving (rate of loss has been slowing)

2. Ecosystems - Level Assessments

2.1. Terrestrial Ecosystems

There are 101 vegetation types and subtypes in the province divided into the following biomes²: Forest, Wetland, Savanna, Indian Ocean Coastal Belt (IOCB) and Grassland.

Status

More than 50% (52 out of 101) of vegetation types in the province are threatened (Table 1, Figure 3). Twenty vegetation types are Critically Endangered, 15 are Endangered, 17 are Vulnerable and 49 Least Threatened.

Trend

The trend in conservation status of vegetation types has not been formally assessed but is known to be deteriorating.

Assessment

The target to maintain all vegetation types at a conservation status of Vulnerable or better is **Not Achieved**; the trend in conservation status is known to be worsening but has not been formally assessed.

Terrestrial	Status Target	Not Achieved	
Ecosystem s	Trend	Not Assessed	

² There is one Fynbos vegetation type which for the purposes of this analysis was included with the grassland biome.

Table 1. Conservation status of KZN vegetation types summarised by biome (IOCB = Indian Ocean Coastal Belt)

Biome	Critically Endangered	Endangered	Vulnerable	Least Threatened
Forest	11	5	0	7
Wetland	4	2	5	15
Savanna	2	1	4	12
IOCB	2	2	1	1
Grassland	1	5	7	14
Total	20	15	17	49

2.2. Freshwater Wetland Integrity

It is necessary that at least 20% of KZN's important wetlands should be maintained in a pristine state (Category A), no less than an additional 30% of KZN's important wetlands should be in a slightly impacted state (Category B), and the remaining 50% or less should be in an impacted (Category C) or better state (Annexure 3).

Status

Currently, based on a provincial assessment of the top 24 priority wetlands, the integrity of priority wetlands varies from unmodified (Category A 20.8%), to largely natural (Category B 12.5%), moderately modified (Category C 45.8%), largely modified (Category D 16.7%) and seriously modified (Category E 4.2%) (Appendix 3, Figure 4). Therefore the targets for wetland condition are **Not Achieved**.

Trend

While this is not the first assessment of the status

of these wetlands, it is the first using a standardised methodology. The methodology used in this assessment was similar enough to that used in 2004 (see Appendix 3) and hence to make broad comparisons. In this respect, the Present Ecological State of the majority of the 24 priority wetlands has remained **Stable** (Figure 5), therefore status is estimated to be **Stable**.

Assessment

While the target conditions of priority wetlands are **Not Achieved**, the trend is at least **Stable** and provides a basis from which to rehabilitate and restore. Note however that this assessment is for a small suite of 24 priority wetlands; many thousands of wetlands have been completely destroyed, and continue to be destroyed or degraded, through dam construction and drainage for agriculture and urban development.





Figure 3: The conservation status of the various vegetation types grouped according to their biome status. The numbers in the graph indicate the number of vegetation types per biome in each threat category.



Figure 4: Present Ecological State of priority wetlands compared to the desired state.





Figure 5: Trend in the Present Ecological State of 24 priority wetlands in KZN between 2004 and 2010/11.

Feature	Biodiversity Indicator	Target	2011 Measure	Target Assessment	Trend Assessment
Wetland Integrity	Proportion of priority wetlands falling into different states	≥20% in a pristine state (Category A), ≥30% slightly impacted (Category B) and the remaining ≤50% in an impacted (Category C) or better state	A = 20.8% B = 12.5% C ⁺ = 66.7%	Not Achieved	Stable





3.1. Plants

KwaZulu-Natal has more than 5600 species of plants of which 407 are endemic to the province and a further 903 species are endemic to South Africa. 5389 species had been assessed by the end of 2013 in the national red listing process.

3.1.1 Conservation Status

Status

Three species of plants in KZN are Extinct, one is Extinct in the Wild, and 207 are listed as Threatened i.e. Critically Endangered, Endangered or Vulnerable (Table 2); a further 262 species have been listed as species of conservation concern.

While the proportion of Extinct, Extinct in the Wild, Critically Endangered and Endangered species is relatively low (1.54 %), our target (to maintain all species in a category of Vulnerable or better) is **Not Achieved**.

Trend

The latest red list assessment is more rigorous and uses slightly different methods and categories to previous assessments, as well as being based on additional information and different species numbers for the province based on new collections and taxonomic revisions. Notwithstanding the slight methodological differences the comparisons for 2009 and 2013 are presented in Table 3.

Assessment

On the surface the number of Extinct and Extinct in the Wild species appears to have remained constant (four), but it should be noted that seven of the Critically Endangered species in 2013 could actually be Extinct (this level of analysis was not done in 2009), so it is possible that the number of plant species in KZN now extinct has increased. The number of Critically Endangered and Endangered species has remained approximately constant (80 in 2009 vs. 79 in 2013), as has the summed number of Critically Endangered, Endangered and Vulnerable species (214 in 2009 vs. 207 in 2013). In the short term (2009 to 2013) therefore the trend appears to be **Stable**, although in the long term the trend has been declining.

Plante	Status Target	Not Achieved
Fidilits	Trend	Stable

Table 2. Conservation status assessment for plant species in KZN (number and percentage of KwaZulu-Natal plant species per threat category)

Threat category	No. of KZN species	Percentage
Extinct	3	0.06
Extinct in the wild	1	0.02
Critically Endangered, Possibly Extinct (CR PE)	7	0.13
Critically Endangered (CR)	19	0.35
Endangered (EN)	53	0.97
Vulnerable (VU)	128	2.35
Near Threatened (NT)	65	1.2
Critically Rare	7	0.13
Rare	121	2.23
Declining	31	0.57
Data Deficient - Insufficient Information (DDD)	37	0.68
Data Deficient - Taxonomically Problematic (DDT)	103	1.89
Least Concern	4814	88.54



Table 3. Trend in proportion of KZN plants in differentred list categories between 2009 and2013 (EX=Extinct, EW=Extinct in the Wild,CE=Critically Endangered, EN=Endangered)

Status	2009	2013
Extinct	3	3
Extinct in the wild	1	1
Critically Endangered	33	26
Endangered	47	53
Vulnerable	134	128
Proportion EX/EW, CE & EN	1.62%	1.37%

3.1.2 Priority species

The status and trend of one Critically Endangered KZN endemic orchid species *Satyrium rhodanthum* (Appendix 4), an Endangered red-hot poker *Kniphofia leucocephala* (Appendix 5) and a Vulnerable cycad species *Encephalartos ngoyanus* (Appendix 6) were assessed.

The population of *Satyrium rhodanthum*, is very small and confined to three sub-populations. The apparent increase in number of occupied quadrats is an artifact of the discovery on one additional sub-population, not a real increase; the population of *Kniphofia leucocephala* is significantly smaller than the target population; and the conservation target of *Encephalartos ngoyanus* has not been achieved with the population in the monitoring area within Ongoye Forest Reserve declining.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Satyrium rhodanthum	Number of sub-populations	≥3	3	Achieved	Stable
	Number of occupied 20x20m grid cells	Stable to increasing trend in number of occupied grid cells	63	Achieved	Stable

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Kniphofia leucocephala	Number of sub-populations	6	1	Not Achieved	Stable
	KZN population size	3000	30	Not Achieved	Not Assessed

Participation of the second

STREES NO.	Second States And	and some star	and the second s	11/200	
Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Ngoya cycad Encephalartos ngoyanus	Number of populations	2	2	Achieved	Stable
	Number of sub-populations	10	5	Not Achieved	Stable
	Ongoye Forest Reserve population size	1000	146	Not Achieved	Declining
	KZN population size	10000	≥1034	Not Assessed	Not Assessed

3.2. Butterflies and Moths

KwaZulu-Natal has an estimated 597 butterfly species and subspecies (taxa).

The number of animal species in KZN is unknown and has not been estimated, but exceeds many tens of thousands, with many species new to science being discovered each year. The overwhelming majority of animal species in KZN are invertebrates. Invertebrates are animal species which do not possess a vertebral column and by definition includes all animals apart from the subphylum Vertebrata. It is estimated that 97% of all animal species on the globe are invertebrates³. Many individual invertebrate taxa have a greater number and variety of species than the entire subphylum of Vertebrata. Familiar examples of invertebrates include insects, crabs, lobsters, snails, clams, octopuses, starfish, sea-urchins and worms. One of the better-known groups within the invertebrates are the butterflies and moths, which are insects in the group Lepidoptera. In the absence of good information on other invertebrate taxa, and acknowledging the limitation of using a small subgroup as an indicator, butterflies and moths are used as an indicators for invertebrate conservation.

3.2.1 Conservation Status

Status

The conservation status of South African butterflies was assessed in 2013 (Table 4). In KZN:

- One species is Extinct: Morant's blue Lepidochrysops hypopolia.
- No species are Critically Endangered.
- Our endemic species or subspecies are Endangered: Pennington's protea butterfly Capys penningtoni, yellowish amakoza rocksitter Durbania amakosa flavida, white-blotched ketsi

blue *Lepidochrysops ketsi leucomacula*, and Karkloof blue *Orachrysops ariadne*.

- Four species or subspecies are Vulnerable: Dingaan's widow *Dingana dingana*, Tsomo River opal *Chrysoritis lyncurium*, whitish amakosa rocksitter *Durbania amakosa albescens*, and Estcourt blue *Lepidochrysops pephredo*.
- Three species are Near Threatened: Wakkerstroom widow *Dingana alaedeus*, southern purple *Aslauga australis*, Drakensberg daisy copper *Chrysoritis oreas*.

A new national category, Rare, with two subcategories, Low density and Habitat specialist, were included in this most recent assessment.

- The KZN species and subspecies in the Low density sub-category are: bicoloured paradise skipper Abantis bicolor, lilac tip Colotis celimene amina, Loteni brown Neita lotenia, little hairtail Anthene minima minima, northern scarlet flash Chrysoritis phosphor borealis, Millar's buff Deloneura millari millari, coastal hairstreak Hypolycaena lochmophila, Natal yellow-banded sapphire Lolaus diametra natalica, white-spotted sapphire Lolaus lulua, Pennington's white mimic Ornipholidotos peucetia penningtoni, Zulu buff Teriomima zuluana.
- The KZN species and subspecies in the Habitat specialist sub-category are: marsh sylph *Metisella meninx*, bamboo sylph *Metisella syrinx*, Zululand emperor swallowtail *Papilio ophidicephalus zuluensis*, eastern opal *Chrysoritis orientalis*, Loewenstein's blue *Lepidochrysops loewensteini*, Potchefstroom blue *Lepidochrysops procera*.

Table 4. Summary of the conservation status of the butterflies of KZN in 2009 and 2013

Year		Extinct	Critically Endangered	Endangered	Vulnerable	Near Threatened	Rare - Low Density	Rare - Habitat Specialist
00001	No. Taxa	1	0	2	7	1	-	-
20091	Percentage	0.17	0	0.34	1.17	0.17	-	-
00102	No. Taxa	1	0	4	4	3	11	6
2013 ²	Percentage	0.17	0	0.67	0.67	0.5	1.84	1.0

¹ Henning, G.A., Terblanche, R.F. & Ball, J.B. (ed.) 2009. South African Red Data Book: butterflies. SANBI Biodiversity Series 13. South African National Biodiversity Institute, Pretoria.

² Mecenero, S., Ball, J.B., Edge, D.A., Hamer, M.L., Henning, G.A., Kruger, M., Pringle, E.L., Terblanche, R.F. & Williams, M.C. (eds.) 2013. Conservation assessment of butterflies of South Africa, Lesotho and Swaziland: Red List and Atlas. Saftronics (Pty) Ltd., Johannesburg & Animal Demography Unit, Cape Town.

³ May, R.M. 1988. How Many Species Are There on Earth? Science 241 (4872): 1441–1449.



Trend

The number of Extinct species has remained constant (one) between assessments in 2009 and 2013 (figure 1). In contrast, the number of Endangered, Vulnerable and Near Threatened taxa has changed over that period. Most of these changes are not real, but rather are a result of greater knowledge of the distributions and other aspects of these taxa. However, the status of two species and subspecies, Pennington's protea butterfly and white-blotched ketsi blue, has become genuinely worse over the period, and three extra species, the Wakkerstroom widow, southern purple and Drakensberg daisy copper, have been assigned to the Near Threatened category. The white-spotted sapphire has been reassigned to the Rare - Low density category from the Near Threatened category over the same period, which is not likely to be a genuine change in its Red-list status.

Assessment

Although the percentage of the total butterfly taxa in KwaZulu-Natal that is threatened is low (1.5%), we cannot become complacent. New threats against indigenous Lepidoptera are emerging and the Redlist status of indigenous species, and endemic species in particular, should not be allowed to become worse. The overall status of butterflies, as assessed by Red List status, has become worse between 2009 and 2013, and the target to maintain all species in a category of Vulnerable or better is **Not Achieved**.

Duttoufling	Status Target	Not Achieved	
Butterflies	Trend	Declining	

Priority species

Monitoring is currently being undertaken for the Karkloof blue butterfly *Orachrysops ariadne* (Appendix 7) and Millar's Tiger Moth *Callioratis millari* (Appendix 8). A re-introduction programme for the Karkloof blue butterfly is in the planning stage, which, if successful, would increase the number of colonies to 5.



Figure 6: Number of butterfly species and subspecies in each Red List class (excluding Least Concern) in KwaZulu-Natal in 2009 and 2013. CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, R-LD = Rare – Low density, R-HS = Rare – Habitat specialist.



Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Karkloof Blue Butterfly <i>Orachrysops</i> <i>ariadne</i>	Number of colonies	≥20	4	Not Achieved	Stable
	Number of eggs laid at the Nkandla monitoring site each year	≥250	235	Not Achieved	Increasing
	Number of eggs laid per 50 mature host-plants at each of the three sites around Howick	Stable to increasing	Not assessed	Not assessed	Not assessed

Species	Biodiversity Indicator	Target	2013 measure	Target Assessment	Trend Assessment
Millar's Tiger Moth <i>Callioratis</i> <i>millari</i>	Number of colonies	≥20	2	Not Achieved	Stable
	Number of eggs laid at the Entumeni monitoring site each year	≥100	131	Achieved	Not Assessed

3.3. Fish

KwaZulu-Natal has an estimated 83 species of freshwater fish and 109 estuarine fish.

3.3.1 Conservation status

Status

fish, the One species of Maloti minnow Pseudobarbus quathlambae, is locally Extinct (although small populations remain in Lesotho), while two species (Serranchromis meridianus and Silhouettea sabayi) are classified as Endangered. The last complete assessment of the red-list status of South African fish was in 2009 (Darwall et al. 2009); however ten species have been re-assessed subsequent to the 2009 assessment (IUCN Red List of Threatened Species. Version 2014.3) and the status of those species was updated accordingly to reflect the more recent assessment (Table 5.1).

While the proportion of extinct, critically endangered and endangered species is relatively low (3.6 %), our target to maintain all species in a category of Vulnerable or better is **Not Achieved**.

Whilst a large proportion of estuarine fish have not been assessed in terms of red-list criteria, at least three species of estuarine fish are Critically Endangered or Endangered (Table 5.2). While the proportion of critically endangered and endangered species is relatively low (2.7%), our target to maintain all species in a category of Vulnerable or better is **Not Achieved**.

Trend

The trend in red list status cannot yet be assessed.

Assessment

The conservation status targets for both freshwater and estuarine fish are **Not Achieved**. The trend in terms of change in status cannot be assessed at this time.

Freshwater	Status Target	Not Achieved
Fish	Trend	Not Assessed

Estuarine	Status Target	Not Achieved
Fish	Trend	Not Assessed

3.3.2 Priority species

No species targets set therefore none assessed.

	Extinct	Critically Endangered	Endangered	Vulnerable	Near Threatened	Not Evaluated
No. of Species	1	0	2	0	4	2
Percent	1.2	0.0	2.4	0.0	4.8	2.4

Table 5.1. Summary of the conservation status of the freshwater fish of KZN $(n=83)^{1}$

¹ Darwall, W.R.T., Smith, K.G., Tweddle, D. and Skelton, P. (eds) 2009. The Status and Distribution of Freshwater Biodiversity in Southern Africa. Gland, Switzerland: IUCN and Grahamstown, South Africa: SAIAB. viii+120pp; status of 10 species updated from the International Union for Conservation of Nature and Natural Resources Red List of Threatened Species. Version 2014.3. www.iucnredlist.org. Accessed January 2015.

Table 5.2. Summary of the Conservation Status of estuarine fish of KZN (n = 109)¹

	Critically Endangered	Endangered	Vulnerable	Near Threatened	Not Evaluated
No. of species	2	1	2	3	84
Percent	1.8	0.9	1.8	2.8	77.1

¹ International Union for Conservation of Nature and Natural Resources Red List of Threatened Species http://www.iucnredlist.org. Accessed February 2012.



3.4. Frogs

KwaZulu-Natal has an estimated 74 frog species.

3.4.1. Conservation Status

Status

The conservation status of southern African frogs was last assessed in 2011. In KZN one species, the Pickersgill's reed frog is Critically Endangered, while the mistbelt chirping frog, the long-toed tree frog and the kloof frog are Endangered. A further two species are Vulnerable and two are Near Threatened (Table 6).

Trend

The number of Critically Endangered, Endangered and Vulnerable species has remained constant between assessments (2004 and 2011) although an extra species has been assigned to the Near Threatened category (Figure 7).

Assessment

While the proportion of Critically Endangered and Endangered species is relatively low (5.33 %), our target to maintain all species in a category of Vulnerable or better is **Not Achieved**. The trend in status is however **Stable** to **Declining**.

Frage	Status Target	Not Achieved
Frogs	Trend	Stable/Declining

3.4.2 Priority species

No species targets set therefore none assessed.

Table 6.	Summary of the	conservation s	status of the	frogs of	KZN in	2004	and 20	011

Year		Critically Endangered	Endangered	Vulnerable	Near Threatened
000.41	No. of Species	1	3	2	1
2004'	Percentage	1.33	4.00	4.00	1.33
00112	No. of Species	1	3	2	2
2011 ²	Percentage	1.33	4.00	4.00	2.66

¹ Minter, L.R., Burger, M., Harrison, J.A., Braack, H.H., Bishop, P.J. and Knoepfer, D. 2004. Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. SI/MAB Series No. 9. Washington, D.C.

² Measey, G.J. (ed.) 2011. Ensuring a future for South Africa's frogs: a strategy for conservation research. SANBI Biodiversity Series 19. South African National Biodiversity Institute, Pretoria. January 2015



Figure 7: Number of frog species in each Red List class (excluding Least Concern) in 2004 and 2011. CE = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened.



3.5. Reptiles

KwaZulu-Natal has an estimated 167 reptile species.

3.5.1 Conservation status

The last conservation assessment of reptiles was undertaken in 1988 and is considered completely out of date and therefore the conservation status of reptiles was not assessed. A revised red-listing of southern African reptiles is currently underway and will be reported on in later KZN State of Biodiversity reports.

Pontilos	Status Target	Not Assessed	
neptiles	Trend	Not Assessed	

3.5.2 Priority species

Surveillance, monitoring and directed conservation action and status reporting is being undertaken for several species of reptile, including the coastal population of the KwaZulu dwarf chameleon Bradypodion melanocephalum (Appendix 9), the Nile crocodile Crocodylus niloticus (Appendix 10), and two species of marine turtle - leatherback turtle Dermochelys coriacea (Appendix 11) and loggerhead turtle Caretta caretta (Appendix 12). Target achievement and continuing increases in loggerhead turtle, and to a lesser extent leatherback turtle, populations is particularly pleasing. Development pressures in the Ethekwini area are however threatening the coastal population of the KwaZulu dwarf chameleon.

Species	Biodiversity Indicator	Target	2013 measure	Target Assessment	Trend Assessment
KwaZulu dwarf chameleon <i>Bradypodion</i> <i>melanocephalum</i>	Number of viable coastal sub- populations	≥3	Unknown	Not Assessed	Not Assessed
	Viable sub- population conserved at Chameleon Park and connected D'MOSS areas	1	0	Not Achieved	Declining
	Number of adult Kwa- Zulu dwarf chameleons at Chameleon Park and the associated D'MOSS strip	≥100 adults	73	Not Achieved	Declining

Species	Biodiversity Indicator	Target	2013 measure	Target Assessment	Trend Assessment
Nile crocodile Crocodylus niloticus	Population size (>1.5m length)	3 500	2 708	Not Achieved	Stable



Species	Biodiversity Indicator	Target	2013 measure	Target Assessment	Trend Assessment
Leatherback turtle <i>Dermochelys</i> <i>coriacea</i>	Number of individual adult females recorded in 60 km monitoring area	Stable to increasing trend over last 8 years	65	Achieved	Stable
	Number of completed nesting events per km patrolled per night in 13 km index area	Stable to increasing trend over last 8 years	0.03	Achieved	Stable

Species	Biodiversity Indicator	Target	2013 measure	Target Assessment	Trend Assessment
Loggerhead turtle <i>Caretta caretta</i>	Number of individual adult females re- corded in 60 km monitoring area	Stable to increasing trend over last 8 years	757	Achieved	Increasing
	Number of com- pleted nesting events per km patrolled per night in 13 km index area	Stable to increasing trend over last 8 years	1.4	Achieved	Increasing



3.6. Birds

KwaZulu-Natal has an estimated 600 terrestrial bird species

3.6.1 Conservation status

Status

The last conservation assessment of birds was undertaken in 2000 and is dated since it used a pre-2001 method. Nevertheless, this assessment does provide a broad understanding of the conservation status of birds of KZN. Two species, the African Skimmer and Yellow-billed Oxpecker are locally Extinct, while a further five species are Critically Endangered.

Trend

The red-listing process for all South African birds is underway and a comprehensive analysis of status and trend will be possible in later reports. However, it is known that several KZN bird species will be moving into higher categories of threat, including all vultures.

Assessment

While the proportion of Extinct, Critically Endangered and Endangered bird species is relatively low (2.5 %), our target to maintain all species in a category of Vulnerable or better is **Not Achieved**. The trend is **Not Assessed**.

Birds	Status Target	Not Achieved	
	Trend	Not Assessed	

3.6.2 Priority species

Surveillance, monitoring and directed conservation action and status reporting is being undertaken for several bird species, including the Bearded Vulture (Appendix 13), Lappet-faced Vulture (Appendix 14), White-headed Vulture (Appendix 15), White-backed Vulture (Appendix 16), Wattled Crane (Appendix 17) and Blue Swallow (Appendix 18). Other than Wattled Crane (which narrowly met its abundance target but is well below the number of pairs target) and Whitebacked Vulture, all species of birds assessed are well below desired target levels. Blue Swallows are at critically low numbers, and still declining, and are at risk of becoming the next vertebrate extinction in South Africa; virtually the entire remaining population is confined to KZN. The ongoing poisoning of vultures is hugely problematic and is a threat to the survival of a number of species. Collisions and electrocutions of large birds on Eskom power line infrastructure remains a significant threat.

Table 7: Summary of the conservation status of KZN birds¹

Threat category	Extinct	Critically Endangered	Endangered	Vulnerable
No. of Species	2	5	8	38
Percentage	0.1	0.8	1.3	6.3

¹ Barnes, K.N. (ed.) 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Birdlife South Africa. Johannesburg.

Species	Biodiversity Indicator	Target	2013 measure	Target Assessment	Trend Assessment
Blue Swallow <i>Hirundo</i> <i>atrocaerulea</i>	Number of nests in KZN	80 by 2020	27	Not Achieved	Declining
	Number of nests that have successfully fledged chicks	No target	22	Not Assessed	Not Assessed
	Number of chicks fledged	No target	64	Not Assessed	Not Assessed



Species	Biodiversity Indicator	Target	2013 measure	Target Assessment	Trend Assessment
Bearded Vulture Gypaetus barbatus	Number of occupied breeding territories in KZN	≥40	15	Not Achieved	Not Assessed
Species	Biodiversity Indicator	Target	2013 measure	Target Assessment	Trend Assessment
Lappet-faced Vulture	Number of nests in KZN	≥20	17	Not Achieved	Increasing
Torgos tracheliotus	Reproductive success (proportion of nests successfully fledging chicks)	≥50%	82% (75% average over 5 years)	Achieved	Stable
	Anthropogenic mortality of breeding population	<2%	0	Achieved	Not Assessed

Species	Biodiversity Indicator	Target	2013 measure	Target Assessment	Trend Assessment
White-headed Vulture <i>Aegypius</i> occipitalis	Number of nests in KZN	≥20	7	Not Achieved	Stable
	Reproductive success (proportion of nests successfully fledging chicks)	≥50%	100% (79% over 5 years)	Achieved	Not Assessed
	Anthropogenic mortality of breeding population	<2%	0%	Achieved	Not Assessed

Species	Biodiversity Indicator	Target	2013 measure	Target Assessment	Trend Assessment
Wattled Crane Bugeranus carunculatus	Population size	≥260	261	Achieved	Increasing
	Number of active nests	100	68	Not Achieved	Increasing



Species	Biodiversity Indicator	Target	2013 measure	Target Assessment	Trend Assessment
White-backed Vulture	Number of nests in KZN	≥350	509	Achieved	Stable
Gyps africanus	Reproductive success (proportion of nests successfully fledging chicks)	≥50%	83.5%	Achieved	Stable
	Anthropogenic mortality of breeding population	<2%	4.2%	Not Achieved	Not Assessed



Mammals

KwaZulu-Natal has an estimated 189 terrestrial mammal species.

3.7.1 Conservation status

Status

The last conservation assessment of mammals was undertaken in 2004. Six species (3%) are considered Critically Endangered, while 12 are Endangered and 16 Vulnerable (Table 8). It should be noted that a further 40 species (21%) were considered data deficient. Mammals are currently being re-assessed and an updated status and assessment of trend should be available in later reports.

Trend

South African mammals are currently undergoing a red-list assessment and the trend in status from 2004 will be reported in future assessments.

Assessment

The proportion of Critically Endangered and Endangered species is relatively high (9.0 %) and the target to maintain all species in a category of vulnerable or better is therefore **Not Achieved**.

Mammals	Status Target	Not Achieved	
	Trend	Not Assessed	

3.7.2 Priority species

Directed conservation action, monitoring and status reporting is being undertaken for several large mammal species, including the African wild dog (Appendix 19), cheetah (Appendix 20), lion (Appendix 21), leopard (Appendix 22), white rhinoceros (Appendix 23), black rhinoceros (Appendix 24), elephant (Appendix 25), tsessebe (Appendix 26), oribi (Appendix 27) and hippopotamus (Appendix 28). There are mixed results for large mammals with a number of species achieving abundance targets and/or having increasing trends; however, poaching and persecution is having negative impacts on target achievement for species such as African wild dog, rhinos and oribi.

Table 8	Summary of	the national	conservation	assessment for K7N	mammals
Table 0.	Ourrinary Or	the national	conscivation	23353311611C101 1121V	mannais

Threat category	Extinct	Critically Endangered	Endangered	Vulnerable
Number of species	0	6	11	16
Percentage	0	3.2	5.8	8.5

¹Friedmann, Y. and Daly, B. (eds.) 2004. Red Data Book of the Mammals of South Africa: A Conservation Assessment: CBSG Southern Africa, CBSG (SSC/IUCN), Endangered Wildlife Trust, South Africa

Species	Biodiversity Indicator	Target	2013 measure	Target Assessment	Trend Assessment
African wild dog <i>Lycaon pictus</i> <i>pictus</i>	Number of sub- populations	≥2	6	Achieved	Stable
	Number of free ranging breeding packs	15	11	Not Achieved	Not Assessed
	Population Estimate	200	117	Not Achieved	Declining



Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Cheetah <i>Acinonyx jubatus</i>	Number of individuals	No target	85	Not Assessed	Declining
	Number of properties	No target	10	Not Assessed	Increasing, but decline in 2013

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Lion <i>Panthera leo</i>	Population size	No target	260	Not Assessed	Increasing
	Number of properties with lions	No target	10	Not Assessed	Increasing

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Leopard <i>Panthera pardus</i>	Population size	500+	721	Achieved	Stable to Increasing

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
White rhinoceros <i>Ceratotherium</i> <i>simum simum</i>	Population size	3000+	3424	Achieved	Stable/ Declining
	Number of sub-popula- tions in State protected areas	5+	13	Achieved	Stable
	Poaching rate	≤2%	2.44%	Not Achieved	Worsening

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Black rhinoceros Diceros bicornis minor	Population size	740	485	Not Achieved	Stable
	Number of sub- populations	No target	18	Not Assessed	Not Evaluated
	Population growth rate	≥5%	2.2%	Not Achieved	Positive, Increasing
	Poaching rate	≤1%	1.4%	Not Achieved	Worsening



Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Elephant <i>Loxodonta</i> <i>africana</i>	Population size	2000	1720	Not Achieved	Increasing
	Number of sub- populations in State protected areas	3+	5	Achieved	Increasing (medium term)
	Number of sub- populations in KZN	None set	18	Not Assessed	Increasing

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Tsessebe Damaliscus Iunatus Iunatus	Population size	No target	03	Not Assessed	Increasing, but Declining in protected areas
	Number of properties with tsessebe	No target	3	Not Assessed	Declined from 4 to 3 in 2013

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Oribi Ourebia ourebi	Population size	2060	1418	Not Achieved	Stable
	Number of properties with ≥25 oribi	No target	16	Not Assessed	Not Evaluated

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Hippo Hippopotamus amphibius	Population size	2000	1797	Not Achieved	Stable
	Number of sub- populations in KZN	4	32	Achieved	Not Evaluated



4. Genetic-Level Assessments

4.1 Genetic Indicators

No genetic indicators have yet been adopted for any species in KZN, but baseline studies are collecting and documenting genetic diversity information for several priority species such as Bearded Vulture, black rhino and white rhino. Of interest, in this small subset of species, both Bearded Vulture and black rhino are demonstrating reduced levels of genetic diversity linked to the activities of man (Karsten et al. 2011; Kruger et al 2015). Many other species are currently going through severe genetic bottlenecks as population numbers decline, and the implications of this are likely to only be noticed, and have to be managed, by future generations.

In other cases genetic manipulation of indigenous species is taking place, both deliberately and accidentally. In the longer term common species such as African wild cat, Yellow-billed Duck, Helmeted Guineafowl (Walker et al. 2004) and White Stinkwood (*Celtis africanus*) are all likely to be lost as pure species through the process of genetic introgression of alien genes through hybridization.

Many large herbivores are being moved across recognised subspecies or Evolutionary Significant

Unit boundaries, particularly in the game ranching industry. There is an increasing trend of selective and intensive breeding of game species, driven by increasing commoditisation of game and demand for colour varieties and particular traits such as horn and body size, and this is likely to have genetic implications in the medium to longer term.

Many indigenous plant species are being selectively bred and/or hybridized for the nursery trade, and there is an increasing trend of selective breeding of colour varieties of indigenous mammals and reptiles for the pet trade.

The activities of today - including a lack of clear policy guidelines on hybridization, deliberate movement of indigenous species across genetic boundaries, and genetic manipulation of indigenous species - are a risk to biodiversity, and placing a financial and managerial burden of responsibility on future generations. Developing genetic monitoring indicators of both threatened and a suite of common species, and managing the genetic integrity of indigenous species, must become a priority for KZN.

References

Karsten, M., van Vuuren, B. J., Goodman, P. and Barnaud, A. 2011. The history and management of black rhino in KwaZulu-Natal: a population genetic approach to assess the past and guide the future. Animal Conservation, 14: 363–370. doi: 10.1111/j.1469-1795.2011.00443

Krüger, S. C., Wesche, P. L., Jansen van Vuuren, B. 2015. Reduced genetic diversity in Bearded Vultures *Gypaetus barbatus* in Southern Africa. Ibis, 157: 162–166. doi: 10.1111/ibi.12200

Walker, A.L., Bowie, R.C.K., Ratcliffe, C.S. & Crowe, T.M. 2004. Fowl play: identification and management of hybridisation between wild and domestic Helmeted Guineafowl (*Numida meleagris*) in South Africa, Ostrich: Journal of African Ornithology, 75(4) 195-198. doi: 10.2989/00306520409485444

5.1 Terrestrial Area Protected

The majority of biodiversity occurs outside protected areas and is threatened by various activities of man. Many interventions are required ensure the persistence of this biodiversity, but, in the face of ever growing human populations, securing representative portions of the province's biodiversity in a system of protected areas is essential. These protected areas also secure critical ecosystem services required by people and are important for the economy of the province.

By the end of 2013 8.58% (810 753 ha) of the province was formally protected in a system of protected areas. While this is a significant achievement, this is 134 120 ha below the IUCN and KZN Protected Area Expansion Strategy target level of 10% by 2000 and 2013 respectively (Appendix 29). Whilst there has been a net increase in the area protected, averaging about 61 000 ha per decade, (Figure 8) it should be noted that part of the protected area estate is no longer being managed primarily for biodiversity objectives. However, these proclaimed but not managed areas have not been deducted from the total due to the absence of a standardised protocol for doing so. The rate of addition of new areas is well below the required rate, making achievement of 2028 target of 19% highly unlikely; the reasons for this are related to inadequate resources allocated to both acquisition and for ongoing management costs. The contribution by the state to protected area expansion has been declining since 1970, and increases in the tracts of protected area in recent years are linked almost entirely to the commitment of private and communal land owners in proclaiming their land through the KZN Biodiversity Stewardship Programme (Figure 9; Appendix 29). It should also be noted that the opportunities for adding to the protected area estate are declining annually associated with the ongoing loss of natural habitat (see Extent of Natural Habitat in section 1.1 and Appendix 1).



Figure 8: Accumulated area of KZN province proclaimed and managed as terrestrial protected area between 1894 and 2013 (Note: last bar represents only three years).







Figure 9: Accumulated area of KZN province proclaimed and managed as terrestrial protected area between 2001 and 2013. Note: State contribution largely static since 2006; increase in protected area extent since 2009 due to the contributions of private and communal landowners, facilitated through the KZN Biodiversity Stewardship Programme.

Feature	Response Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Terrestrial Protected Area	Proportion of KZN protected	10% by 2013; 19% by 2028	8.58%	Not Achieved	Increasing but rate of increase below the required rate



5.2. Protection Levels of Terrestrial Ecosystems

Of all KZN vegetation types, 44.5% fall into the poorly protected category (< 10% protected) or worse. Non-forest vegetation types have 53.8% falling into the poorly protected or worse category whilst forest vegetation types have 13% falling into the poorly protected or worse category. Only 26 vegetation types (25.7% of all vegetation types) occurring in KZN are considered fully protected (Appendix 30, Table 9, Figure 10).

Grassland and savanna vegetation types are the least well protected with more than 74% of the grassland

and 57% of the savanna vegetation types falling into Poorly Protected or worse categories. Forest types were the best protected with the majority of categories falling into the Moderately Protected category or better. Non-forest vegetation types have 29.5% fully protected whilst forest vegetation types have 13% fully protected.

Given that the target is to have all vegetation types at least moderately protected the target is **Not Achieved**.

Protection Category	Grassland	Savanna	IOCB ¹	Wetlands	Forests	Total
Not Protected	6	3	0	2	0	11
Nominally Protected	5	5	1	1	1	13
Poorly protected	9	3	1	6	2	21
Moderately Protected	1	5	2	5	17	30
Fully Protected	6	3	2	12	3	26
Total	27	19	6	26	23	101

Table 9. The number of vegetation types falling into protection categories for each biome in KZN

1 IOCB – Indian Ocean Coastal Belt



Figure 10: Proportional protection levels of vegetation types per biome (IOCB = Indian Ocean Coastal Belt).



Feature	Response Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Protection levels of terrestrial ecosystems	Proportion of vegetation types per biome that are moderately to fully protected $(\geq 10\%)$	100%	Grassland25.9%Savanna42.1%IOCB66.7%Wetland65.4%Forest86.6%	Not Achieved	Not Assessed
	Proportion of vegetation types that are fully protected	100%	25.7%	Not Achieved	Not Assessed

5.3. Marine Area Under Protection, and Protection Levels of Marine Ecosystems

The extent of protection of the marine environment is very poor with almost all targets not achieved (Table 10; Appendix 31). The overall proportion of the KZN Exclusive Economic Zone (EEZ) under formal protection is currently 0.4% whereas the target for 2013 is 3%, therefore target Not Achieved. However, the inshore Delagoa bioregion has currently met all targets including the 15% no-take target - target Achieved. The inshore Natal bioregion has 6% of the 2013 target of 8% currently within a marine protected area; however none of this occurs within a sanctuary or no-take zone. Neither the total nor notake target are met, therefore the 2013 target was Not Achieved. The 2013 target for the offshore area is 3% and currently the total proportion of the offshore area formally protected is 0.28% (with 0.08% falling within a sanctuary zone, 0.095% within a restricted zone and 0.1% within a controlled zone), therefore the 2013 target is Not Achieved.

Table 10. The overall proportion of the KZN EEZ proclaimed as different zones of marine protected areas as at the end of 2013

Zone	Sanctuary	Restricted	Controlled	Total
% protected	0.1	0.1	0.2	0.4

Over the last four decades the marine protected estate has grown at 28.3% per decade, but no new marine protected areas have been declared in KZN since 2004 (Figure 11). The marine environment off the KZN coast is increasingly under pressure for mining, oil and gas extraction, electricity generation and growing demand for food. The primary threats to achieving the protected area targets for KZN, in addition to increasing competition for other uses, are the lack of adequate resource to manage current and future marine protected areas.





Figure 11: Extent of marine protected areas within the KZN Exclusive Economic Zone (Note: last column represents only three years).

Feature	Response Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Protection levels of marine ecosystems	Overall proportion of the KZN EEZ under formal protection	3% by 2013	0.4%	Not Achieved	Stable
	Delagoa bioregion	25% by 2013	100%	Achieved	Stable
	Natal bioregion	8% by 2013	6%	Not Achieved	Stable
	Offshore	3% by 2013	0.28%	Not Achieved	Stable

STATE OF

5.4. Management Effectiveness of Terrestrial Protected Areas

Only protected areas managed by Ezemvelo KZN Wildlife are assessed. 387,050 ha of the Ezemvelo protected area estate is *effectively managed* at or above the minimum standard of 67% effectiveness (Appendix 32, Figure 12), therefore the target of having 70% of the protected area estate managed at or above 67% management effectiveness is **Achieved**. A total of 28 protected areas (44%) achieved the minimum standard, whilst 36 protected (56%) did not achieve the minimum standard. Scores ranged from 22.2% to 88.3% with an arithmetic mean score of 62.1% effectiveness.

The area meeting the minimum score in 2013 is some 101,374 ha less than in 2012 (when 488,424 ha met the minimum standard), indicating a significant decrease in the effectiveness of protected area management; the 2013 score is however still higher than the 2009 baseline score. The short-term trend is therefore **Declining**.



Area achieving or exceeding minimum score Area not achieving minimum standard

Figure :	12: The	e area d	of the	Ezemvel	o prote	cted a	area	estate	meeting	minimum	managemer	nt effectiveness	S
	targ	jets rel	ative t	the ba	seline c	of 200)9/20	10.					

Feature	Response Indicator	Target	2013 mea- sure	Target Assessment	Trend Assessment
Protected Area Management Effectiveness	Area (proportion) of Ezemvelo PA estate scoring ≥67%	≥381,993 ha (70%) of Ezemvelo PA estate scoring ≥67%	387,050 ha	Achieved	Declining




A total of 57 status and 5 trend biodiversity state indicators were assessed, while seven status and six trend response indicators were assessed for KZN in 2013 (Table 11). It is acknowledged, at a species level, that the indicators are not an unbiased sample, and are not all independent measures, but do tend to cover those species for which there are focussed conservation interventions.

The targets for most biodiversity status indicators are not achieved (38.6% of targets achieved). In terms of trend, most are stable or not increasing at the required rate to meet targets, with 27.4% of indicators showing an improving trend but a worrying 21.6% showing a declining trend. Overall, target achievement and population trends are indicating that biodiversity in KZN is under pressure despite conservation interventions. Perhaps more worrying is the apparent failure of the Provincial response to biodiversity threats, with 71.4% of targets not achieved, and the trends being stable or, if positive, being too slow to meet targets and time frames. Resource limitations and failure of cooperative governance in managing buffer zones, primarily, are resulting in a decline in management effectiveness of protected areas managed by Ezemvelo KZN Wildlife. It is essential that adequate resources are allocated to biodiversity conservation and that decision making by all spheres of government - national, provincial and local – better integrate the needs of the environment into their decision making processes

Indicator Type	Status Indicators		Target Achievement		Trend Indicators		Trend		
	Number	Assessed	Achieved	Not Achieved	Number	Assessed	Improving	Stable	Declining
State	61	57 (93.4%)	22 (38.6%)	35 (61.4%)	72	51 (70.8%)	14 (27.4%)	26 (51%)	11 (21.6%)
Response	7	7 (100%)	2 (28.6%)	5 (71.4%)	7	6 (85.7%)	0 (0%)	5 (83.3%)	1 (16.7%)

43

Table 11. Biodiversity state and response indicators for KZN with target and trend assessment for 2013

Recommendations

Specific management recommendations for each biodiversity feature are listed in the relevant Appendices. However, the key interventions required in the Province of KwaZulu-Natal to ensure that a representative sample of biodiversity is conserved and that the provision of vital ecosystem services is maintained are:

- Formally adopt biodiversity status and trend targets for ecosystems, species and genetic integrity. These targets will allow for more informed and defendable decision making in managing the trade-offs between development and conservation, and will form the basis of systematic conservation assessments (and hence Bioregional Plans) and State of Biodiversity (and hence State of Environment) reporting.
- Formal monitoring documents are required for several biodiversity features, with the priorities probably being for terrestrial area protected, crocodile, leopard and oribi.
- The Constitution of South Africa and the resulting Intergovernmental Relations Framework Act require organs of state to communicate, collaborate and support each other's mandates. The ongoing decline in biodiversity in the province is largely a result of the failure to achieve sufficient levels of coordination and collaboration between organs of state with different mandates. It is essential that spatial planning, delivery programmes and decision making of all spheres of government better integrate and incorporate the requirements of biodiversity and ecosystem services, possibly managed through a series of implementation protocols.
- The province has not achieved national protected area targets. It is essential that the province allocate additional resources to secure additional land through acquisition and management of additional protected areas, as well as additional support to the KZN Biodiversity Stewardship Programme (BSP). The KZN BSP has reached capacity to take on additional sites despite many additional landowners expressing a willingness to commit their land for the benefit of the state. An important constraint is the large number of vacant District Conservation Officer and ecologist posts within Ezemvelo: these staff are required to provide management advice (a key incentive) and ensure that stewardship sites are being properly managed.
- There are indications that resource constraints are affecting the ability of the province to achieve the national protected area management effectiveness targets. Whilst narrowly achieved in 2013, unless additional resources are allocated to protected area management, it is likely that in 2014 or 2015 the province will fall below the national minimum standard. The key requirements are to (1) provide adequate budget to allow for filling of vacant posts so that basic management can be implemented, and to effectively implement invasive species management, and (2) to implement measures to better coordinate the planning and activities of provincial and local government with respect to land use change in the buffer zones of protected areas.

Implementing the above recommendations would go a long way to improving the chances of the province meeting biodiversity targets, and in ultimately ensuring a better life for all.



APPENDICES





46



List of Appendices

Туре	Level	Indicator	Appendix
State	Landscape	Extent of Natural Habitat	1
State	Ecosystem	Terrestrial Ecosystems Conservation Status	2
State	Ecosystem	Priority Wetland Integrity	3
State	Species (Plant)	Satyrium rhodanthum	4
State	Species (Plant)	Kniphofia leucocephala	5
State	Species (Plant)	Encephalartos ngoyanus	6
State	Species (Insect)	Karkloof blue butterfly	7
State	Species (Insect)	Millar's tiger moth	8
State	Species (Reptile)	Kwazulu dwarf chameleon	9
State	Species (Reptile)	Nile crocodile	10
State	Species (Reptile)	Leatherback turtle	11
State	Species (Reptile)	Loggerhead turtle	12
State	Species (Birds)	Bearded Vulture	13
State	Species (Birds)	Lappet-faced Vulture	14
State	Species (Birds)	White-headed Vulture	15
State	Species (Birds)	White-backed Vulture	16
State	Species (Birds)	Wattled Crane	17
State	Species (Birds)	Blue Swallow	18
State	Species (Mammals)	African wild dog	19
State	Species (Mammals)	Cheetah	20
State	Species (Mammals)	Lion	21
State	Species (Mammals)	Leopard	22
State	Species (Mammals)	White rhino	23
State	Species (Mammals)	Black rhino	24
State	Species (Mammals)	Elephant	25
State	Species (Mammals)	Tsessebe	26
State	Species (Mammals)	Oribi	27
State	Species (Mammals)	Нірро	28
Response	Landscape	Terrestrial Area Protected	29
Response	Ecosystem	Terrestrial Ecosystems Protected	30
Response	Landscape and Ecosystem	Marine Area and Ecosystems Protected	31
Response	Landscape	Protected Area Management Effectiveness	32



APPENDIX 1.

Biodiversity Asset:

Extent of Natural Habitat

Feature	Landscapes
Name	Natural Landscapes - Extent of Transformation
Assessment period	2011
Monitoring period	Five times since 1994; now standardised triennially;
	last monitored in 2011
Author	Debbie Jewitt, Ezemvelo KZN Wildlife
Assessment report date	January 2014

Strategic Objective

To limit the level of landscape transformation in the province to a level that enables all of KZN biodiversity to be represented and conserved in perpetuity and to sustain the supply of free ecosystem goods and services.

Biodiversity Target

Two biodiversity targets for landscapes have been set in the province, based on the Board approved (5 July 2013) Monitoring Plan for Land Transformation (Jewitt, 2012). The targets are:

- i) the level of transformation is limited to <50% of the province, and
- ii) the rate of habitat transformation has slowed to zero by 2020.
- The targets were set and assessment undertaken against published thresholds namely:
- Connectivity Threshold (30% transformation) landscape connectivity declines rapidly once 30-50% of natural habitat is lost, significantly impacting population dynamics and interactions





between species (Dobson et al., 2006).

- Persistence Threshold (50% transformation)

 Above 50% transformation, there is a rapid decline in the probability of landscapes being able to support viable populations (Flather and Bevers, 2002).
- Fragmentation Threshold (70 to 80% transformation) Once 70-80% of habitat is lost, the effects of fragmentation (as opposed to direct habitat loss), becomes important for the survival of the remaining species, and the spatial configuration and linkages of patches becomes critically important (Fahrig, 2003).

Indicator Parameter

The following parameters are assessed:

- Natural habitat remaining that proportion (expressed as a %) of the province which has remained untransformed since land cover was first assessed in 1994.
- The rate of habitat transformation (expressed as a %) in the province since land cover was first assessed in 1994.

The methods and criteria for assessment are documented in the KZN land cover monitoring plan (Jewett 2012).

Indicator Relevance

Habitat loss has large, consistently negative effects on biodiversity including loss of species richness, decreased population abundance and distribution, loss of genetic diversity, altered population growth rates, reduced trophic chain length (upper trophic levels are lost first), altered species interactions, reduced number of specialist, large bodied species, negative breeding success, limited dispersal success, altered predation rates and altered animal behaviour that affects foraging success rate (Fahrig, 2003).

Habitat loss and transformation may lead to fragmentation which causes numerous small patches. Species that are unable to cross the non-habitat portion of the landscape (matrix) will be confined to small patches, ultimately reducing the overall population size and probability of persistence. These patches contain more edge for a given amount of habitat which may increase overall mortality rate and reduce overall reproductive rate of the population. This indicator is therefore a surrogate for the many other elements of biodiversity and ecosystem goods and services.

Assessment

Data adequacy

• Quality – The overall accuracy assessments of the

five land cover maps is as follows: 79.7%, 65.8%, 83.06%, 78.92% and 83.51% for the 1994, 2000, 2005, 2008 and 2011 datasets respectively. The minimum mapping units are 25ha for the 1994 dataset, 1ha for the 2000 dataset and 0.25ha for the 2005, 2008 and 2011 datasets.

- **Coverage** Each land cover assessment covered the whole province, so coverage was complete.
- Overall confidence the different methods of creating the various land cover assessments, differing legend categories and differing image resolutions make direct land cover assessment comparisons difficult, therefore Medium.

Status

In 2011, 53.6% (5 078 344 ha) of KZN remained as natural terrestrial habitat (Figure 1). This is below the minimum connectivity threshold of 70%. Of this, 7.35% was considered degraded and thus would not support the full complement of biodiversity elements. One percent of the province was eroded. Using the agricultural layer derived from 1:50 000 topographic maps it was found that 352 407ha identified as natural in the land cover map was actually previously cultivated. Added to the identifiable old cultivated fields from the land cover map (63 354 ha), a total of 415 761 ha (4.38 %) is thus available to reuse for agriculture or other development instead of transforming remaining natural areas.

The dominant transformation land cover types of the province in 2011 were agriculture (16.4%), urban and rural development areas (7%) and plantations (7.8%).

Trend

Using the accumulated transformation approach and correcting for abandoned agricultural fields, the following percentages of the province were untransformed: 73.3%, 62.1%, 56.8%, 54.3% and 53.6% in 1994, 2000, 2005, 2008 and 2011 respectively (Figure 2). The average annual area transformed each year (1994-2011) is 109 906 ha.annum-1 (1.16%). This marks a significant slowdown in habitat transformation compared to sustain human livelihoods. Agriculture, urban and rural development, and plantations are the leading proximate cause of habitat transformation in the province. Plains and wide valleys, mid and open slopes are the most transformed parts of the landscape. The primary threats are continued land transformation, degradation of the landscape through alien plants, inappropriate grazing, fire and harvesting regimes, as well as projected climate change.





Figure 1: The proportion of natural habitat remaining in KZN in 2008, and the proportion of old cultivated fields that could be used for development instead of natural areas.

Existing pressures and future threats

The ultimate pressure for landscape transformation comes from population growth and the increased demand this places on untransformed landscapes to yield the resources and space needed to sustain human livelihoods. Agriculture, urban and rural development, and plantations are the leading proximate cause of habitat transformation in the province. Plains and wide valleys, mid and open slopes are the most transformed parts of the landscape. The primary threats are continued land transformation, degradation of the landscape through alien plants, inappropriate grazing, fire and harvesting regimes, as well as projected climate change. It should be noted that there are no risks to biodiversity should the stated target be achieved. However, should the target not be achieved, huge biodiversity losses are certain.

Evaluation Summary

1. Status - by 2011, the amount of natural habitat remaining in the province, once accumulated transformation was removed and old field agriculture was corrected for, was 53.6%. Since this is below the connectivity threshold it is inferred that population dynamics and species interactions are been negatively affected. However, this is still above the persistence threshold of 50% and the provincial target, therefore Target Achieved.



Figure 2: Trend in the proportion of the area of natural habitat remaining in KZN between 1994 and 2011.





Figure 3: The average annual rate of change (%) between assessment periods.



Figure 4: The accumulated transformation maps in 1994 and 2011where green areas are untransformed (natural habitat) and grey areas are transformed (natural habitat completely destroyed by the activities of man).



Feature	Biodiversity Indicator	Target	2011 Measure	Target Assessment	Trend Assessment
Extent of natural habitat	Proportion of natural habitat remaining	>50%	53.6% (estimated at 51.2% for 2013)	6%Achievedimated1.2%2013)1.2%	Declining
	Rate of habitat loss	0% by 2020	0.27% (2008- 2011)	Not Achieved	Improving (rate of loss has been slowing)

The average annual rate of landscape transformation in KZN since 1994 is 109 906 ha/ annum-1 or 1.16%. The target is to slow the rate of habitat transformation to zero by 2020, therefore Target **Not Achieved**.

 Trend - By fitting an exponential decay curve to these data the maximum transformation target of 50% would be achieved in 2014. The extent of untransformed land is declining, therefore Trend is **Declining**.

However, the annual rate of habitat transformation in the province has slowed significantly from 2.24% between 1994 and 2000, to 0.27% between 2008 and 2011.

Key Management Actions

Key management actions required for 2014 and 2015 include:

 A high level awareness campaign focussing on the primary driver of land transformation (and human misery) namely human population growth, and engagement with provincial and national government to develop plans to manage human population growth rates.

- 2. The securing of agreements with government that further transformation of highly threatened landscapes will not be supported.
- The securing of agreements with government to use previously cultivated areas for development instead of remaining natural land as a strategy to slow down the rate of transformation and yet meet human needs.
- 4. The implementation of habitat linkages in the parts of the province where connectivity has been lost (particularly the coastal and midlands regions) and where fragmentation of the landscape occurs.
- 5. The re-mapping of KZN's land cover commencing in 2015 based on 2014 conditions.

References

Dobson, A. et al. 2006. Habitat loss, trophic collapse, and the decline of ecosystem services. Ecology 87(8): 1915-1924

Fahrig, L. 2003. Effects of habitat fragmentation on biodiversity. Annu. Rev. Ecol. Evol. Syst. 34: 487-515

- Flather, C.H. and Bevers, M. 2002. Patchy reaction-diffusion and population abundance: the relative importance of habitat amount and arrangement. The American Naturalist 159(1): 40-56
- Jewitt, D. 2012. Ezemvelo KZN Wildlife Monitoring Plan: Land Transformation. Unpublished report. Ezemvelo KZN Wildlife. Pietermaritzburg, South Africa.



APPENDIX 2.

Biodiversity Asset: Terrestrial Ecosystems - Conservation Status

Feature	Ecosystems
Name	Terrestrial ecosystems - Conservation Status
Assessment period	2011
Monitoring period	Derived from the 2011 KZN Land Cover Map
	(accumulated transformation)
Author	Debbie Jewitt, Ezemvelo KZN Wildlife
Assessment report date	December 2014

Strategic Objective

To secure the integrity of representative examples of all of KZN's terrestrial ecosystems (= vegetation types).

Biodiversity Target

No biodiversity target for terrestrial ecosystem conservation status has been set or adopted for KZN Province. In the interim, an initial target for this assessment has been set as follows:

To maintain all of KZN's vegetation types in a conservation status category of vulnerable or better (i.e. least threatened).

Assessment Parameter

No province-wide surveillance or monitoring document exists for conservation status of terrestrial ecosystems. The assessment was undertaken

against published thresholds for threatened ecosystems namely:

Critically Endangered Endangered Vulnerable

Least Threatened

Criteria for allocating a vegetation type into any one of these categories are listed and explained in Government Gazette 34809 of 2011. In this assessment, only criteria A1, has been applied. A single parameter is reported here namely:

• Number of vegetation types falling into each threatened ecosystem category.

Indicator Relevance

Habitat loss and degradation has large, negative effects on biodiversity. Certain vegetation types are more highly impacted by transformation and



degradation than others. By identifying which vegetation types or ecosystems are threatened by transformation and other impacts, conservation effort can be focussed towards conserving them.

Assessment

Data adequacy

- Quality The data used for this analysis comprise 2011 vegetation of KZN mapped at a 1:50 000 scale. The extent of transformation was derived from the 2011 KZN Land cover map (accumulated transformation) which has a 20m pixel resolution medium to high
- Coverage/Quantity The data sources cover the whole province and are therefore complete. The vegetation map undergoes regular revision which then requires retrospective analysis for trend analysis to be undertaken - medium to high.
- Overall confidence Medium to High

Status

There are 101 vegetation types and subtypes in the province divided into the following biomes: Forests Wetlands, Savanna, Indian Ocean Coastal Belt and Grassland (Table 1, Figure1). Twenty vegetation types are Critically Endangered, 15 are Endangered, 17 are Vulnerable and 49 Least Threatened (Figure 1).

Trend

Not Evaluated.

Existing pressures and future threats

The primary pressure for ecosystem transformation comes from population growth and the increased demand this places on untransformed ecosystems to yield the resources and space needed to sustain human livelihoods. Agriculture, urban and rural development, and plantations are the leading cause of ecosystem transformation in the province. High grazing pressure as well as unsustainable indigenous resource harvesting also contribute to the degradation of intact ecosystems, and are a major concern for the future.

There are no perceived risks to biodiversity should the stated strategic objective be achieved; on the contrary, however, should the strategic objective not be achieved, huge biodiversity losses are certain.

Evaluation

Summary

- 1. Status by 2011, 20 vegetation types were considered Critically Endangered and 15 were considered Endangered. Our aim is to maintain all vegetation types at a conservation status of Vulnerable or better, therefore Target is **Not Achieved**.
- Trend vegetation types are continuing to be transformed and degraded, but no formal assessment conducted - therefore Not Evaluated.

Key Management Actions

Key management actions required for 2015 include:

- 1. The development and adoption of a provincial target for an acceptable level of transformation that will allow the meeting of an acceptable level of human livelihoods and simultaneously biodiversity and ecosystem service targets.
- 2. The securing of agreements with DAEA&RD that further transformation of highly threatened ecosystems will not be supported.
- 3. A high level awareness campaign focussing on the primary driver of land transformation (and human misery) namely human population growth, and engagement with provincial and national government to develop plans to stem human population growth rates.

Biome	Critically Endangered	Endangered	Vulnerable	Least Threatened
Forest	11	5	0	7
Wetlands	4	2	5	15
Savanna	2	1	4	12
ЮСВ	2	2	1	1
Grassland	1	5	7	14
Total	20	15	17	49

Table 1. Conservation status of KZN vegetation types summarised by biome

¹There is one Fynbos vegetation type which for the purposes of this analysis was included with the grassland biome.





Figure 1: The conservation status of the various vegetation types grouped according to their biome status. The numbers in the graph indicate the number of vegetation types per biome in each threat category.

Feature	Biodiversity Indicator	Target	2011 Measure	Target Assessment	Trend Assessment
Terrestrial Ecosystems	Conservation status of vegetation types	Maintain all vegetation types at a conservation status of Vulnerable or better	20 Critically Endangered, 15 Endangered	Not Achieved	Not Evaluated

References

- Government Gazette 34809 of 2011. General Notice 1002 of 2011 issued by the Department of Environmental Affairs. National Environmental Management: Biodiversity Act (10/2004): National list of ecosystems that are threatened and in need of protection.
- Jewitt, D. 2009. Conservation targets for KZN Vegetation Types in KZN. Internal Report, Biodiversity Division, Ezemvelo KZN Wildlife, Cascades, 3202.
- Mucina, L. & Rutherford, M.C. (eds). 2006. The vegetation of South Africa, Lesotho and Swaziland. Stelitzia 19, SANBI, Pretoria.



APPENDIX 3.

Biodiversity Asset: Integrity of Priority Wetlands

Feature	Ecosystems
Name	Integrity of priority wetlands
Assessment period	2011
Monitoring period	Status based on 2011 assessment;
	trend compares 2004 to 2011 status
Author	Dr. P.S. Goodman, Ezemvelo KZN Wildlife
Assessment report date	5 July 2012

Strategic Objective

To ensure that a representative sample of the inland wetlands of KwaZulu-Natal is maintained in a state that allows viable samples of the provinces aquatic biodiversity to be conserved in perpetuity.

Biodiversity Target

No target has been formally agreed to however two goals are widely discussed amongst the wetland fraternity in South Africa:

- No net decline (from present) of overall wetland integrity in the province (and Country)
- At least 20% of KZN's important wetlands should be maintained in a pristine state (Present

Ecological State Category A), no less than an additional 30% of KZN's important wetlands should be in a slightly impacted (Present Ecological State Category B) and the remaining 50% or less should be in an impacted (Present Ecological State Category C) or better state.

A discussion on the merits and derivation of these targets is available elsewhere.

Indicator Parameters

The following indicators are relevant:

Wetland integrity - proportion (by number and area) of wetlands of KZN falling into 'pristine' and 'near pristine' integrity classes.





Indicator relevance

At the heart of the need to protect wetlands, is the recognition that wetlands provide important benefits to society. They supply a suite of resources for people such as food, fuel, fibre and water. These are known as provisioning services. Many people obtain spiritual enrichment, aesthetic experiences or recreational benefits from wetlands. Many wetlands also provide opportunities for recreation, tourism, education and cultural practices amongst local users. They also provide a wide range of indirect benefits by regulating various ecological processes which contribute to a healthy environment. These include water purification through the assimilation of nutrients and removal of toxins, erosion control and the regulation of climate. Finally, wetlands provide supporting services which are necessary for the production of other ecosystem services such as primary production, soil formation and nutrient cycling (Macfarlane, et.al. 2012).

The degradation of South African wetlands (with KwaZulu-Natal being no exception) is a concern now recognized by Government as requiring urgent action and the protection of wetlands is considered fundamental to the sustainable management of South Africa's water resources and the provision of safe drinking water to all.

The **wetland integrity indicator** addresses a second component of wetland degradation that being the

'health' of a wetland system at a level of detail greater than 'transformation'. The method used in the assessment is that developed by Macfarlane et. al. (2007) and the assumption is that a decline in health status is associated with a decline in ecological goods and services delivered, as well as the biodiversity supported by these wetlands.

Assessment

Data adequacy

Quality - the data for this status summary are extracted from the assessment undertaken by Macfarlane et. al. (2012). This study conformed to a Level 1 assessment, which relies primarily on desktop indicators for evaluating various aspects of wetland integrity. The evaluation was based largely on 2009 SPOT imagery for the province.

Quantity - the assessment covers all of Begg's (1989) priority wetlands of KZN and, while only covering 24 wetlands, is therefore considered complete.

Overall confidence in estimates - **Moderate to High** (error < 15%)

Status

The integrity status of KZN's priority wetlands varied from unmodified (A) 20.8%, to largely natural (B) 12.5%, moderately modified (C) 45.8%, largely modified (D) 16.7% and seriously modified (E) 4.2% (Figure 1).



Figure 1: Proportion of priority wetlands assessed in different Present Ecological State categories in comparison to the desired target states. Note that there is a fairly large proportion (20.9%) of priority wetlands in category D and E whereas the target is to have all priority wetlands in category C or better.





Trend of Wetlands

Figure 2: Trend in the Present Ecological State of 24 priority wetlands in KZN between 2004 and 2010/11.

Trend

While this is not the first assessment of the status of these wetlands, it is the first using a standardised method. Previous assessments by Begg (1989) and Kotze (2004) used somewhat different methodologies and so results are difficult to compare. The methodology used by Kotze (2004) was similar enough to make broad comparisons and in this respect, the PES of the majority of priority wetlands had remained stable (Figure 2), therefore status is estimated to be stable.

Current Pressures and Future Threats

The past primary threats to wetlands have been conversion for agriculture and silviculture activity,

rural settlement and urban development, and mining. Other threats include flooding as the result of drainage line impoundment. Future threats remain the same, but with a rural settlement, urban development and mining featuring more prominently now.

Evaluation

Summary

Status - the present ecological state of KZN's priority wetlands is currently below the desired target, therefore target **Not Achieved**.

Trend - the estimated trend over the 6 year assessment period in the present ecological state of priority wetlands is **Stable**.

Feature	Biodiversity Indicator	Target	2011 Measure	Target Assessment	Trend Assessment
Wetland Integrity	Proportion of priority wetlands falling into different states	≥20% in a pristine state (Category A), ≥30% slightly impacted (Category B) and the remaining \leq 50% in an impacted (Category C) or better state	A = 20.8%, B = 12.5%, C ⁺ = 66.7%	Not Achieved	Stable



Key Management Actions

Wetlands respond relatively slowly to manipulation, be it impacts or restoration; in addition, the assessment from which these results are summarised (Macfarlane et. al. 2012) can only be undertaken every three to five years. Therefore management actions should be planned around three to five year cycles. Management (prevention/mitigation of impacts and restoration) is also the combined responsibility of a number of state entities including KZN DEDTEA, Ezemvelo KZN Wildlife, Department of Water Affairs (Regional Office) and Working for Wetlands. To address the narrow focus of the targets for priority wetlands in KZN, the following actions for the next 3-5 years are recommended:

 Restore the PES for Umfolozi Swamp (currently E) to a D state (the feasibility of this needs to be evaluated).

- Plan and implement restoration measures on all D status wetlands (Phongola Floodplain, Stilwater, Mhlatuze, Mvoti Vlei) with an aim of achieving C status within the next 5 to 10 years.
- Nominate four priority wetlands which are currently in a C PES for rehabilitation to B state, plan and implement rehabilitation.
- Prevent or mitigate current and proposed impacts on all A, B and C PES priority wetlands to prevent further degradation.
- Plan a re-assessment of priority inland wetlands no later than 2014.

References

Begg, G.W., 1989. The wetlands of Natal (Part 3). The location, status and function of the priority wetlands of Natal. Natal Town and Regional Planning Report 73.

Kotze, 2004. An assessment of freshwater wetlands for the 2004 KwaZulu-Natal State of the Environment Report.

Macfarlane D.M., Kotze D.C., Ellery W.N., Walters D., Koopman V., Goodman P. and Goge C., 2007. WET-Health: A technique for rapidly assessing wetland health. WRC Report No TT 340/08, Water Research Commission, Pretoria.

Macfarlane, D.M., Walters, D. and Cowden, C., 2012. A wetland health assessment of KZNs priority wetlands. Unpublished Report prepared for Ezemvelo KZN Wildlife, Pietermaritzburg.





APPENDIX 4.

Biodiversity Asset: Satyrium rhodanthum

Group	Plants
Common Name	-
Scientific Name	Satyrium rhodanthum Schltr.
Assessment period	2013
Monitoring period	Most years in the period 2007 to 2013 (5 monitoring events)
Author	Brigitte Church, Ezemvelo KZN Wildlife
Assessment report date	30 March 2014

60

Strategic Objective

To protect the known population of this species from further decline due to anthropogenic pressures and to ensure that the wild population remains viable in the long term.

Biodiversity Target

Quantitative targets for this species have not been set. However, interim short term targets are to:

- 1. Maintain the number of subpopulations greater than or equal to three.
- 2. Have a stable to increasing trend in number of occupied grid cells.

Abundance Parameters

A single parameter is currently used to monitor and report on abundance - the number of 20×20 m grid cells occupied by the species within the distribution range in which it is known to occur.





Indicator Relevance

Satyrium rhodanthum is a Critically Endangered (B1ab(i,ii,iii)) KwaZulu-Natal endemic orchid with a limited distribution range and three known extant populations. The type locality population has gone extinct possibly due to the transformation of grasslands in the area. Alien silviculture has led to a large decline in the habitat of this species. Two extant subpopulations occur on private land and one occurs on community owned land. Orchids are considered good biological indicators due to their association with specialized pollinators and high levels of mycorrhizal specialization. Their disappearance has been linked to changes in soil quality, changes in the disturbance regime and changes in climate.

Assessment

Data adequacy

- Quality Data are derived from high resolution (GPS, single fix resolution) mapping of all flowering individuals. Additional surveillance over an extended period (minimum 5 years) is required to fully understand the distribution and movement of this species in its habitat. Due to the cryptic nature of the species during the vegetative stage, monitoring is conducted during the flowering period. This method of assessing the status of terrestrial orchids can underestimate the size of the population as dormant plants are not included in the census. An improved understanding of the phenology of the species is required to determine the effectiveness of this method and potential undercount bias - Moderate to High
- **Quantity** The entire known population area is surveyed, but some plants can be missed if they are not in flower at the time of the survey. It is possible that additional subpopulations may exist

but finding these is dependent on landowner awareness and good will - **Moderate**

Overall confidence - Moderate to High

Status

- Protected areas *Satyrium rhodanthum* does not occur in any protected areas.
- Private and communally owned land *Satyrium rhodanthum* occurs on two privately owned farms and on community owned land.
- The number of 20 x 20 m sample quadrats found to be occupied in 2013 was 63 (Table 1).

Trend

The in situ population of *Satyrium rhodanthum* has shown an increase in the number of occupied cells (Table 1). An additional two sites were found in the Hlutankungu district and were monitored for the first time in 2012. The plants found at Hlutankungu are unusual in that their flowers are all pink unlike the Stainton and Mournapea populations that have predominantly dark red flowers. Overall there is a general increase in the number of occupied cells over the survey period (Figure 1) but the trend is stable since 2010 if the new populations are excluded from the total.

Existing pressures and future threats

The grassland habitat in which *Satyrium rhodanthum* occurs is severely transformed. The remaining habitat is threatened by livestock grazing and change in land-use, particularly alien silviculture operations. The specialization for pollination by a single bird species means that reproduction in this orchid is vulnerable to losses in surrounding communities of plants that subsidize the energetic requirements of sunbirds (van der Niet et al. 2015).

Year	Stainton Farm, Ixopo	Mournapea Farm, High Flats	Hlutankungu	Total
2007	14	12	Population not known	26
2009	27	14	Population not known	41
2010	21	32	Population not known	53
2012	24	23	5	52
2013	23	28	12	63

Table 1. The number of 20 x 20 m quadrats occupied by Satyrium rhodanthum from 2007 to 2013





Figure 1: The number of 20X20 m quadrats occupied by S. rhodanthum in 2007, 2009, 2010, 2012 and 2013.

Evaluation

Summary

The results of the 2013 surveillance programme of *S. rhodanthum* show a slight increase in the overall distribution of individuals represented by an increase in the number of 20 x 20m quadrats occupied by the species from 52 in 2012 to 63 in 2013. This is largely due to the two new sub-population found at Hlutankunga. If the Hlutankunga data are excluded then the trend for the remaining two sites is **Stable** since 2010 and therefore the interim targets are **Achieved**.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Extensive surveys of potential habitat to improve our understanding of the distribution of the species.
- 2. The development of a conservation target for the species.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Satyrium rhodanthum	Number of sub- populations	≥3	3	Achieved	Stable
	Number of occupied 20x20m grid cells	Stable to increasing trend in number of occupied grid cells	63	Achieved	Stable

References

Van der Niet, T., Cozien, R.J. and Johnson, S.D. 2015. Experimental evidence for specialized bird pollination in the endangered South African orchid *Satyrium rhodanthum* and analysis of associated floral traits. Botanical Journal of the Linnean Society 177(1): 141-150



APPENDIX 5.

Biodiversity Asset: Kniphofia leucocephala

Group	Plants
Common Name	-
Scientific Name	Kniphofia leucocephala Baijnath
Assessment period	2012
Monitoring period	Biennially since 1999; last monitored in 2012
Author	Brigitte Church, Ezemvelo KZN Wildlife
Assessment report date	31 March 2013
1	

Strategic Objective

To conserve a viable, wild population of *Kniphofia leucocephala*, throughout its historical range in KZN, supported through a shared commitment on private, community and State land.

Short Term Objectives

- To protect the known population of *Kniphofia leucocephala* from decline due to human impact.
- Establish and maintain an ex situ population at the Threatened Plant Conservation Unit for population enhancement and re-establishment purposes.

Biodiversity Target

Refer to Church (2006) Recovery Plan for *Kniphofia leucocephala*. The biodiversity target for the species developed in 2002 for the Systematic Conservation Assessment (Goodman 2002) was only area based and therefore interim numerical targets have been developed for the province:

- a. Number of discrete sub populations A minimum of 6 sub-populations in wetlands of approximately 16ha each that have relatively independent disturbance factors but are genetically linked.
- b. Population size target (N) A province-wide population of 3000 individuals.

Abundance Parameters

Refer to Church (2012) for full monitoring and reporting protocols and standards for *Kniphofia leucocephala* in the province. Two parameters are reported here:

- a. Number of discrete sub-populations of flowering plants.
- b. Number of flowering individuals in the KZN population as an index of adult population size.





Indicator Relevance

Kniphofia leucocephala is a Critically Endangered, endemic species found in wetlands associated with the coastal grasslands between Richards Bay and St Lucia. This area had been extensively transformed by urban development, commercial alien tree plantations, commercial sugarcane and subsistence farming over the past 70 years. Less than 2% of the natural grasslands and associated wetlands in this area remain in an intact state. Since it is primarily a wetland species its well-being is linked to the state of the wetland in which it occurs and may serve as an indicator for other wetland-dependant species.

Assessment Data adequacy

- Quality The area in which Kniphofia leucocephala • is known to occur is surveyed every second year after the burn, and GPS points (high resolution) are taken of all individual flowering or seeding plants. Population estimates are pinned to the end of each two year period. Flowering, and hence the population estimate, is dependent on the area being burnt prior to the survey, and flowering is also affected by the abundance of rain received in the spring immediately prior to the survey. The use of flowering individuals as a measure of population size is therefore slightly problematic since it is not known what proportion of plants are mature nor what proportion of mature individuals flower in any one year – therefore some changes in the indicator measure may not reflect actual changes in abundance. The number of flowering individuals is therefore a minimum population estimate.
- Quantity all flowering plants are surveyed in the population. Plants that are in a vegetative stage are easily missed and therefore the count represents a minimum estimate. Surveys have been conducted biennially since 1999.

Status

Kniphofia leucocephala does not occur in any existing protected area. The wetland in which it occurs is managed by private public partnership, namely Siya Qhubeka Forestry (Pty) Ltd

Kniphofia leucocephala is now restricted to a single population at one wetland locality which is surrounded by exotic plantations. The extent of occupancy is 0.13 km², the area of occupancy <0.1 km². The species is categorized as Critically Endangered. The number of reproductive individuals in the population in the last monitoring cycle (2012) was 30 (Table 1).

Trend

The only known wild population of this species showed an increase in the number of reproductive individuals between 2000 and 2009 (when 252 flowering plants were recorded), but a sharp decrease in the number of flowering plants was observed in the 2010 and 2012 censuses (Figure 1). Low rainfall in 2010 could account partially for the low number in flowering plants as a relationship has been shown between rainfall and flowering of *K. leucocephala.* This relationship and the effect of evapotranspiration of the surrounding exotic plantation on the number of flowering plants is being studied.

Existing Pressures and Future Threats

The natural habitat of *K. leucocephala* has been severely transformed by urban development, commercial alien plantations, commercial sugarcane and subsistence farming. The site at which it occurs is surrounded by plantations. Although the recent replacement of *Eucalyptus* spp with Pine trees by Siya Qhubeka (Pty) Ltd is expected to increase the water level of the pan and improve flowering, this will need to be monitored. Two attempts to increase the number of wetlands in which it occurs through introduction programmes have not been successful.

Overall confidence in estimates: Number of subpopulations - **High** Provincial population estimate - **Low to Moderate**

	Protected Areas	Private & Communal	Total
Number of sub- populations	0	1	1
Number of flowering plants 2012	0	30	30

Table 1. Number of sub-populations, and numerical status of Kniphofia leucocephala in KZN at the end of 2012





Figure 1: The number of flowering plants counted during eight census periods.

Evaluation

Summary

1. Status

- a. Number of sub populations There is only a single sub-population, whereas the target is six sub-populations, therefore target Not Achieved.
- b. Population Size The estimated population size in 2012, as indexed by the number of flowering plants present, was 30, but this may be an underestimate due to rainfall cycles. In 2009 it was 252 individuals, which is significantly less than the target of 3000, therefore target **Not Achieved**.
- 2. Trend the only known wild population of this species showed a remarkable recovery after a conservation plan that prescribed regular burning was implemented in 2001. A marked decrease in flowering in 2010 and 2012 is cause for concern.

Trend in flowering individuals has declined in recent times, but it is not clear if this represents a downward trend in the number of individual plants in the population or just variation in flowering related to environmental conditions, therefore trend is Not Assessed until further information is available.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Review the conservation target for the species.
- Monitor the ground water at Langepan vlei, to develop an understanding of (a) the relationship between rainfall, evapotranspiration of the surrounding plantation and the water table, and (b) the relationship between water table, plant distribution and flowering success.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Kniphofia leucocephala	Number of sub- populations	6	1	Not Achieved	Stable
	KZN population size	3000	30	Not Achieved	Not Assessed

References

Church, B. (2006) Management Plan for *Kniphofia leucocephala*, Biodiversity Research and Assessment Division, Ezemvelo KZN Wildlife, Pietermaritzburg.

- Church, B. (2012) Monitoring Plan for *Kniphofia leucocephala*, Biodiversity Research and Assessment Division, Ezemvelo KZN Wildlife, Pietermaritzburg.
- Goodman, P.S. (2002) Non Marine Biodiversity Conservation Targets for KwaZulu-Natal, Biodiversity Research Division, Ezemvelo KZN Wildlife, Pietermaritzburg.



APPENDIX 6.

Biodiversity Asset: Ngoye Dwarf Cycad *Encephalartos ngoyanus*

Group	Plants
Common Name	Ngoye Cycad; Ngoye Dwarf Cycad
Scientific Name	Encephalartos ngoyanus Verdoorn
Assessment Period	2013
Monitoring Period	10 years (2002-ongoing) for Ongoye Forest Reserve; 2011 only for Ubombo Mountain Nature Reserve
Author	Brigitte Church, Ezemvelo KZN Wildlife
Assessment report date	31 March 2014

Strategic Objective

To conserve viable, wild populations of *Encephalartos ngoyanus*, throughout its historical range in KZN and thereafter attain a population growth which will result in a down listing of the species in terms of its status in the IUCN Red List (Church 2014).

Biodiversity Targets

The biodiversity target for *Encephalartos ngoyanus* developed in 2002 for the Systematic Conservation Assessment (Goodman, 2002) was only area based and therefore interim numerical targets have been developed for the province:

- a. Number of populations 2
- b. Number of sub populations 10
- c. Population size target KZN A province-wide wild

population of 10 000 individuals

d. Population size target Ongoye Forest Reserve - A minimum population size of 1000 individuals

Abundance Parameters

Refer to Church (2014) for full monitoring and reporting protocols and standards for *Encephalartos ngoyanus* in the province. Four parameters are reported here:

- a. Number of populations
- b. Number of discrete sub-populations
- c. The number of adult plants with a leaf length of greater than 50 cm in the Ongoye Forest Reserve population
- d. Number of individuals with a leaf length of greater than 50 cm in KZN.





Indicator Relevance

Encephalartos ngoyanus is a cycad species which is listed as vulnerable to extinction (Donaldson, 2009). Cycads are the most threatened taxa in the world mainly due to the collection of plants from the wild for the horticultural industry. In KwaZulu-Natal land transformation and collection for traditional medicine has exacerbated this threat.

Encephalartos ngoyanus is an endemic dwarf cycad restricted to Zululand, Maputaland, eastern Swaziland and south-eastern Mpumalanga. It is a low-growing grassland species that is also found on forest margins, in closed woodland and in thorn scrub. There are two distinct, geographically isolated, populations occurring at Ngoye Forest (Ongoye Forest Reserve, EKZNW), the type locality, and in the Lebombo Mountains. The Lebombo population is severely fragmented with four known colonies. Population numbers continue to decline through illegal collecting, to satisfy the trade in medicinal plants and the cycad collecting trade.

All *Encephalartos* species are specially protected indigenous plants in KwaZulu-Natal under the Natal Conservation Ordinance No. 15 of 1974 and are protected under section 59 of NEMBA. Cycads are also listed as CITES I species and therefore have international trade restrictions. Improvement in the status of this species would indicate that trade and management interventions are being effective.

Assessment

Data Adequacy

Quality

The number of sub-populations includes all sub-

populations that are recorded in the Biodiversity Database, and is thought that all sub-populations are known.

All adult plants in the Ongoye Forest Reserve population are marked with aluminium markers and high resolution GPS points are taken of all individual plants.

• Quantity

All plants have been surveyed annually in the Ongoye Forest Reserve population since 2002; a limited survey of Ubombo Mountain Nature Reserve was conducted in 2011

 Overall confidence in estimates: Number of sub-populations - Moderate to High Ongoye Forest Reserve population estimate -High

KZN population - Low

Status

- There are two disjunct populations separated by a distance of approximately 125 km.
- Protected areas *Encephalartos ngoyanus* occurs in four protected areas, namely Ongoye Forest Reserve, uMkhuze Game Reserve, Pongolapoort Nature Reserve and Ubombo Mountain Nature Reserve (UMNR). The minimum population size in Ubombo Mountain Nature Reserve in December 2011 was 867 plants. The Ongoye population has only one subpopulation. The number of adult plants found in Ongoye Forest reserve in 2013 was 146 compared with 295 found in 2002 (Table 1, Figure 1). The size of the populations in the other protected areas is not known.
- Private and communal land Encephalartos ngoyanus occurs in several small colonies on

Table 1.	The numerical status of Encephalartos ngoyanus populations in KZN and the number of adult plants in
	Ongoye Forest Reserve (OFR) and Ubombo Mountain Nature Reserve (UMNR) in 2013.

	Protected Areas	Private & Communal	Total
Number of populations			2
Number of sub- populations	4*	1	5
Number of adult plants in OFR 2013	146		146
Number of adult plants counted in UMNR 2011	867		867
Number of plants in KZN			≥1034

* Umkhuze Game Reserve population has not been surveyed for many years.



communal land in the Lebombo district. The population at Ongoye forest extends outside the reserve in the communal area adjacent to the reserve where 21 plants have been found but not surveyed recently (these are additional to the numbers reported for the forest reserve).

 The minimum population size for KZN is 1034, but the total may be higher than this. It is reported that some plants remain outside Ubombo Mountain Nature Reserve, but the plants previously recorded from Umkhuze Game reserve have not been seen for many years

Trend

The number of adult plants at Ongoye Forest Reserve has declined by 50.5% from 295 in 2002 to 146 in 2013 (Figure 1). The average annual rate of decline is 5.05% but with some indication that the rate of decline has accelerated in the last five years compared to the first five years of monitoring.

Existing pressures and future threats

Collecting for cultural, medicinal and horticultural purposes, habitat destruction and habitat alteration through overgrazing and veld fires are the most important reasons for the decline in E. ngoyanus populations. The rate of removal from the wild may be increasing.

Evaluation

Summary

- 1. Status
- a. Number of populations There are two populations, therefore target **Achieved**.
- b. Number of sub-populations Number of sub-

populations in 2013 is five, below the target of 10, therefore target **Not Achieved**.

- c. Ongoye Forest Reserve Population Size the population size in 2013 is 146 individuals, well below the target of 1000, therefore target Not Achieved.
- d. KZN population size The minimum population size for KZN is 1034 plants (Ongoye Forest Reserve, Ongoye communal land and Ubombo Mountain Nature Reserve), but for UMNR this represents a minimum estimate and a number of other sub-populations have not been assessed, therefore target **Not Assessed**.
- 2. Trend The number of populations and subpopulations is Stable, but the number of adult plants in Ongoye Forest Reserve has decrease by 50.5% over the past 10 years, therefore trend is Declining. The trend in the KZN population is Unknown, but given the declines in Ongoye Forest Reserve is likely to be Declining.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Revision of the conservation target for the species
- 2. Revision and adoption of the management plan for *E. ngoyanus*
- 3. Revision and adoption of the Ongoye Forest population monitoring programme
- 4. Stricter protection of *E. ngoyanus* in Ongoye Forest Reserve
- 5. Development of a monitoring and surveillance plan for *E. ngoyanus* and surveys of all known populations.



Figure 1: The number of adult <u>Encephalartos ngoyanus</u> plants in Ongoye Forest Reserve over ten monitoring seasons.



Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Ngoye Cycad Encephalartos ngoyanus	Number of populations	2	2	Achieved	Stable
	Number of sub- populations	10	5	Not Achieved	Stable
	Ongoye Forest Reserve population size	1000	146	Not Achieved	Declining
	KZN population size	10000	≥1034	Not Assessed	Not Assessed

References

Church, B. (2006, 2014) Management Plan for *Encephalartos ngoyanus*, Biodiversity Research and Assessment Division, Ezemvelo KZN Wildlife, Pietermaritzburg.

- Church, B. 2014. Monitoring Plan for *Encephalartos ngoyanus*, Biodiversity Research and Assessment Division, Ezemvelo KZN Wildlife, Pietermaritzburg.
- Donaldson, J.S. 2009. *Encephalartos ngoyanus* I.Verd. National Assessment: Red List of South African Plants version 2014.1. Accessed on 2015/01/06
- Goodman, P.S. (2002) Non-Marine Biodiversity Conservation Targets for KwaZulu-Natal, Biodiversity Research Division, Ezemvelo KZN Wildlife, Pietermaritzburg.





APPENDIX 7.

Biodiversity Asset: Karkloof Blue Butterfly *Orachrysops ariadne*

Group	Butterflies
Common Name	Karkloof blue butterfly
Scientific Name	Orachrysops ariadne
Assessment period	2013
Monitoring period	Annually since 2002 at Nkandla
Author	Dr. Adrian Armstrong and Sharon Louw,
	Ezemvelo KZN Wildlife
Assessment report date	10 November 2014

Strategic Objective

To conserve 20 viable colonies of the Karkloof blue butterfly in perpetuity, to increase the number of eggs laid at the Nkandla monitoring site each year to at least 250, and to maintain or improve the colony sizes at the three existing sites around Howick.

Biodiversity Targets

- 1. At least 20 viable colonies of the Karkloof blue butterfly conserved across its distribution range.
- 2. At least 250 eggs laid at the Nkandla monitoring site each year.
- 3. A relatively stable number of eggs laid per 50 mature host-plants (the prostrate variety of Wood's indigo plant *Indigofera woodii* var *laxa*) over successive monitoring occasions (tri-annually) at each of the three sites around Howick.

Abundance Parameters

a. Number of colonies known to exist, including any re-introduced colonies.

- b. Number of eggs laid at the Nkandla monitoring site as determined by the annual census.
- c. Number of eggs laid per 50 mature host plants every third year at Wahroonga, Stirling and The Start, as determined by the three-yearly egg monitoring at each site.

Indicator Relevance

The Endangered Karkloof blue butterfly is endemic to KwaZulu-Natal and is confined to the Endangered Midlands Mistbelt Grassland vegetation type. The latter has been greatly transformed by timber plantations, agriculture and urbanisation. The Karkloof blue butterfly has specific life history requirements that must be met in the same place in order for it to survive. These include the presence of the host plant on which the adult female lays its eggs and on which the larva feeds, the presence of the host ant (the Natal sugar ant *Camponotus*





natalensis) which tends and protects the larva in its nest, and the presence of a set of nectar plants which fuel the flight of the adults over the flight period. The butterfly is therefore very sensitive to changes in the vegetation and soils of its habitat and is confined to specific areas of its habitat. The continued presence of the butterfly at known sites would indicate that habitat management is appropriate. The butterfly is threatened by extinction owing to the extent of transformation of its habitat, and re-introduction of the butterfly to rehabilitated sites is the only way in which its survival in the long term will be ensured.

Assessment

Data adequacy

• Quality - moderate for number of colonies known to exist (South African Butterfly Conservation Assessment and ground-truthing of the distribution model for the butterfly are underway),; good for the number of eggs laid at the Nkandla monitoring site; poor for the triennial egg monitoring at the three colonies near Howick.

- Quantity adequate for the Nkandla monitoring site; inadequate for the other three colonies.
- Overall confidence moderate for the number of existing colonies; high for the Nkandla monitoring site; low for the other three sites.

Status

- Protected areas no Karkloof blue butterflies present in any protected area.
- Private land there are four known extant colonies of the Karkloof blue butterfly, and 235 eggs were recorded at the Nkandla monitoring site in 2013 (Table 1).

Table 1. Number of colonies and eggs of the Karkloof blue butterfly Orachrysops ariadne in KwaZulu-Natal at
the end of 2013

	Protected Areas	Municipal, Private & Communal	Total
Number of colonies	0	4	4
Number of eggs recorded at the Nkandla monitoring site on 4 June 2013	N/A	235	235
Egg count index (triennial monitoring)	N/A	Not Assessed	Not Assessed



Figure 1: Number of Karkloof blue butterfly eggs counted at the Nkandla monitoring site since 2002.



Trend

- Protected areas not applicable.
- Municipal, private and communal land egg numbers are near target at the Nkandla monitoring site after a catastrophic decline in 2003, but are still under target (Figure 1).

Existing pressures and future threats

Much of the natural habitat of the Karkloof blue butterfly appears to have been transformed or degraded by commercial timber plantations, too frequent or too infrequent burning of the grassland, and overgrazing by livestock. The fire regime and grazing pressure on Midlands Mistbelt Grassland must be managed appropriately for the continued survival of the Karkloof blue butterfly. Livestock browsing and grazing must be avoided on the colony sites, as must trampling of the sites by livestock, and reduced in the immediate vicinity of the colonies. Burning of the sites must not occur more frequently than biennially nor less frequently than every four years.

Evaluation Summary

Status - only four colonies of the butterfly are known to exist which is well below the target of 20 colonies. The number of eggs laid at the Nkandla monitoring site is near, but still below, the desired target level, while the status of the other three colonies is unknown.

Trend - the population at the Nkandla monitoring site, as indexed through the number of eggs counted, is increasing, but the population trend at the other three colony sites is unknown.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Continue ground-truthing the predicted distribution map for the Karkloof blue butterfly.
- 2. Filling of the Threatened Animal Species Post so that monitoring at the colonies not monitored in the past three years can recommence and that re-introductions can proceed.
- Development of the Karkloof blue butterfly reintroduction protocol document in readiness for a possible re-introduction of the butterfly at Curry's Post.
- 4. Proclamation of Wahroonga as a Nature Reserve, so that the future of the colony is more secure.
- 5. Training of Ezemvelo KZN Wildlife staff, especially Ecological Advice staff, to undertake annual to three-yearly monitoring of all the Karkloof blue butterfly colonies.
- 6. Ensure that the co-management agreement with the Chube Traditional Authority and management recommendations in terms of the firebreak, burning, fence maintenance and alien plant control at the Nkandla monitoring site are timeously, efficiently, and correctly carried out: (1) burning of perimeter fire-break around the fenced monitoring site, including neighbouring drainage lines where this butterfly is known to occur, and burning of at least some of the colony areas at the appropriate time of year if the fuel load is very high; (2) maintenance of the fence to be undertaken if necessary; (3) egg census to be conducted at the monitoring site early in June, and; (4) development of an interpretation point along the P50-2 road.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Karkloof Blue Butterfly Orachrysops ariadne	Number of colonies	≥20	4	Not Achieved	Stable
	Number of eggs laid at the Nkan- dla monitoring site each year	≥250	235	Not Achieved	Increasing
	Number of eggs laid per 50 mature host-plants at each of the three sites around Howick	Stable to increasing	Not Assessed	Not Assessed	Not Assessed



APPENDIX 8.

Biodiversity Asset: Millar's tiger moth *Callioratis millari*

Group	Butterflies and moths
Common Name	Millar's tiger moth
Scientific Name	Callioratis millari
Assessment period	2013
Monitoring period	2005 to present, annually, at Entumeni Nature Reserve
Author	Sharon Louw and Dr. Adrian Armstrong, Ezemvelo KZN Wildlife
Assessment report date	1 July 2014

Strategic Objective

To conserve 20 viable colonies of the Millar's tiger moth in perpetuity and to increase the number of eggs laid during peak population years at the Entumeni Nature Reserve monitoring site to at least 100 eggs in the *Stangeria eriopus* cycad host-plant colony established in Management Block 2.

Biodiversity Target

- 1. At least 20 viable colonies of the Millar's tiger moth conserved across its distribution range.
- 2. At least 100 eggs laid at the Entumeni Nature Reserve monitoring site (Management Block 2) each year.

Abundance and Integrity Indicators

- a. Number of colonies known to exist, including any re-introduced colonies.
- b. Number of eggs laid within Management Block 2 Stangeria eriopus cycad population at the Entumeni Nature Reserve monitoring site as determined by the annual count. From 2005 to 2012 the number of eggs on the first 50 Stangeria plants encountered in Management Block 2 were recorded; however, this was not a strictly random sample as it appears that certain plants were preferentially selected for monitoring based on experience that these would have eggs, and those less likely to have eggs were not sampled. The method changed in 2013 to monitor all Stangeria plants to avoid bias in selecting plants to be monitored. This may increase the number of eggs recorded even when there has been no real change in number of eggs laid, thus creating a perception of a population increase when there





Figure 1: Miller's tiger moth egg cases.

has in fact been no change. In reality, from 2005 to 2012 all plants with eggs were monitored so there is unlikely to be a significant impact of the change of technique in 2013. However, caution needs to be exercised in interpreting trends.

Indicator Relevance

The Millar's tiger moth is endemic to KwaZulu-Natal and is confined to sub-coastal grassland above 650 m above sea level. The latter has been greatly transformed by timber plantations, agriculture and urbanisation. The Millar's tiger moth has specific life history requirements that must be met in the same place in order for it to survive. These include the presence of the host plant on which the adult female lays its eggs and on which the larva feeds, and the presence of a set of secondary host plants on which the larva is assumed to feed after the third instar. The butterfly is therefore very sensitive to changes in the vegetation of its habitat and is confined to where the host plants and secondary food plants grow. The moth is threatened by extinction owing to the extent of the transformation of its habitat. Re-introduction of the moth to rehabilitated sites is the only way in which its survival in the long term will be ensured.

Assessment Data adequacy

- Quality Moderate confidence that all colonies are known; moderate to high quality assessments undertaken for the index count at the Entumeni Nature Reserve (16 May 2013) and Dreadnaught Peak (17 May 2013) monitoring sites, but it is still possible to miss eggs where these are not laid on the host plant.
- Quantity all Stangeria eriopus plants in Block 2 at Entmeni Nature Reserve and at Dreadnaught Peak monitored, therefore quantity good for the monitoring sites.
- **Overall confidence** Low for the number of existing colonies; Moderate to High for the number of eggs at the monitoring site.

Status

• **Protected areas** - the only known breeding colony is in the Entumeni Nature Reserve.(Table 1).

	Protected Areas	Municipal, Private & Communal	Total
Number of colonies	1	1	2
Egg count (incl. hatched and unhatched eggs)	131	36	167
Number of <i>Stangeria eriopus</i> cycads monitored	99	163	262
Number of Millar's tiger moth larvae observed	45	2	47
Number of <i>Stangeria</i> <i>eriopus</i> cycads with feeding signs	32	6	38

Table 1. Number of populations of the Millar's tiger moth <u>Callioratis millari</u> in KwaZulu-Natal at the end of 2013





Figure 2: Number of Millar's tiger moth eggs in a sample of 50 <u>Stangeria eriopus</u> host plants up to and including 2012 (represents minimum population size estimate), and on all <u>Stangeria eriopus</u> plants in Management Block 2 at the Entumeni Nature Reserve monitoring site in 2013. See text for explanation.

 Municipal, private and communal land - The Stangeria eriopus cycad colony established at Dreadnaught Peak farm a short distance from Entumeni Nature Reserve, was monitored for the first time in 2013.

Trend

- Private land Dreadnaught Peak farm has a viable colony of *Stangeria eriopus* cycads; however the Millar's tiger moth's use of this site is precarious. Continued monitoring will establish the population trend at this site.
- Protected areas The index for the monitored sub-population in the Entumeni Nature Reserve has varied greatly over the past nine years, indicating instability in the number of eggs from year to year (Figure 2). Such swings in number are a natural property of some insect populations, but whether this was normal for the Millar's tiger moth in the historical past is unknown.

Current Pressures and Future Threats

Much of the natural habitat of the Millar's tiger moth appears to have been transformed by agricultural cultivation, commercial timber plantations and urbanisation. The fire regime and grazing pressure on Moist Ngongoni Veld grassland must be managed appropriately for the continued survival of the moth. Transformation of the limited remaining potential habitat for the species must be prevented. The management guidelines for Millar's tiger moth should be followed. Extinction of this endemic species may result if the colony at the Entumeni Nature Reserve and at Dreadnaught Peak is not afforded protection from inappropriate burning regimes (by burning firebreaks where and when appropriate and by biennial, rotational patch burning four months after the moths have laid their eggs), from browsing and trampling of Stangeria eriopus and secondary host plants by zebra, and from alien plants (through alien plant control). Only one of the grassland patches where Millar's tiger moth occurs (Management Blocks 2 and 4) should be burnt each year to reduce the threat of burning at incorrect times (as has happened previously). Reduced fire frequency in these moist grasslands in the past resulted in the encroachment of indigenous species such as Maesa lanceolata, Pseudarthria hookeri, Acacia karroo and Pteridium aquilinum, although increased levels in global CO² may have assisted the expansion of the later two species into the grasslands. Selective control of indigenous tree species should be considered.

Evaluation Summarv

Status - Only two colonies are known to exist: the continued existence of the subpopulation at the Entumeni Nature Reserve monitoring site appears to be precarious; a colony now exists at a second site on private land (Dreadnaught Peak) in the vicinity of Entumeni Nature Reserve; therefore the target of 20 or more colonies/subpopulations is **Not Achieved**.

The number of eggs laid in 2013 (131) was above the minimum target level of 100, therefore the target is **Achieved**.

Trend - the subpopulation size at the monitoring site appears unstable and the egg count index from



2009 till 2012 fluctuated markedly. From 2013 all *Stangeria eriopus* plants are/will be monitored, not just a sample of 50 plants. Continued monitoring of the number of eggs laid is necessary to determine trends; currently the trend is **Not Evaluated**.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Appropriate management of the grasslands in the Entumeni Nature Reserve according to the Millar's tiger moth management plan.
- 2. Continuation of the annual monitoring programme at Entumeni Nature Reserve.

- 3. Continuation of the monitoring of *Stangeria eriopus* at Dreadnaught Peak for both eggs and the characteristic feeding signs in the period April to June.
- 4. Evaluate the predicted modelled Millar's tiger moth habitat in the Ntuli Traditional Council Area.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Millar's Tiger Moth <i>Callioratis</i> <i>millari</i>	Number of colonies	≥20	2	Not Achieved	Stable
	Number of eggs laid at the Entumeni monitoring site each year	≥100	131	Achieved	Not Assessed



Biodiversity Asset:

Coastal population of the KwaZulu Dwarf Chameleon Bradypodion melanocephalum

Group	Reptiles		
Common Name	KwaZulu dwarf chameleon		
Scientific Name	Bradypodion melanocephalum		
Assessment period	2013		
Monitoring period	Chameleon Park monitored annually since 2002		
Author	Dr. Adrian Armstrong, Ezemvelo KZN Wildlife		
Assessment report date	13 October 2014		

Strategic Objective

To conserve a viable wild coastal population of the KwaZulu dwarf chameleon in perpetuity throughout its remaining historical range in KwaZulu-Natal, through a shared commitment on private, communal and State land.

Biodiversity Target

To conserve three viable free-living sub-populations of the coastal population of the KwaZulu dwarf chameleon in perpetuity and to improve the status and viability of the sub-population at Chameleon Park and adjacent area in Bellair, Durban. Specifically:

- 1. At least three viable sub-populations of 7 000 adults each conserved across the range of the coastal population.
- 2. A viable sub-population conserved at Chameleon Park and connected D'MOSS areas.
- 3. A minimum of 100 adults conserved at Chameleon Park and the D'MOSS area adjacent to Edwin Swales Business Park.

Abundance Parameters

a. Number of viable sub-populations, where a viable sub-population comprises 7000 adults, estimated by the amount of contiguous potential





habitat remaining of large enough area to support a viable sub-population (582 ha at a density of 12.02 ha-1).

- b. Estimated amount of contiguous potential habitat in the eThekwini Municipal Area that comprises Chameleon Park, the D'MOSS strip adjacent to the Edwin Swales Business Park and other potential habitats in the vicinity.
- c. Number of adult KwaZulu dwarf chameleons at Chameleon Park and the associated D'MOSS strip.

Indicator Relevance

The coastal population of the KwaZulu dwarf chameleon may be confined to the central and southern coastal strip of KwaZulu-Natal, a region that has been largely transformed by urbanisation, timber farming and sugarcane cultivation, and is still being transformed by urbanisation in particular. The coastal population of the KwaZulu dwarf chameleon is therefore threatened with extinction. The Umbilo River valley was considered by Raw (1995) as important for the conservation of the KwaZulu dwarf chameleon and he suggested the setting up of a reserve there and linking it to other suitable habitat through the D'MOSS. The achievement of the biodiversity targets would ensure the long-term persistence of the coastal population of the KwaZulu dwarf chameleon and would indicate that there is adequate habitat and habitat corridors/connectivity - which will benefit other species in the eThekweni Metro area.

Assessment

Data adequacy

- **Quality** moderate (land cover data at 4 ha resolution for the coastal region of KwaZulu-Natal¹), but good for annual dwarf chameleon count at Chameleon Park.
- **Quantity** adequate for Chameleon Park, inadequate count data for the D'MOSS strip adjacent to the Edwin Swales Business Park (counts suspended after 2007 owing to lack of alien plant control on the site).
- Overall confidence in estimates: Number of viable subpopulations - Medium to Low
 Chameleon Park subpopulation size - High D'MOSS subpopulation size - Low

Status

- Protected areas no viable subpopulations are known to occur in protected areas (Table 1).
- Municipal, private and communal land estimated that there is no viable subpopulation in any single contiguous area of suitable habitat. However:
 - The number of viable subpopulations in several areas joined by potential corridors is unknown. Only three potential habitat patches of more than 582 ha remain, two of which may not contain KwaZulu dwarf chameleons, as ascertained during ground-truthing surveys.
- Chameleon Park and D'MOSS strip population estimated to be 73 adults. Numbers fluctuate somewhat, particularly in response to management interventions.

¹Thompson, M.W. 2006. KZN coastal land-cover mapping (from SPOT satellite imagery 2005). Data users report and meta data (vs. 1). Geoterralmage (Pty) Ltd, South Africa

Table 1.	Number of viable sub-populations of the coastal population of the KwaZulu dwarf chameleon in
	KwaZulu-Natal at the end of 2013, and number of adults at Chameleon Park and the D'MOSS strip

	Protected Areas	Municipal, Private & Communal	Total
Estimated number of viable sub-populations	0	Unknown	Unknown
Number of habitat areas remaining that have potential to hold a viable sub-population	0	Unknown, but not more than 3	3
Estimated number of adults at Chameleon Park and the D'MOSS strip	N/A	73	N/A



Trend

- Number of viable sub-populations unknown.
- Number of habitat areas remaining that have potential to contain a viable sub-population unknown, but probably declining.
- Number of adults at Chameleon Park and the D'MOSS strip fluctuating well below target.

Existing pressures and future threats

Much of the natural habitat of the coastal population of the KwaZulu dwarf chameleon has been transformed or degraded by commercial timber plantations, sugarcane cultivation, urbanisation, too frequent and extensive or too infrequent burning of the grassland, alien plants and overgrazing by livestock. Coastal grassland areas that are large enough to support at least three viable sub populations of the KwaZulu dwarf chameleon need to be conserved. The fire regime and grazing pressure on KwaZulu-Natal Coastal Grassland must be managed appropriately for the continued survival of the coastal population of the KwaZulu dwarf chameleon. Extinction of subpopulations of the KwaZulu dwarf chameleon may result if inappropriate burning regimes (too frequent fires, no fires or burning of the whole habitat patch at once) are applied to the remaining suitable habitat, if heavy livestock grazing is allowed in the habitat, and if alien plants are not appropriately controlled or eradicated in the habitat. Alien birds (Common Mynah) may pose a predation risk to this species (anecdotal reports but no quantitative data).

Evaluation

Summary

1. Status - the number of viable sub-populations and the sub-population sizes at the Chameleon

Park and D'MOSS monitoring sites are below the desired target levels – therefore targets **Not Achieved**.

2. Trend - the number of potential habitat areas that might hold viable sub populations appears to be decreasing as only a few remain of large enough contiguous size. These are under considerable land use change pressure, and the estimated number of KwaZulu dwarf chameleons at the Chameleon Park (73 adults located) is lower than the target and appears to be declining - therefore trend **Declining**.

Key Management Actions

Key management actions for 2014/15 include:

- 1. Engage with the eThekwini Municipality and the Edwin Swales Business Park occupants to
 - manage the D'MOSS strip appropriately to increase the amount of suitable habitat for the KwaZulu dwarf chameleon there, and;
 - (2) manage the Chameleon Park more consistently and appropriately. Management actions required includes regular, frequent and light alien plant control, and mosaic defoliation of moribund grass, removing the moribund material off the site. The site needs to be securely fenced or hedged with an impenetrable barrier plant (e.g. *Acacia ataxacantha*) except at the entrance, and litter traps need to be fitted to the storm water pipe outflows.
- 2. Increase the protection status (zonation) of Chameleon Park from Public Open Space zonation to Environmental Conservation.



Figure 1: Size of remaining potential habitat for the coastal population of the KwaZulu dwarf chameleon as determined from the cartographic distribution model (Armstrong 2009).




Figure 2: Estimated number of KwaZulu dwarf chameleons at Chameleon Park and the D'MOSS strip over the given period.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
KwaZulu dwarf chameleon <i>Bradypodion</i> <i>melanocephalum</i>	Number of viable coastal sub- populations	≥3	Unknown	Not Assessed	Not Assessed
	Viable sub- population conserved at Chameleon Park and connected D'MOSS areas	1	0	Not Achieved	Declining
	Number of adult KwaZulu dwarf chameleons at Chameleon Park and the associated D'MOSS strip	≥100 adults	73	Not Achieved	Declining

Reference

Armstrong, A.J. 2009. Distribution and conservation of the coastal population of the black-headed dwarf chameleon *Bradypodion melanocephalum* in KwaZulu-Natal. African Journal of Herpetology 58(2): 85-97.



APPENDIX 10.

Biodiversity Asset: Nile crocodile *Crocodylus niloticus*

Group	Reptiles
Common Name	Nile crocodile
Scientific Name	Crocodylus niloticus
Assessment period	2013
Monitoring period	2006 to present, annual assessment
Author	Dr. Xander Combrink, Dr. P.S. Goodman, John Craigie, Ezemvelo KZN Wildlife
Assessment report date	15 January 2015

Strategic Objective

To conserve all wild Nile crocodile populations, irrespective of size, throughout its historical range in KZN.

Biodiversity Target

No biodiversity target has been set or adopted for KZN. A preliminary target of 3500 adult and sub-adult (>1.5 m) crocodiles is proposed.

Abundance Parameters

No province-wide monitoring document exists for

this species. One population parameter is reported here:

- a. Number of sub-adult and adult individuals
 - (> 1.5 m total length)

Our suggestion is to include an additional population parameter, the number of Nile crocodile nests, in the next (2014) assessment. Reproductive output is one of the key population processes responsible for changes in population size, and the number of crocodiles nests successfully hatched every year



may provide a recruitment index. Furthermore, some Nile Crocodile populations, e.g. Amatikulu Nature Reserve, are extremely difficult to monitor using conventional aerial or spotlight surveys due to thick riparian vegetation and fluctuating water levels (Uys 2012). Nest surveys seems to be the only practical way to monitor the population.

Indicator Relevance

Nile crocodiles have a conservation status of Vulnerable in South Africa (Marais 2014). Although currently listed internationally as Lower Risk/Least Concern (the species may be threatened in some parts of its range), the IUCN recognises the need for this status to be re-assessed (CGS 1996). A metadata analysis of all crocodile surveys conducted in Africa since 1955 concluded that populations are declining, despite an increase in the 1990s (Laínez 2008). The Nile crocodile was transferred in 1994 to Appendix II (Resolution Conf. 11.16 for "Ranching"). Limited ranching, through egg collection of "doomed" (i.e. high clay content) nests were conducted between 1988 to 1995 at the St Lucia estuary (Combrink 2015). The wild population is fully protected by national and provincial legislation and all commercial production is by captive breeding, with some establishments now producing second-generation offspring. South Africa is a major exporter of crocodile products and crocodile farms are also significant importers of live crocodiles from other African countries (Jenkins et al. 2004).

Crocodilians are increasingly recognised as good indicators in ecosystem monitoring and restoration programmes (Mazzotti and Brandt 1994, Mazzotti et al. 2009, Lane et al. 2013), have significant commercial value for tourism (Ryan and Harvey 2000), the leather industry (MacGregor 2002), and sustainable use conservation programmes (Da Silveira and Thorbjarnarson 1999, Thorbjarnarson 1999, Fukuda et al. 2011). As a flagship species they have the potential of being a catalyst in wetland conservation programmes (Shirley et al. 2009).

However, despite their ecological importance, indiscriminate killing and commercial overexploitation combined with severe habitat loss has resulted in many crocodilian species suffering drastic declines in numbers and reductions in distribution, with several species brought to the brink of extinction (Ross 1998). Despite the recovery of numerous species and populations following strict protection (Fukuda et al. 2011), many Nile Crocodile populations in South Africa appear to be at risk. Kruger National Park and Loskop Dam have experienced large-scale pansteatitis mortalities from broad-scale environmental deterioration leading to contamination (Botha et al. 2011, Ferreira and Pienaar 2011, Lane et al. 2013). Threats to Nile Crocodiles in KZN are more related to habitat transformation, freshwater extraction from rivers, disturbance, direct killings, destruction of nests and hypersaline conditions (Pooley 1973, 1982, Leslie 1997, Combrink et al. 2011, Combrink et al. 2013a). However, the population may not be secure from contaminants due to the increase of human settlements in the catchment combined with agriculture (Fergusson 2010) and potential mining.

Assessment

Data adequacy

- Data quality: Uncorrected crocodile census techniques, such as aerial and spotlight surveys, are not useful estimators of absolute abundance due to visibility bias (crocodiles present but obscured by vegetation, inside a burrow, water turbidity etc.), diving bias (the proportional time a crocodile is submerged) and observer bias (crocodiles in an observer's line of view and the number of crocodiles counted by that observer during a survey) (Bayliss 1987, Shirley et al. 2012), each of which can significantly influence survey accuracy (Bayliss et al. 1986). We calculated correction factors using 55173 GPS data points from GPS-satellite transmitters attached to 18 Nile Crocodiles over four years, to augment aerial and spotlight survey parameters that couldn't account for diving behaviour. We furthermore used two airplanes during simultaneous double count aerial surveys to estimate observer bias. The aerial survey correction factor calculated was 1.063 for June (water temperatures at a minimum so aerial surveys must be flown in June). The spotlight count correction factor calculated was 1.339 for January (water temperatures at a maximum, so spotlight counts must be conducted in January). Finally the aerial survey detectability bias correction factor was calculated as 1.31 (Combrink 2015).
- Crocodiles are sensitive to weather conditions and estimates obtained from aerial surveys can vary depending on conditions at the time of the survey. Therefore aerial surveys were standardised by conducted them during June after 10:00 in the morning (Downs et al. 2008) when wind speed <20 km/hour and cloud cover <25 % (Combrink 2015).
- Data of smaller crocodile populations managed by Ezemvelo as well as private property owners are collected annually from protected area



managers and private property owners via the annual CITES and Important Vertebrate Species Survey. Most of these small populations are not monitored annually through aerial or spotlight counts, therefore they are either speculative or estimates based on individually known animals, the latter being true for some private properties.

- Data quality for small populations is rated as poor to moderate.
- Data quality for all the large populations is rated as moderate to good.
- Based on the calculated correction factors, all figures are reported as estimates, and not raw counts.
- **Quantity:** Nile Crocodile aerial surveys (helicopter and fixed wing aircraft) have been conducted annually at Lake St Lucia, the largest crocodile population in KZN, since 1972 and nesting surveys since 1982 (Combrink et al. 2013b).
- Aerial surveys (helicopter) have been conducted at Ndumo Game Reserve from 1971 - 1994 and recently in 2009 (Calverley and Downs 2014) and Pongolapoort Dam (Champion 2011), the second and third largest KZN populations respectively. The work is part of the University of KwaZulu-Natal (UKZN) Zululand Crocodile Research Programme.
- Kosi Bay crocodiles have been counted by boat since 1981 (Kyle 2014) and aerial counts were conducted for most years since 1985.
- Bruton (1979) conducted crocodile nest surveys at Lake Sibaya in 1970 and 1971. Nest surveys were also carried out during 1976, 1986-1991 and 2003 (Combrink et al. 2011) and aerial surveys 1985 - 1990, 1993, 2003-2004. From 2007 this population is counted every year.
- Crocodiles at Nsumo Pan (uMkhuze Game Reserve) have in recent years also been counted annually from the air.
- Crocodile populations at Enseleni NR, Amatikulu and Umlalazi have in recent years been monitored (Uys 2012, S. Louw, pers. comm.)
- The annual CITES and Important Vertebrate Species Survey results are derived from a

province-wide survey of protected areas and private game ranches. Not all populations are known so some small populations are missed. Inconsistency in reporting the status of known populations between years further downgrades the estimate.

- Data quantity for small populations in terms of distribution and number of records is therefore rated as poor to moderate.
- **Data quantity** for all the large populations in terms of distribution and number of records is therefore rated as **moderate to good**
- Overall confidence in population estimate: **moderate** (underestimate, <30% error).

Status

The numerical status of the KZN crocodile population at the end of 2013, which comprises 20 sub-populations in protected areas and 18 sub-populations on private and communal land, primarily in the Zululand region, is summarised in Table 1.

Trend

- Protected areas: As a result of all the biases (see data quality) influencing crocodile survey results, real changes in the meta-population will be evident only after a number of years. The mean (± standard deviation) for the KZN crocodile population in protected areas over the last seven years is 2793 ± 241.
- Private and communal land: The mean (± standard deviation) for the KZN crocodile population in private and communal land over the last seven years is 278 ± 42.

Existing Pressures and Future Threats

Threats to Nile crocodiles in KZN include: habitat destruction and degradation of lakes, wetlands, dams, rivers and estuaries; construction of dams in rivers and uncontrolled water removal for agriculture or mining; pollution and the release of pesticides or herbicides into waterbodies; uncontrolled water release from the Pongolapoort Dam may flood crocodile nest-sites downstream; altered river flow pathways; illegal killings of crocodiles for the

Table 1. Numerical status of Nile crocodile in KZN at the end of 2013

	Protected Areas Private & Communal		Total
Population estimate	2501	207	2708
Number of populations	20	18	38







muthi trade and witchcraft rituals; destruction of crocodile nests and killings of crocodiles by people competing for the same water resource; destruction of crocodile nests by trampling and disturbance of livestock; small crocodiles drown or are killed when entangled in gillnets; reduced embryonic survival and skewed sex ratios due to exotic invasive vegetation, especially when forming dense stands at breeding sites, e.g. *Chromolaena odorata*; ingestion of lead fishing sinkers.

Illegal killings are recorded in the annual CITES and Important Vertebrate Species survey and in the Ezemvelo KZN Wildlife crime database, but mortalities are considerably under-reported (Figure 2). Results from a recent study at Lake Sibaya, the largest natural freshwater lake in South Africa, suggest a decline in the adult population of approximately 95 - 98% since 1970, attributed to illegal killings and destruction and disturbance of crocodile nests (Combrink et al. 2011). The situation at Lake Sibaya reflects the state of crocodiles in all unfenced rivers, lakes and wetlands in north-eastern KZN (e.g. Muzi Pan, Kosi Bay, Lake Shengeza, Lake Zilonde) irrespective of their legal conservation status, and is of grave concern.

Evaluation

Summary

- Status the total population size is below the desired target level - therefore target is Not Achieved.
- 2. Trend Population estimates have fluctuated around a mean of 2793 ± 241 for the last seven years, therefore the trend is **Stable**.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Set a biodiversity target for Nile Crocodiles in KZN.
- 2. Develop and adopt a monitoring document for standardised crocodile population and nest surveys and data management protocol in KZN.
- 3. Train field staff responsible for crocodile population and crocodile nest surveys.
- 4. By implementing the monitoring protocol improve the level of monitoring and reporting of crocodile status in KZN.
- 5. Develop educational material in isiZulu and English on human-crocodile conflict and safety protocols for local communities sharing waterbodies with crocodiles in KZN.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Nile crocodile Crocodylus niloticus	Population size (>1.5m length)	3500	2708	Not Achieved	Stable





Figure 2: Trend in the number of crocodile recorded as killed in private and state protected areas over the last eight years.

References

- Bayliss, P. 1987. Survey methods and monitoring within crocodile management programmes. Pages 157-175 In: G. J.
 W. Webb, C. Manolis, and P. Whitehead, editors. Wildlife Management: Crocodiles and Alligators. Surry Beatty and Sons Pty. Ltd., Chipping Norton.
- Bayliss, P., G. J. W. Webb, P. J. Whitehead, K. Dempsey, and A. Smith. (1986). "Estimating the abundance of Saltwater Crocodiles, Crocodylus porosus Schneider, in tidal wetlands of the Northern Territory: a mark-recapture experiment to correct spotlight counts to absolute numbers, and the calibration of helicopter and spotlight counts". Australian Wildlife Research 13:309-320.
- Botha, H., W. van Hoven, and L. J. Guillette. (2011). "The decline of the Nile crocodile population in Loskop Dam, Olifants River, South Africa". Water SA 1:103-108.
- Bruton, M. N. 1979. The amphibians, reptiles, birds and mammals of Lake Sibaya. Pages 246-285 In: B. R. Allanson, editor. Lake Sibaya. Monographiae Biologicae. Dr. W. Junk bv Publishers, The Hague.
- Calverley, P. M., and C. T. Downs. (2014). "Population status of Nile Crocodiles in Ndumo Game Reserve, KwaZulu-Natal, South Africa (1971-2012)". Herpetologica 70:417-425.
- Champion, G. 2011. The ecology of Nile Crocodile (*Crocodylus niloticus*) in Pongolapoort Dam, northern KwaZulu-Natal, South Africa. MSc thesis. University of KwaZulu-Natal, Pietermaritzburg.
- Combrink, A. S. 2015. Spatial and reproductive ecology and population status of the Nile Crocodile (*Crocodylus niloticus*) in the Lake St Lucia estuarine system, South Africa. PhD thesis (in prep.). University of KwaZulu-Natal, Pietermaritzburg.
- Combrink, X., J. L. Korrûbel, R. Kyle, R. Taylor, and P. Ross. (2011). "Evidence of a declining Nile crocodile (*Crocodylus niloticus*) population at Lake Sibaya, South Africa". South African Journal of Wildlife Research 41:145-157.
- Combrink, X., R. H. Taylor, and C. T. Downs, editors. 2013a. Theme 6: Ecology of indicator species and Red Data taxa: Nile Crocodile. Water Research Commission, Pretoria.
- Combrink, X., J. K. Warner, and C. T. Downs. 2013b. Crocodiles. Pages 332-353 In: R. Perissinotto, D. D. Stretch, and R. H. Taylor, editors. Ecology and conservation of estuarine ecosystems Lake St Lucia as a global model. Cambridge University Press, Cambridge.
- Da Silveira, R., and J. B. Thorbjarnarson. (1999). "Conservation implications of commercial hunting of black and spectacled caiman in the Mamiraua Sustainable Development Reserve, Brazil". Biological Conservation 88 103-109.
- Downs, C. T., C. Greaver, and R. Taylor. (2008). "Body temperature and basking behaviour of Nile crocodiles (*Crocodylus niloticus*) during winter". Journal of Thermal Biology 33:185-192.



- Fergusson, R. A. 2010. Nile crocodile *Crocodylus niloticus*. Pages 84-89 In: S. C. Manolis and C. Stevenson, editors. Crocodiles: status survey and conservation action plan. Crocodile Specialist Group, Darwin.
- Ferreira, S. M., and D. Pienaar. (2011). "Degradation of the crocodile population in the Olifants River Gorge of Kruger National Park, South Africa". Aquatic Conservation: Marine and Freshwater Ecosystems 21:155-164.
- Fukuda, Y., G. J. W. Webb, C. Manolis, R. Delaney, M. Letnic, G. Linder, and P. Whitehead. (2011). "Recovery of saltwater crocodiles following unregulated hunting in tidal rivers of the Northern Territory, Australia". Journal of Wildlife Management 75:1253-1266.
- Jenkins, R. W. G., D. Jelden, G. J. W. Webb, and S. C. Manolis. 2004. Review of crocodile ranching programs conducted for CITES by the Crocodile Specialist Group of IUCN/SSC: January April 2004.
- Kyle, R. 2014. A July 2014 update on Nile crocodile numbers in and around the Kosi Bay lakes.
- Laínez, D. 2008. Fifty years of crocodile surveys in Africa: a review of the surveys and population trends. MSc thesis. University College London, London.
- Lane, E. P., F. W. Huchzermeyer, D. Govender, R. G. Bengis, P. E. Buss, M. Hofmeyr, J. G. Myburgh, J. C. A. Steyl, D. J. Pienaar, and A. Kotze. (2013). "Pansteatitis of unknown etiology associated with large-scale Nile Crocodile (*Crocodylus niloticus*) mortality in Kruger National Park, South Africa: pathologic findings". Journal of Zoo and Wildlife Medicine 44:899-910.
- Leslie, A. J. 1997. The ecology and physiology of the Nile crocodile, *Crocodylus niloticus*, in Lake St Lucia KwaZulu-Natal, South Africa. PhD thesis. Drexel University, Drexel.
- MacGregor, J. 2002. International trade in crocodilian skins: review and analysis of the trade and industry dynamics for market-based conservation. IUCN/SSC Crocodile Specialist Group.
- Marais, J. 2014. *Crocodylus niloticus* (Laurenti, 1768). In: M. F. Bates, W. R. Branch, A. M. Bauer, M. Burger, J. Marais, G. J. Alexander, and M. S. de Villiers, editors. Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. Suricata 1. South African National Biodiversity Institute, Pretoria.
- Mazzotti, F. J., G. R. Best, L. A. Brandt, M. S. Cherkiss, B. M. Jeffery, and K. G. Rice. (2009). "Alligators and crocodiles as indicators for restoration of Everglades ecosystems". Ecological Indicators 9:137-149.
- Mazzotti, F. J., and L. A. Brandt, editors. 1994. Ecology of the American alligator in a seasonally fluctuating environment. St. Lucie Press, Delray Beach, Florida.
- Pooley, A. C. 1973. Notes on the ecology of the Lake St Lucia crocodile population. Pages 81-90 In: Proceedings of the second working meeting of crocodile specialists. IUCN SSC, Ndumu and Lake St Lucia.
- Pooley, A. C. 1982. The ecology of the Nile crocodile *Crocodylus niloticus* in Zululand. MSc thesis. University of Natal, Pietermaritzburg.
- Ross, J. P. 1998. Crocodiles Status survey and conservation action plan. IUCN/SSC Crocodile Specialist Group, IUCN Gland, Switzerland & Cambridge, UK.
- Ryan, C. O., and K. Harvey. (2000). "Who likes Saltwater Crocodiles? Analysing socio-demographics of those viewing tourist wildlife attractions based on Saltwater Crocodiles". Journal of Sustainable Tourism 8:426-433.
- Shirley, M. H., R. M. Dorazio, E. Abassery, A. A. Elhady, M. S. Mekki, and H. H. Asran. (2012). "A sampling design and model for estimating abundance of Nile Crocodiles while accounting for heterogeneity of detectability of multiple observers". Journal of Wildlife Management 76:966-975.
- Shirley, M. H., W. Oduro, and H. Y. Beibro. (2009). "Conservation status of crocodiles in Ghana and Cote-d'Ivoire, West Africa". Oryx 43:136–145.
- Thorbjarnarson, J. B. (1999). "Crocodile Tears and Skins: International Trade, Economic Constraints, and Limits to the Sustainable Use of Crocodilians". Conservation Biology 13:465-470.
- Uys, R. 2012. Crocodile population management in Amatikulu. Ezemvelo KZN Wildlife. Unpublished report.



APPENDIX 11.

Biodiversity Asset: Leatherback Turtle *Dermochelys coriacea*

Group	Reptiles
Common Name	Leatherback turtle
Scientific Name	Dermochelys coriacea
Assessment period	2013
Monitoring period	1965 to present, annual assessment
Author	Santosh Bachoo, Ezemvelo KZN Wildlife
Assessment report date	31 March 2013

Strategic Objective

Enhance the viability of the breeding population of leatherback turtles, which nest on the beaches of north east KwaZulu-Natal within the iSimangaliso Wetland Park Word Heritage Site (iSimangaliso).

Biodiversity Target

None set for this species. A Biodiversity Management Plan for turtles is to be developed by the Department of Environmental Affairs and it is envisaged that biodiversity targets will be set in this plan. In the interim, a target of a stable to increasing trend in abundance, measured as (1) the trend in number of individually identifiable females (slope of the regression over the last 8 years), and (2) the trend in the number of successful nesting events in an index sample area, is proposed.

Abundance Parameters

Refer to monitoring document (Nel and Lawrence, 2006) for full monitoring and reporting procedures.





Only two parameters are reported here:

- a. Number of individual female leatherback turtles contributing to the total nesting effort identified in a season throughout the entire monitoring area (Figure 1).
- b. Number of successful nesting events per km patrolled per night in the 13 km index sample area (from Bhanga Nek to beacon 32 North). This area is selected as it is the only area where consistent effort has been applied for the duration of the monitoring programme.

Indicator Relevance

Leatherback turtles are listed as Critically Endangered (IUCN 2009), primarily as a result of direct and indirect human activities that impact them both locally and globally. Their ability to utilize different habitats renders them vulnerable at all stages of their life cycle. Bad coastal zone practices, habitat destruction, direct and indirect harvesting (as by-catch in fisheries) have resulted in their current IUCN categorisation. In South Africa, the uncontrolled harvesting of turtles from the beaches of northern KwaZulu-Natal led to their almost complete disappearance prior to 1962. Conservation measures were put in place to protect the nesting females and nests, and to monitor the numbers of nesting females and nests to document the population recovery. Initially, consumptive harvesting was considered an option once leatherback numbers recorded on the beach exceeded 200 individuals; this objective has fallen away, given the worldwide decline in turtle numbers and resultant IUCN status. The cosmopolitan nature of sea turtles means that they can only be monitored when they aggregate in high densities - in this case, when females come ashore to nest on the beaches of northern KwaZulu-Natal.

Indicators represent the following:

a. An estimate of the number of adult females nesting in the defined area. An increase in this number is interpreted to signify a recovery in this



Figure 1: Extent of the beaches currently being monitored.

component of the population.

b. The number of completed nesting attempts (eggs laid and covered up) – this is a measure of the reproductive output of the population, and represents one aspect of the populations' potential to recover. It can also be seen as a measure of the effectiveness of beach protection that is conferred to nesting leatherbacks as it allows them to successfully complete a nesting event without harassment.

Assessment

Data adequacy

- Quality data are collected annually from night time beach surveys undertaken in the period 15 October to 15 March of the following year. Individual animals are tagged with individually identifiable numbered tags. Procedures are in place to eliminate double-counting. Animals may be missed due to intermittent coverage.
- **Quantity** The nesting female sub population estimate is derived from coverage of approximately 60 km of beach, which has the highest densities

of nesting turtles in KwaZulu-Natal. It is known however that leatherback turtles do nest further south than the monitoring area.

 Overall confidence in estimates: Number of distinct individuals Low to Moderate (small under-count bias) Nesting events per km in index area Moderate (<2% error)

Status

All nesting takes place on the beaches within the proclaimed iSimangaliso Wetland Park World Heritage Site (iSimangaliso), located on the northeastern KwaZulu-Natal. For the 2012/2013 season, there were 65 distinct individuals identified via flipper-tagging throughout the monitoring area from the Mozambican/South African border south to Mabibi. Population trend analysis is based on the number of successful leatherback nesting events for the season (0.03 nests per km per night patrolled) found in the index sample area. The index sample area is the stretch of beach from Bhanga Nek to the Kosi mouth. This stretch of beach is 13 km of the

Table 1. Summary of the leatherback turtle abundance indicators for the 2012/2013 nesting season

Indicator	2012/2013 Season
Number of Distinct Individuals	65
Number of nesting events per km patrolled per night	0.03



Number of Distinct Leatherback Individuals over the last 8 Nesting seasons

Figure 2: Number of distinct individuals as identified by their tags per season over the past eight years across the entire monitoring area.





Figure 3: Number of leatherback turtle nests recorded within the 13 km index sample area between Bhanga Nek and Beacon 32 North since 1965.

total 60 km under the monitoring programme and is considered the index beach as this beach was the most intensely monitored in terms of consistent effort since the inception of the programme. The survey took place between 15 October 2012 and 15 March 2013.

Trend

- The number of distinct individuals recorded for the past eight seasons in the entire monitoring area is shown in Figure 1. The apparent slight increasing trend is non-significant ($R^2 = 0.3286$), therefore the population is deemed stable for this reporting period.
- The number of nests in the index area for the duration of the monitoring programme is shown in Figure 2. For the first decade since monitoring began, there was a steady increase in nesting activity. There was a relatively stable trend (with fairly large inter-annual variability and a bi-modal curve with an approximately 20-year cycle) for the last 40 years i.e. no significant upward or downward trend in the last 40 years.

Current Pressures and Future Threats

The primary pressures and threats to the population are:

Poaching - this involves killing female turtles and/ or nest raiding for eggs. The monitoring programme was initiated in response to the killing of turtles on the Tongaland coast. Poaching incidences are reported by the Officer In Charge and documented in the annual report. No leatherback poaching incidents were reported for the 2012/2013 season. **Predators** - there is a perceived increase in the level of predation on leatherback turtle nests by honey badgers, especially in the Island Rock area in the vicinity of the Manzengwenya beach on-ramp. This requires further investigation as there is greater leatherback activity there.

Direct harvesting and by-catch - even though turtles are protected by South African legislation, their cosmopolitan nature renders them vulnerable in areas outside of the South African EEZ.

The vulnerable areas are:

Climate Change - this is a significant threat to leatherback turtles, as the sex of the turtles are determined by beach sand temperature, and rising sea levels may inundate breeding grounds. Increased storminess as a result of climate change may erode beaches and destroy nesting habitat.

Insensitive Coastal Developments - light pollution and increased visitor presence from such developments are a real threat to nesting success. Leatherback turtles respond negatively to disturbances and may abandon nesting attempts if any threat is perceived. Leatherback turtles use light cues differently during the nesting phase:

- Light detection by leatherbacks during their emergence from the sea to nest may deter them from nesting;
- Leatherbacks returning to the sea after nesting use light to return to the sea, as it is less dark than the dunes. The presence of lights will hinder a speedy return to the sea;
- Hatchlings emerging from their nests also use light to orient themselves to the sea. Unnatural



light sources will attract hatchlings, increasing their chances of being predated on and affecting their overall survival.

Unauthorised developments within the iSimangaliso therefore represent a major threat to the continued nesting success of leatherback turtles. The Park must continually be monitored for illegal developments and all legal means must be utilised to control this.

Evaluation

Summary

- Status it appears as if this population remains secure, but vulnerable, given its small size (65 distinct individuals recorded in the monitored area in 2012-13) and number of nesting events (0.03 per km patrolled per night in the 13 km index area).
- 2. **Trend** the trend in the population indicators showed an initially steady increase but has been relatively stable (with fairly large inter-annual variability) for the last 40 years. In the short term (last 8 years) the population trend, as indexed through both number of individuals and number of nesting events, appears to be **Stable**.

Key Management Actions Key management actions for 2014 and 2015 include:

- Continue supporting the surveillance of nesting female leatherback turtles for as long as possible - the subpopulation remains very vulnerable;
- 2. Expanding the monitoring south to Sodwana Bay. The low numbers of leatherbacks encountered may be an effect of under sampling and this must be investigated. It is known that leatherbacks utilise a wider expanse of beach during nesting, and there may be increased activity outside of the monitoring area. The expansion must be cost-effective. This action alone will increase the overall confidence in estimates and elevate the confidence to the **Moderate to High** category, following a prolonged period of data collection;
- Train all turtle tour operators, sign a code of conduct with the turtle tour concessions and enforce same;
- Area north of Bhanga Nek is an important nesting area for both leatherback and loggerhead turtles. Conservation effort must also be directed toward turtle tour operators to ensure compliance with the code of conduct;
- 5. Monitor the Coastal Forest Reserve for illegal developments and take necessary legal measures to ensure their removal from the World Heritage site.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Leatherback turtle <i>Dermochelys</i> <i>coriacea</i>	Number of individual adult females recorded in 60 km monitoring area	Stable to increasing trend over last 8 years	65	Achieved	Stable
	Number of completed nesting events per km patrolled per night in 13 km index area	Stable to increasing trend over last 8 years	0.03	Achieved	Stable

Reference

Nel, R and Lawrence, C. 2006. Provincial Species Monitoring Plan: Leatherback (<u>Dermochelys coriacea</u>) and Loggerhead (<u>Caretta caretta</u>) Sea Turtles. Plan Produced for Ezemvelo KZN Wildlife. 25 pp.



APPENDIX 12.

Biodiversity Asset: Loggerhead Turtle Caretta caretta

Group	Reptiles
Common Name	Loggerhead turtle
Scientific Name	Caretta caretta
Assessment period	2013
Monitoring period	1965 to present, annual assessment
Author	Santosh Bachoo, Ezemvelo KZN Wildlife
Assessment report date	31 March 2013

Strategic Objective

Enhance the viability of the breeding population of loggerhead turtles, which nest on the beaches of north east KwaZulu-Natal within the iSimangaliso Wetland Park Word Heritage Site (iSimangaliso).

Biodiversity Target

None set for this species. A Biodiversity Management Plan (BMP) for Turtles is to be developed by the Department of Environmental Affairs (Oceans and Coasts) and it is envisaged that biodiversity targets will be set in this plan. In the interim, a target of a stable to increasing trend in index of abundance, measured as slope of the regression over the last 5 years is proposed. For the purposes on this report, the slope of the regression over the last 8 years will be used.

Abundance Parameters

Refer to monitoring document (Nel and Lawrence, 2006) for full monitoring and reporting procedures. Only two parameters are reported here:

a. Number of individual female loggerhead turtles contributing to the total nesting effort identified in a season throughout the entire monitoring area (Fig 1).





b. Number of successful nesting events per km patrolled per night in the index sample area (foot, from Bhanga Nek to Beacon 32 north). This area is selected as it is the only area where consistent effort has been applied for the duration of the monitoring programme.

Indicator Relevance

The loggerhead turtle is listed as Endangered (IUCN 2009), primarily as a result of direct and indirect human activities that impact them both locally and globally. Their ability to utilize different habitats renders them vulnerable at all stages of their life cycle. Bad coastal zone practices, habitat destruction, direct and indirect harvesting (as by-catch in fisheries) have resulted in their current IUCN categorisation. In South Africa, the uncontrolled harvesting of turtles from the beaches of northern KwaZulu-Natal led to their almost complete disappearance prior to 1962. Conservation measures were put in place to protect the nesting females and nests, and to

monitor the numbers of nesting females and nests to document the population recovery. Initially, consumptive harvesting was considered an option once loggerhead numbers recorded on the beach exceeded 500 individuals; this objective has fallen away, given the worldwide decline in turtle numbers and resultant IUCN status. The cosmopolitan nature of sea turtles means that they can only be monitored when they aggregate in high densities – in this case, when females come ashore to nest on the beaches of northern KwaZulu-Natal.

Indicators represent the following:

- a. An estimate of the number of adult females nesting in the defined area. An increase in this number is interpreted to signify a recovery in this component of the population.
- b. The number of completed nesting attempts (eggs laid and covered up) - this is a measure of the reproductive output of the population, and represents one aspect of the populations'



Figure 1: Extent of the beaches currently being monitored.

potential to recover. It can also be seen as a measure of the effectiveness of beach protection that is conferred to nesting leatherbacks as it allows them to successfully complete a nesting event without harassment.

Assessment

Data adequacy

- Quality data are collected annually from night time beach surveys undertaken in the period 15 October to 15 March of the following year. Individual animals are tagged with individually identifiable numbered tags. Procedures are in place to eliminate double-counting. Animals may be missed due to intermittent coverage. Data quality - High.
- **Quantity** The nesting female sub population estimate is derived from coverage of approximately 60 km of beach, which has the highest densities of nesting turtles in KwaZulu-Natal.
- Overall confidence in estimates: Number of distinct individuals - Moderate (small under-count bias).

Nesting events pe.r km in index area - **Moderate** to High (<2% error).

Status

All nesting takes place on the beaches within the proclaimed iSimangaliso Wetland Park World Heritage Site (iSimangaliso), located on the northeastern KwaZulu-Natal. For the 2012/2013 season, there were 757 distinct individuals identified via flipper-tagging throughout the monitoring area from the Mozambican/South African border south to Mabibi. Population trend analysis is based on the number of successful loggerhead turtle nesting events for the season (1.4 nests per km per night patrolled) found in the index sample area. The index sample area is the stretch of beach from Bhanga Nek to the Kosi mouth. This stretch of beach is 13 km of the total 60 km under the monitoring programme and is considered the index beach as this beach was the most intensely monitored in terms of consistent effort since the inception of the programme. The survey took place between 15 October 2012 and 15 March 2013.

Table 1. Summary of the loggerhead turtle abundance indicators for the 2012/2013 nesting season

Indicator	2012/2013 Season
Number of distinct individuals	757
Number of nesting events per km patrolled per night	1.4



Number of Distinct Loggerhead Individuals over the last Eight Nesting Seasons

Figure 2: Number of distinct individual loggerhead turtles recorded per season over the past eight years across the entire monitoring area.





Figure 3: Nesting trend for the loggerhead population within the index sample area since 1965.

Trend

- There has been a consistent increase in the number of distinct individuals recorded for the past eight seasons in the entire monitoring area (Figure 2), with an average annual rate of increase of 15.2%. There was however only a 0.5% increase in numbers between the 2011/2012 and 2012/2013 nesting seasons.
- The number of nests in the index area for the duration of the monitoring programme is shown in Figure 3. There is a highly significant increase in the nesting population of this species, especially during the past 10 seasons.

Risks and Threats

- Risks there are no perceived risks to biodiversity with the growth and expansion of this population.
- Past Pressures and Future Threats the primary pressures and threats to the population are:

Poaching - this involves killing female turtles and/ or nestraiding for eggs. The monitoring programme was initiated in response to the killing of turtles on the Tongaland coast. Poaching incidences are reported by the OiC and documented in the annual report. No loggerhead poaching incidents were reported for the 2012/2013 season.

Predators - natural predation of nests by honey badgers for example, is known to occur. Predation of nests by dogs must be prevented. **Direct harvesting and bycatch** - even though turtles are protected by South African legislation, their cosmopolitan nature renders them vulnerable in areas outside of the South African EEZ. The vulnerable areas are:

- Direct harvesting in coastal waters, outside of the South African EEZ;
- By-catch by long liners by far the greatest threat;
- By-catch in the bather protection nets deployed along the KZN coast - this is considered the second biggest threat to turtles, but the catches are considered "sustainable", with approximately 50% of those caught alive in nets being released. In the meantime, Ezemvelo does not support new installations and future renewals, but does support measures that would exclude turtle bycatch;
- By-catch in shrimp trawlers. Turtle exclusion devices are being used voluntarily with some success. The fishery has all but collapsed for now, but this fishery is anticipated to revive following the restoration of the St. Lucia estuary.

Climate Change - this is a significant threat to loggerhead turtles, as the sex of the turtles are determined by beach sand temperature, and rising sea levels may inundate breeding grounds. Increased storminess as a result of climate change may erode beaches and destroy nesting habitat.

Insensitive Coastal Developments - light pollution and increased visitor presence from such developments are a real threat to nesting success. Loggerhead turtles respond negatively to disturbances and will abandon nesting attempts if any threat is perceived. Loggerhead turtles use light cues differently during the nesting phase:



- Light detection by loggerheads during their emergence from the sea to nest will almost always result in an aborted nesting attempt;
- Loggerheads returning to the sea after nesting use light to return to the sea, as it is less dark than the dunes. The presence of lights will hinder a speedy return to the sea;
- Hatchlings emerging from their nests also use light to orient themselves to the sea. Unnatural light sources will attract hatchlings, increasing their chances of being predated on and affecting their overall survival.

Unauthorised developments within the iSimangaliso therefore represent a major threat to the continued nesting success of loggerhead turtles. The Park must continually be monitored for illegal developments and all legal means must be utilised to control this.

Evaluation Summarv

- 1. **Status** No target has been set for status, but it appears as if this population remains secure.
- 2. **Trend** the trend in the population indicator has shown a substantial increase in the long term since 1965, with this increase being startlingly apparent in the last decade. In the short term (last eight years) the population size is showing a yearon-year increase - therefore target **Achieved**.

Key Management Actions

Key management actions for 2014 and 2015 include:

- Continue supporting the surveillance of nesting female loggerhead turtles for as long as possible

 the recovery of the sub-population has been exceptional since the inception of the monitoring programme.
- 2. Investigate the possibility of expanding the monitoring south to Sodwana Bay. The expansion must be cost-effective.
- 3. Train all turtle tour operators, sign a code of conduct with the turtle tour concessions and enforce; the area north of Bhanga Nek is an important nesting area for both leatherback and loggerhead turtles. Conservation effort must also be directed toward turtle tour operators to ensure compliance with the code of conduct.
- 4. Monitor the Coastal Forest Reserve for illegal developments and take necessary legal measures to ensure their removal from the World Heritage site. As mentioned in the Risks and Threats section, loggerhead turtles are extremely skittish during emergence and will abort a nesting attempt if a threat is perceived. Generally, almost half of their emergences result in a successful nesting event. Therefore, any activity that affects a nesting attempt must be opposed.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Loggerhead turtle <i>Caretta caretta</i>	Number of individual adult females recorded in 60 km monitoring area	Stable to increasing trend over last 8 years	757	Achieved	Increasing
	Number of completed nesting events per km patrolled per night in 13 km index area	Stable to increasing trend over last 8 years	1.4	Achieved	Increasing

Reference

Nel, R and Lawrence, C. 2006. Provincial Species Monitoring Plan: Leatherback (<u>Dermochelys coriacea</u>) and Loggerhead (<u>Caretta caretta</u>) Sea Turtles. Plan Produced for Ezemvelo KZN Wildlife.



APPENDIX 13.

Biodiversity Asset: Bearded Vulture Gypaetus barbatus meridionalis

Group	Birds
Common Name	Bearded Vulture
Scientific Name	Gypaetus barbatus meridionalis
Assessment period	2013
Monitoring period	Annually
Author	Sonja Krüger, Ezemvelo KZN Wildlife
Assessment report date	March 2014

Strategic Objective

Maintain the Bearded Vulture population at or above minimum target levels (Rushworth 2008).

Biodiversity Target

The southern African biodiversity target for Bearded Vultures is 100 breeding pairs (Krüger 2013). The KZN target is 40 pairs that are occupying a breeding territory in the province each year (Rushworth 2008).

Abundance Parameters

Number of breeding pairs (= number of breeding territories occupied even if the pair does not breed).

Indicator Relevance

Bearded Vultures are classed as Critically Endangered in South Africa (Krüger 2014a). The status of the Bearded Vulture is an indicator of the suitability of its preferred habitat (alpine and mixed grasslands on rugged mountains and escarpments) and the availability of food in terms of quantity and quality, within its preferred range.

Assessment

Data adequacy

Quality - staff trained plus complete aerial survey undertaken - **Moderate to High.**





Table 1. Numerical status of Bearded Vulture in KZN in 2013

Abundance Parameter	Protected Areas	Private & Communal	Total
Total number of breeding territories	30	10	40
Number of occupied territories 2013	13	2	15
Number of territories not occupied	17	7	24
Number of territories not surveyed	0	1	1
Population estimate – number of pairs			15
Population estimate – number of individuals			50

Quantity - 39 of 40 historical sites surveyed in 2013 - **Moderate to High.**

Overall confidence in estimates - Moderate to High. Status

- Protected areas There are 30 potential territories in protected areas in KZN; where potential territories are those known to be used either historically or currently (within the past 10 years, Krüger et al. 2014). Of the 30 territories that were checked, 13 were occupied and breeding was confirmed at seven (Table 1).
- Private and communal land There are 10 potential territories on private and communal land in KZN. Of the 9 nests that were checked outside protected areas, 2 were occupied and breeding was confirmed at 1 (Table 1).
- Based on the survey of occupied territories, the minimum size of the adult population of Bearded Vulture is 30. Assuming the same ratio of adult (60%) to non-adult (40%) birds as per Brown (1997) and Krüger (2014b), the estimate of the KwaZulu-Natal Bearded Vulture population is 50 individuals.

Trend

The trend in the breeding population has not been assessed.

Current Pressures and Future Threats

The primary threats to the population are poisoning and collisions with powerlines, based on the deaths of tagged birds. Accidental poisoning from ingesting lead and poison baits meant for mammalian scavengers is by far the most serious threat to the population (Krüger 2014b). Development of wind farms in Lesotho and the Eastern Cape are likely to cause significant mortality (Rushworth & Krüger 2014, Reid et al. 2014). The small population size is resulting in low genetic diversity (Krüger et al. 2015) and this may pose a long term threat to the population viability.

Evaluation

Summary

1. Status - the number of breeding pairs and the total population estimate are well below the target levels – therefore target **Not Achieved**.

2. Trend - Not Assessed.

Key Management Actions Key management actions for 2014 and 2015:

- 1. Complete and implement the Monitoring Plan for Bearded Vultures.
- 2. Implement the Biodiversity Management Plan (BMP-S) for Bearded Vultures.
- 3. Undertake an aerial survey of the entire Drakensberg escarpment.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Bearded Vulture Gypaetus barbatus meridionalis	Number of occupied breeding territories in KZN	≥40	15	Not Achieved	Not Assessed



References

- Krüger, S. (Ed.). 2013. Biodiversity Management Plan for the Bearded Vulture (*Gypaetus barbatus meridionalis*) for Southern Africa. Published 8 May 2014 Government Gazette Notice No 37620.
- Krüger, S. 2014a. Bearded Vulture. In M.R. Taylor (Ed). The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg. In press.
- Krüger, S. 2014b. An Investigation into the Decline of the Bearded Vulture, *Gypaetus barbatus* in Southern Africa. PhD thesis, Percy FitzPatrick Institute, University of Cape Town, South Africa, pp 235.
- Krüger, S.C., Allan, D.G., Jenkins, A.R. and Amar, A. 2014. Trends in territory occupancy, distribution and density of the Bearded Vulture *Gypaetus barbatus meridionalis* in southern Africa. Bird Conserv Int 24: 162-177. doi:10.1017/S0959270913000440.
- Krüger, S.C., Wesche, P.L. and Jansen van Vuuren, B. 2015. Reduced genetic diversity in Bearded Vultures, *Gypaetus barbatus* in Southern Africa. Ibis 157: 162–166.
- Reid, T., Krüger, S., Whitfield, P. and Amar, A. 2014. Using spatial analyses of Bearded Vulture movements in southern Africa to inform wind turbine placement. In press (Journal of Applied Ecology).
- Rushworth, I. (Ed.). 2008. KZN Vulture Conservation Strategy. Ezemvelo KZN Wildlife Unpublished report.
- Rushworth, I. and Krüger, S. 2014. Wind Farms Threaten Southern Africa's Cliff-Nesting Vultures, Ostrich 85(1): 13-23. doi:10.2989/00306525.2014.913211.



99

APPENDIX 14.

Biodiversity Asset: Lappet-faced Vulture Torgos tracheliotus

Group	Birds
Common Name	Lappet-faced Vulture
Scientific Name	Torgos tracheliotus
Assessment period	2013
Monitoring period	Annually since 2004
Author	Brent Coverdale, John Cragie and Bill Howells, Ezemvelo KZN Wildlife
Assessment report date	1 December 2014

Strategic Objective

Maintain the Lappet-faced Vulture population at or above minimum target levels (Rushworth 2008).

Biodiversity Target

The management targets for this species are as follows (Howells and Goodman, 2013):

- 1. To restore and maintain a breeding population of a minimum of 20 pairs of Lappet-faced Vultures on State, private and communal land in KZN.
- 2. To ensure a minimum reproductive success rate of 50%.
- 3. To restrict illegal mortalities to less than 2% of the breeding population per annum.

Abundance Parameters

Monitoring is undertaken according to the adopted monitoring plan for Lappet-faced Vulture (Howells and Goodman, 2013) with the following parameters being reported on:

- a. Number of active nests in the KZN population this is equivalent to a minimum estimate of half of the adult breeding population size.
- b. Reproductive success rate this is defined as the number of surviving chicks seen at the end of the breeding season, divided by the number of active nests. Since a maximum of a single chick is fledged per nest, a 100% reproductive success





Table 1. Number of active Lappet-faced Vulture nests and reproductive success rate in KZN during the 2013breeding season (Craigie and Nanni 2014)

	Protected Areas	Private & Communal	Total
Number of active nests	16	1	17
Reproductive success rate (%)	81	100	82

rate would mean that each active nest fledged a chick.

c. Illegal mortalities - illegal killing of vultures to be restricted to less that 2% of the breeding population per annum.

Data are derived primarily from the annual Zululand tree nesting vulture survey undertaken by Ezemvelo (Craigie and Nanni, 2014). The survey attempts to cover all nests in protected areas and private and communal land - this includes all nests that have been active (built or lined), had eggs laid, had chicks, or fledged chicks. Numbers are reported for protected areas and private and communal land separately. Mortalities are recorded when found and submitted by rangers to the regional Animal Population Management Database and Illegal Incidents Database.

Indicator Relevance

Lappet-faced Vultures are a **Vulnerable** (BirdLife 2008 in IUCN 2010) species internationally and evaluated as **Vulnerable** in South Africa (Barnes 2000). However, it has been suggested that this species be uplisted to **Endangered** in South Africa in the revised Red Data list (Taylor pers. comm.). In KZN this species breeding distribution is restricted to the semi-arid savannahs of Zululand where it ranges widely in search of large carcasses to feed on. The achievement of this indicator target is indicative of the extent of suitable habitat (open savannah), with a suitable carrion supply accompanied by little or no illegal harvesting (see pressures and threats).

Assessment

Data adequacy

• **Quality** - Historical estimates of the species abundance are derived from the literature and probably represent a minimum population estimate. Recent survey results are derived from aerial surveys and are of a high quality, but have only recently been formally reported through the annual vulture survey report for 2010, 2011, 2012 and 2013 (Craigie and Nanni 2013). From a time series perspective, the records have been sporadic.

- **Quantity** The full breeding range of the species is covered in the surveys, with all known breeding sites being surveyed. However, since birds move their nests, nests can be missed resulting in an underestimate.
- Overall confidence in estimates:
 - Number of active nests **Low to Moderate** (estimates pre-2004) to **High** (records from 2004 on).
 - Reproductive success rate **Moderate to High**, but records only available from 2009.

Status

The known number of active nests in the province in 2013 was 17, of which 16 were in protected areas and one was on private land (Craigie and Nanni, 2013; Table 1). While foraging takes place over a large area and includes protected areas and private and communal wildlife ranches, breeding activity in the past was only recorded from formal protected areas (Table 1). Breeding activity is now being recorded on private wildlife ranches. Overall provincial reproductive success was 82% comprising 81% in protected areas (n = 16) and 100% on private land (n = 1).

Trend

- **Number of active nests** By the mid-2000s the population had declined to less than half of the estimated size during the 1990s, which in itself represented a major decline from historical levels (Figure 1). During the last decade, however, the number of breeding pairs has shown a steady increase, but there was a decrease in active nests in 2013 in comparison to the preceding two years (Figure 1). A breeding pair was recorded in Ithala Game Reserve in 2006 but has not been recorded since 2007.
- **Reproductive success rate** only five years of reproductive success data has been collected (2009 to 2013) and no trend is evident in these data (Figure 2). The overall reproductive success rate across the last five years is 75%.

Current Pressures and Future Threats

Widespread targeted poisoning of vulture species for the medicinal market might have contributed to







Figure 1: Trend in the number of active Lappet-faced Vulture nests in and outside of protected areas in KwaZulu-Natal (Figure 1a) and trend for the population since 2004 (Figure 1b).

declines in this species. Increasing use of agricultural pesticides may also be a problem, as might be bush encroachment which reduces the availability of suitable foraging habitat. There were no mortalities of Lappet-faced Vulture recorded in 2013 (does not however mean there were no anthropogenically caused mortalities). Historical records are also relatively low with two recorded in 2001 and one in 2005. Detection probability for carcasses is however know to be low.

Evaluation

Summary

- 1. Status
 - The number of active nests in 2013 year is below the target level, therefore target is **Not Achieved**.
 - The reproductive success of the breeding population is 75% therefore target is **Achieved**.
- 2. Trend The number of active nests over the last

nine years is **Increasing**.

3. Illegal Mortalities – No mortalities reported and therefore the target is **Achieved**.

Key Management Actions

Key management actions for 2014 and 2015:

- 1. Strict protection of all known existing and historical nesting sites.
- Continued education of communities regarding the use of vulture parts for medicinal purposes, and the indiscriminate poisoning of vultures to attain products.
- 3. Surveillance of suitable habitat in the remainder of KZN for nesting activity.
- 4. Conduct a more intensive aerial survey using a helicopter and transect flight path.
- 5. Ensure adequate management of elephant populations to ensure that suitable nesting sites are not destroyed.





Figure 2: Reproductive success of Lappet-faced Vultures in and outside of protected areas in KZN; average reproductive success from 2009 to 2013 is 75%.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Lappet-faced Vulture	Number of nests in KZN	≥20	17	Not Achieved	Increasing
tracheliotus	Ars Reproductive success (75%) (proportion of nests over 5 successfully fledging chicks)	Achieved	Stable		
	Anthropogenic mortality of breeding population	<2%	0	Achieved	Not Assessed

References

Barnes, K.N. (ed.) 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Birdlife South Africa. Johannesburg.

Craigie, J. and Nanni, G. 2014. Aerial Survey of Zululand Tree Nesting Vultures, 2013. Ezemvelo KZN Wildlife, Unpublished Report, Pietermaritzburg.

Howells, W.W. and Goodman, P.S. (2013). Ezemvelo KZN Wildlife Monitoring Plan: Lappet-faced Vulture (*Torgos tracheliotos*). Unpublished, Ezemvelo KZN Wildlife, Pietermaritzburg, South Africa.

Rushworth, I (Ed). 2008. KZN Vulture Conservation Strategy 2008-2012. Ezemvelo KZN Wildlife, Pietermaritzburg.



APPENDIX 15.

Biodiversity Asset: White-headed Vulture *Aegypius occipitalis*

Group	Birds
Common Name	White-headed Vulture
Scientific Name	Aegypius occipitalis
Assessment period	2013
Monitoring period	Annually since 2004
Author	Brent Coverdale, John Cragie and Bill Howells, Ezemvelo KZN Wildlife
Assessment report date	1 December 2014

Strategic Objective

The overall objective of the KZN Vulture Conservation Strategy is to ensure that populations of all species of vultures in KZN attain and/or maintain minimum target population levels within a functioning landscape (Rushworth, 2008).

Biodiversity Target

The management targets for this species are as follows (Howells and Goodman, 2013):

1. To restore and maintain a breeding population of a minimum of 20 pairs of White-headed Vultures on state, private and communal land in KZN.

- 2. To ensure a minimum reproductive success rate of 50%.
- 3. To restrict anthropogenic mortalities to less than 2% of the breeding population per annum.

Abundance Parameters

Monitoring is undertaken according to the adopted monitoring plan for White-headed Vulture (Howells and Goodman, 2013) with the following parameters being reported on:

a. Number of active nests in the KZN population – this is equivalent to a minimum estimate of half of the adult breeding population size.





Table 1. Number of active White-headed Vulture nests and reproductive success rate in KZN during the 2013breeding season (Craigie & Nanni 2014)

	Protected Areas	Private & Communal	Total
Number of active nests	6	1	7
Reproductive success rate (%)	100	100	100

- b. Reproductive success rate this is defined as the number of surviving chicks seen at the end of the breeding season, divided by the number of active nests. Since a maximum of a single chick is fledged per nest, a 100% reproductive success rate would mean that each active nest fledged a chick.
- c. Illegal mortalities illegal killing of vultures to be restricted to less that 2% of the breeding population per annum.

Data are derived primarily from the annual Zululand tree nesting vulture survey undertaken by Ezemvelo (Craigie and Nanni, 2014). The survey attempts to cover all nests in Protected Areas and private and communal land – this includes all nests that have been active (built or lined), had eggs laid, had chicks, or fledged chicks. Numbers are reported for protected areas and private and communal land separately. Mortalities are recorded when found and submitted by rangers to the regional Animal Population Management Database and illegal incidents database.

Indicator Relevance

White-headed Vultures are a **Vulnerable** (BirdLife 2008 in IUCN 2010) species internationally and evaluated as **Vulnerable** in South Africa (Barnes 2000). However, it has been suggested that this species be uplisted to **Endangered** in South Africa in the revised Red Data list (Taylor pers. comm.). In KZN this species breeding distribution is restricted to the semi-arid savannahs of Zululand where it ranges widely in search of large carcasses to feed on. The achievement of this indicator target is indicative of the extent of suitable habitat, with suitable carrion supply accompanied by little or no illegal harvesting (see pressures and threats).

Assessment

Data adequacy

 Quality – Historical estimates of the species abundance are derived from the literature and incidental reporting and are no better than minimum estimates. Recent results are derived from aerial surveys, are of a high quality, but have only recently been formally reported through the annual vulture survey report for 2010, 2011, 2012 and 2013. From a time series perspective, the records have been, until recently, sporadic.

- **Quantity** The full breeding range of the species is covered in the surveys, with all known breeding sites being surveyed. However, since birds move their nests, nests can be missed resulting in an underestimate.
- Overall confidence in estimates:
 - Number of active nests **Low to Moderate** (estimates pre-2004) to High (records from 2004 on).
 - Reproductive success rate **Moderate to High**, but records only available from 2009.

Status

The known number of active nests in the province in 2013 was 7, of which 6 were in protected areas and 1 was on private land (Table 1). While foraging takes place over a large area and includes protected areas and private and communal game ranches, breeding activity is now recorded in both formal protected areas and privately owned game ranches (Table 1). Overall provincial reproductive success was 100%.

Trend

- **Number of active nests** The rather sporadic time series data indicates that the breeding population declined to less than one quarter of the estimated size between the late 1990's and the mid 2000s; in the last five years, however, the number of breeding pairs appears to be relatively stable at between 6 and 8 (Figure 1).
- **Reproductive success rate** this is a very short time series (2009 to 2013 only) but during this period the reproductive success rate has fluctuated between 67% and 100% (Figure 2). The average reproductive success rate across five years is 79%.

Current Pressures and Future Threats

Widespread targeted poisoning of vulture species for the medicinal market has contributed significantly to declines in this species. Increasing use of agricultural pesticides may also be a problem, as might be bush encroachment which reduces the availability of





Figure 1b

Figure 1: Trend in the number of active Lappet-faced Vulture nests in and outside of protected areas in KwaZulu-Natal (Figure 1a). Trend for the population since 2004 (Figure 1b).

of suitable foraging habitat. In the medium term, continuously increasing elephant populations in protected areas and other vulture breeding habitat outside protected areas may reduce the availability of suitable nesting trees. The increase in intensive farming of high-value game species within the foraging range of White-headed Vultures is reportedly resulting in increased intolerance of predators, possibly resulting in increased use of poisons (but there is no data to support this). There were no mortalities reported resulting from anthropogenic factors (illegal killings, power line collisions and electrocutions) in 2013.

Evaluation

Summary 1. Status

- The number of active nests counted this year is below the target level, therefore target is Not Achieved.
- The number of chicks fledging per active nest is 100% in 2013 (79% average over five years), therefore target is Achieved.
- 2. **Trend** The number of active nests has shown a large (>75%) decline from the late 1990's to the mid-2000's. However, from 2009 to 2013 the population has remained stable at between six and eight nests, therefore trend is Stable.





Figure 2: Reproductive success of White-headed Vultures in and outside of protected areas in KZN; the average reproductive success over five years is 79%.

3. Illegal Mortalities - No anthropogenic caused mortalities reported in 2013, therefore target Achieved.

Key Management Actions

Key management actions for 2014 and 2015:

- 1. Implementation of the standardised monitoring and reporting programme.
- 2. Strict protection of all known existing and historical nesting sites.
- 3. Continued education of communities regarding

the use of vulture parts for medicinal purposes, and the indiscriminate poisoning of vultures to attain products.

- 4. Surveillance of suitable habitat in the remainder of KZN for nesting activity.
- 5. Conduct a more intensive aerial survey using a helicopter and transect flight path.
- 6. Scavenger support programmes (provision of carcasses) in protected areas with no, or low predator numbers to be maintained and implemented across the full season.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
White-headed Vulture	Number of nests in KZN	≥20	7	Not Achieved	Stable
Aegypius occipitalis	Reproductive success (proportion of nests successfully fledging chicks)	≥50%	100% (79% over 5 years)	Achieved	Not Assessed
	Anthropogenic mortality of breeding population	<2%	0%	Achieved	Not Assessed

References

Barnes, K.N. (ed.) 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Birdlife South Africa. Johannesburg.,

Craigie, J. and Nanni, G. 2014. Aerial Survey of Zululand Tree Nesting Vultures, 2013. Unpublished report, Ezemvelo KZN Wildlife, Pietermaritzburg.

Howells, W.W. and Goodman, P.S. (2013). Ezemvelo KZN Wildlife Monitoring Plan: White-headed Vulture (*Aegypius occipitalis*). Unpublished document, Ezemvelo KZN Wildlife, Pietermaritzburg.

Rushworth, I. (Ed). 2008. KZN Vulture Conservation Strategy 2008-2012. Ezemvelo KZN Wildlife, Pietermaritzburg.



APPENDIX 16.

Biodiversity Asset: White-backed Vulture Gyps africanus

Group	Birds
Common Name	White-backed Vulture
Scientific Name	Gyps africanus
Assessment period	2013
Monitoring period	Annually since 2004
Author	Brent Coverdale, John Cragie and Bill Howells, Ezemvelo KZN Wildlife
Assessment report date	1 December 2014

Strategic Objective

The overall objective of the KZN Vulture Conservation Strategy is to ensure that populations of all species of vultures in KZN attain and/or maintain minimum target population levels within a functioning landscape (Rushworth, 2008).

Biodiversity Target

Management targets for the White-backed Vulture population in KZN are as follows (Howells and Goodman, 2013):

1. To restore and maintain a breeding population of a minimum of 350 pairs of White-backed Vultures on state, private and communal land in KZN.

- 2. To ensure a minimum reproductive success rate of 50%.
- 3. To restrict illegal mortalities to less than 2% of the breeding population per annum.

Abundance Parameters

Monitoring is undertaken according to the adopted monitoring plan for White-backed Vulture (Howells and Goodman, 2013) with the following parameters being reported on:

- a. Number of active nests in the KZN population
 - this is equivalent to a minimum estimate of half





of the adult breeding population size.

- b. **Reproductive success rate** this is defined as the number of surviving chicks seen at the end of the breeding season, divided by the number of active nests. Since a maximum of a single chick is fledged per nest, a 100% reproductive success rate would mean that each active nest fledged a chick.
- c. **Illegal mortalities** illegal killing of vultures to be restricted to less that 2% of the breeding population per annum.

Data are derived primarily from the annual Zululand tree nesting vulture survey undertaken by Ezemvelo (Craigie and Nanni, 2014). The survey attempts to cover all known nests in protected areas and on private and communal land – this includes all nests that have been active (built or lined), had eggs laid, had chicks, or fledged chicks. Numbers are reported for protected areas and private and communal land separately. Mortalities are recorded when found and submitted by rangers to the regional Animal Population Management Database and Illegal Incidents Database.

Indicator Relevance

White-backed Vultures are an **Endangered** (BirdLife International, 2012) species internationally and evaluated as **Vulnerable** in South Africa (Barnes 2000). However, it has been suggested that this species be uplisted to **Endangered** in South Africa in the revised Red Data list (Taylor pers. comm.). In KZN this species breeding distribution is restricted to the semi-arid savannahs of Zululand where it ranges widely in search of large carcasses to feed on. The achievement of this indicator target is indicative of the extent of suitable habitat, with suitable carrion supply accompanied by little or no illegal harvesting (see pressures and threats).

Assessment

Data adequacy

• Quality - Historical estimates of the species abundance are derived from the literature and

incidental records and represent minimum estimates. Recent results are derived from aerial surveys, are of a high quality, but have only recently been formally reported through the annual Vulture Survey report for 2010, 2011, 2012 and 2013. From a time series perspective, the records have been, until recently, sporadic.

- **Quantity** The full breeding range of the species is covered in the surveys, with all known breeding sites being surveyed. However, since birds move their nests, nests can be missed resulting in an underestimate.
- Overall confidence in estimates:
- Number of active nests Low to Moderate (estimates pre-2004) to High (records from 2004 on).
- Reproductive success rate **Moderate to High** but records only available from 2009.

Status

The known number of active nests in the province in 2013 was 509, of which 428 (84%) were in protected areas and 81 (16%) were on private land (Craigie & Nanni 2014; Table 1). While foraging takes place over a large area and includes protected areas and private and communal game ranches, breeding activity is now recorded in both formal protected areas and privately owned game ranches. Overall provincial reproductive success was 83.5%, comprising 82.7% in protected areas and 87.7% on private land. **Trend**

- Number of active nests The medium term time series data indicates that the breeding population appears to have increased from 2004 to 2010 and then stabilised since then (Figure 1). However, there has been a decrease in 2013. This may have been as a result of poisoning events in 2012.
- **Reproductive success rate** this is a very short time series (2009 to 2013 only) but during this period the reproductive success rate appears to have been relatively stable between 2009 and 2013 (69% to 83%) with a sharp decrease in 2012 to 58.2% (Figure 2). The average reproductive

Table 1. Number of active White-headed Vulture nests and reproductive success rate in KZN during the 2013breeding season (Craigie & Nanni 2014)

	Protected Areas	Private & Communal	Total
Number of active nests	428	81	509
Reproductive success rate (%)	82.7	87.7	83.5





Figure 1: Trend in the number of active White-backed Vulture nests in protected areas and private and communal land in KZN.



Figure 2: Trend in the reproductive success of White-backed Vultures in and outside of protected areas in KZN.

success rate across five years is 71.5%. The impact of vulture poisonings on reproductive success may depend on the time of the event. The 2013 event was during the breeding season and thus may have targeted non-breeding individuals.

Current Pressures and Future Threats

Widespread targeted poisoning of vulture species for the medicinal market has contributed significantly to declines in this species at particular colonies (e.g. Mkhuze). Increasing use of agricultural pesticides may also be a problem, as might be bush encroachment which reduces the availability of suitable foraging habitat. 2013 saw the poisoning of at least 43 White-backed Vultures in HluhluweiMfolozi Park and Pongola Nature Reserve, which amounts to 4.2% of the breeding population. Poisoning incidents are sporadic (Figure 3) with no discernible trend, however, there were two notable poisoning events in 2012 and 2013.

Evaluation

Summary

1. Status

- The number of active nests counted this year is above the target level, therefore target Achieved. The number of chicks fledged per active nest is 83.5% (71.5% average over 5 years), therefore the target is Achieved.
- The number of illegal mortalities amounted to 4.2% of the breeding population, therefore the target is **Not Achieved**.
- Trend The number of active nests has remained stable over the last four years, therefore the trend is Stable. There is however evidence of a decline in 2013. The trend in reproductive success is Stable.





Figure 3: Trend in the number of White-backed Vultures found and reported as poisoned in KwaZulu-Natal.

Key Management Actions Key management actions for 2014 and 2015:

- 1. Implementation of the standardised Whitebacked Vulture monitoring plan.
- 2. Strict protection of all known existing and historical nesting sites.
- 3. Continued education of communities regarding the use of vulture parts for medicinal purposes, and the indiscriminate poisoning of vultures to

attain products.

- 4. Surveillance of suitable habitat in the remainder of KZN for nesting activity.
- 5. Conduct a more intensive aerial survey using a helicopter and transect flight path.
- 6. Scavenger support programmes (provision of carcasses) in protected areas with no, or low predator numbers to be maintained and implemented across the full season.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
White-backed Vulture	Number of nests in KZN	≥350	509	Achieved	Stable
Gyps arricanus	Reproductive success (proportion of nests successfully fledging chicks)	≥50%	83.5%	Achieved	Stable
	Anthropogenic mortality of breeding population	<2%	4.2%	Not Achieved	Not Assessed (erratic)

References

- Barnes, K.N. (ed.) 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Birdlife South Africa, Johannesburg.
- BirdLife International 2012. *Gyps africanus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. www.iucnredlist.org. Downloaded on 20 March 2013.
- Craigie, J. and Nanni, G. 2014. Aerial Survey of Zululand Tree Nesting Vultures, 2013. Unpublished report, Ezemvelo KZN Wildlife, Pietermaritzburg.
- Howells, W.W. and Goodman, P.S. (2013). Ezemvelo KZN Wildlife Monitoring Plan: White-backed Vulture (*Gyps africanus*). Unpublished document, Ezemvelo KZN Wildlife, Pietermaritzburg, South Africa.
- Rushworth, I. (Ed). 2008. KZN Vulture Conservation Strategy 2008-2012. Ezemvelo KZN Wildlife, Pietermaritzburg.



APPENDIX 17.

Biodiversity Asset: Wattled Crane *Bugeranus carunculatus*

Group	Birds
Common Name	Wattled Crane
Scientific Name	Bugeranus carunculatus
Assessment period	2013
Monitoring period	Annually since 1981 (nests) and 2001 (population size)
Author	Brent Coverdale, Ezemvelo KZN Wildlife; Tanya Smith, Endangered Wildlife Trust
Assessment report date	1 December 2014

Strategic Objective

To collaboratively conserve a demographically viable subpopulation of Wattled Crane on state, communal and private land in the province, as part of the national vision and goal for the species.

Biodiversity Target

A population of 260 birds comprising 200 breeding (100 pairs) and a minimum of 60 non-breeding floater birds.

Abundance Parameters

Monitoring norms and standards have been developed and adopted in the province (see

McCann, 2014). Data are derived from the annual Wattled Crane monitoring programme which in the province is managed jointly by Ezemvelo and the Endangered Wildlife Trust. The following abundance parameters are reported:

- a. Provincial population estimate (N)
- b. Number of active nests in the KZN population (N_b)
- c. Short, medium and long term rate of change
- d. Hatching, fledgling and breeding success

Indicator Relevance

Wattled Crane are considered Vulnerable





internationally (IUCN 2010) and **Critically Endangered** in South Africa (Barnes 2000). It is also listed on CITES Appendix II. This species is dependent on wetlands, congregating in large numbers at large wetlands on riparian floodplains, but also requiring pristine or semi-pristine, highaltitude wetlands and grasslands in some places for breeding and foraging. This bird's status in KZN is an indicator of the state of medium to high altitude grasslands and wetlands.

Assessment

Data adequacy

- Quality data are collected annually by aerial census (population size and nest activity), and nest activity is collected by District Conservation Officers and personnel from the Endangered Wildlife Trust's Crane Working Group and KZN Crane Foundation. The aerial count cannot be considered a total area count and in which some birds may be missed, surveillance in suitable habitat is also undertaken. In addition, all known nest sites are visited during the nesting season. Not all nest sites might be known. Recent estimates (last ten years), are considered to be of a higher quality than earlier estimates.
- **Quantity** The time series of these data is moderately long for the population size (since 2001), and for the number of nests is longer (since 1981). Estimates have been made annually.

Overall confidence in estimates:

- Population estimate **High** (slight underestimate)
- Number of active nests High.

Status

The overall estimate of Wattled Cranes in KZN in 2013 was 261 individuals, with 68 active pairs.

- Protected areas The total number of birds counted within protected areas was 33, while the number of active pairs found within protected areas was 16.
- Private land The number of birds counted on private and communal land was 228 and the number of active pairs was 52 (Table 1).

Hatching, fledgling and breeding success Trend

Overall the medium trend in the provincial population of Wattled Crane is stable to slightly positive, showing an average growth of 3.3% per annum over the last 13 years (Figure 1).

The long term trend in the number of active nests however is not as positive exhibiting a strongly downward trend (Figure 2).

The medium term trend for active nest is however more positive with upward growth during the last 13 years of 1.3% per annum (Figure 3).

Existing pressures and future threats

The primary threat to this species in KZN is the loss and degradation of grasslands and wetlands as a result of intensified agriculture, alien tree farming, drainage and flooding by dam construction. Other problems include power line collisions, nest disturbance, grass-burning regimes, poisoning, and direct persecution.

Evaluation

Summary

1. Status

- The total size of the population (261) is above target (260) therefore target is **Achieved**.
- The number of active pairs (68) is below the target level (100) therefore target is **Not Achieved**.

2. Trend

- The trend in the population size over the last 13 years is slightly positive exhibiting a 3.3% growth per annum, therefore trend is **Increasing**.
- The number of active nests has shown a 1.3% per annum increase over the last 13 years therefore trend is **Increasing**.

Table 1. The population and nesting status of Wattled Crane in KZN in 2013

	Protected Areas	Private & Communal	Total
Population size	33	228	261
Number of active pairs	16	52	68



Table 2. Summary of breeding information for Wattled Cranes in KZN in 2013

	2012	2013
Total nests	62	68
Nests not monitored	3	11
Total nests monitored	59	57
Nests sites with pairs not present	4	3
Nest sites with no breeding attempt (pairs present)	7	2
Total nests with breeding attempts (incubating)	48 (81%)	52 (91%)
Breeding attempt with unknown outcome	9	4
Breeding attempts with known outcomes	39	48
Total breeding pairs	55	52
Failed breeding attempts	18 (46%)	23 (48%)
Successful breeding attempts	21 (54%)	25 (52%)
Chicks produced (successful plus estimate)	26	29
Chicks produced per breeding pair	0.47 chicks/pair	0.56 chicks/pair
Chicks produced per total nests (pairs with unknown outcome extrapolated to per- centage success rate of the season)	0.42 chicks/pair	0.43 chicks/pair

Table 3. Clutch size and hatching success

	Monitored	Hatched	Failed	Known outcome	Hatching success	Unknown outcome
2 egg clutches	10	8	2	10	0.80	0
1 egg clutches	30	20	3	23	0.66	7
Incubating (unknown clutch size)	17	16	1	17	0.94	0
Total	57	44	6	50	0.80	7

Tarboton *et.al.* (1987) presents hatching success as 0.49 (0.49hatched/clutch laid) over a five year period whereas during 2013, hatching success for KZN is 0.80 or 80% of all eggs laid hatched.

Table 4. Clutch size, fledgling and breeding success

	Monitored	Fledged	Failed	Known outcome	Breeding success	Unknown outcome
2 egg clutches	10	4	6	10	0.40	0
1 egg clutches	30	11	13	24	0.37	6
Incubating (unknown clutch size)	17	10	4	14	0.59	3
Total	57	25	23	48	0.45	9

Tarboton *et.al.* (1987) concluded that the success rate of juvenile Wattled Cranes in KZN was 0.47young/clutch hatched, i.e. 47% of all clutches laid fledged a chick, thus 53% of chicks died prior to fledging due to a variety of factors including fires, hail and merely disappearing. During 2013, breeding success is calculated at 0.45 i.e. 45% of all eggs laid reached fledgling age, which is similar to research conducted in the eighties.





Figure 1: Trend in the population size of Wattled Crane in KZN.



Figure 2: Long term trend in the number of active Wattled Crane nests in KZN; red line indicates active nest target.



Figure 3: Medium term trend in the number of active Wattled Crane nests in KZN.


Key Management Actions Wattled Crane Recovery Programme

The Wattled Crane Recovery Programme is a conservation initiative aimed at preventing local extinction of the Wattled Crane through the collection of abandoned eggs from wild birds and the subsequent release of captive-reared chicks back into the wild. During 2013, no second eggs were collected, as a result of space constraints within the captive facilities participating in the programme. It is essential that all partner organisations continue to support the WCRP.

Key management actions for 2014 include:

- 1. Adopt and implement a standardised monitoring programme.
- 2. Strict protection of all known existing and historical nesting sites.
- 3. Surveillance of suitable habitat in the remainder of KZN for nesting activity.
- 4. Identify and plan rehabilitation of historical nesting sites.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Wattled Crane	Population size	≥260	261	Achieved	Increasing
carunculatus	Number of active nests	100	68	Not Achieved	Increasing

References

Barnes K.N. (ed.) 2000. The Eskom red data book of birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.

Tarboton, W.R., Barnes, P.R. & Johnson, D.N. 1987. The Wattled Crane in South Africa during 1979-1982. In: G.W. Archibald & R.F. Pasquier (eds). Proceedings of the 1983 International Crane Workshop, Baraboo, Wisconsin. International Crane Foundation, pp. 353-361.





APPENDIX 18.

Biodiversity Asset: Blue Swallow *Hirundo atrocaerulea*

Group	Birds
Common Name	Blue Swallow
Scientific Name	Hirundo atrocaerulea
Assessment period	2013/14 breeding season
Monitoring period	Annually since 1987
Author	Athol Marchant, Ezemvelo KZN Wildlife
Assessment report date	1 May 2014

Strategic Objective

To collaboratively conserve a demographically viable sub population of Blue Swallow on state, communal and private land in the province, as part of the national vision and goal for the species.

Biodiversity Target

Eighty active nests by 2020 and 156 active nests (5/8 of the National target of 250) by 2040.

Abundance Parameters

A monitoring plan has been developed and adopted for KZN (Marchant 2012), and data presented here are collected according to the methods and protocols described in that document. A full time monitor was employed by Ezemvelo for the duration of the breeding season. The following abundance parameters are reported:

- a. Number of active nests in the KZN population. Number derived from annual surveys on all PA's and private and communal land – this includes all nests that were lined with fresh mud/grass or with feathers, or have had laid eggs, had chicks, or fledged chicks. Numbers reported for protected areas and private and communal land.
- b. Number of nests that have successfully fledged chicks.
- c. Number of chicks fledged.





Indicator Relevance

Blue Swallows are a Vulnerable (IUCN 2008) species internationally and evaluated as Critically Endangered (Barnes 2000) in South Africa. This intra-Africa migratory species is threatened by destruction, degradation and fragmentation of its grassland and wetland habitats on both its breeding grounds (southern Africa) and its non-breeding grounds (East Africa). The destruction and fragmentation of natural habitat has been found to have led to a rapid reduction of its already small population. In KZN this species has a narrow habitat preference for moist mistbelt grassland where it is found foraging and nesting. The extent of these grasslands has continued to decline through transformation, and the achievement of the target therefore assumes that there are adequate areas of appropriate grassland with suitable nesting and foraging habitat set aside, where land use is compatible with Blue Swallow nesting and foraging requirements.

Assessment

Data adequacy

Quality - data are collected annually by protected area managers, a few property owners, and by a full time monitor in 2013/14. While almost all known nest sites are visited, not all nest sites might be known. The results for the 2010/11 season have been excluded due to insufficient sample effort as only seven of the potential 34 properties were monitored. In the 2013/14 breeding season three properties known to have Blue Swallows were not monitored and this was mainly due to poor weather, and one landowner who will not allow monitoring on his farm. In addition, three properties in the Harding area were not monitored more than once due to distance to this area. Had these properties been included, or visited more often, it is likely that the number of active nests found would have increased slightly. Surveillance in modelled suitable habitat has not been undertaken but is planned to be carried out in the 2014/15 season.

- Quantity The time series of these data is relatively long for the number of active nests (since 1986), but for the other two parameters is shorter (from 2000), and has been inconsistent in its collection and storage.
- Overall confidence in estimates :
 - Number of active nests Moderate to high
 - Number of nests successfully fledging chicks -Moderate
 - Number of chicks fledged Moderate

Status

The number of active Blue Swallow nests in KZN at the end of the 2013/14 nesting season is summarised in Table 1. Of the 27 active nests, three occurred in state protected areas (iMpendle Nature Reserve), while the bulk of nests (89%) occur on private and communal land. Five nests did not successfully fledge chicks, and were all on private land. A comprehensive report on Blue Swallow monitoring up till the 2012/13 breeding season is provided by Marchant (2013).

Trend

The number of active Blue Swallow nests in KZN has declined at a rate of about 3 pairs per 4 years since 1990 (Figure 1), and this species is likely to be the next vertebrate to go extinct in South Africa. However, the trend for the number of active nests in iMpendle Nature Reserve indicates a general increase from 2003/04 to at least 2010/11 (Figure 2). An active nest does not always result in egg laying although in most cases it did. The upward trend at iMpendle Nature Reserve does not necessarily mean that the number of breeding pairs has increased - as it is virtually impossible to identify individual birds it is possible that, as the swallows do not always all breed at the same time, a pair might breed in more than one nest hole. However, when looking at the dates when eggs were first laid and when fledglings

Table 1. Number of active Blue Swallow nests, number of nests successfully fledging chicks and number of chicks fledged in KZN in the 2013/14 season

	Protected Areas	Private & Communal	Total
Number of active nests	3	24	27
Number of nests successfully fledging chicks	3	19	22
Number of chicks fledged	15	49	64





Figure 1: Trend in the number of active Blue Swallow nests in KZN (no reliable data for 2010/11).



Figure 2: Trend in the number of active Blue Swallow nests in iMpendle Nature Reserve.

from those eggs were first seen at each active nest site it is possible that there were at least four breeding pairs in 2013/14.

Current Pressures and Future Threats

Grassland in many parts of its range is being lost to afforestation, intense human settlement, cultivation (especially sugarcane), intensive livestock-farming, intense grazing, intensive grass-burning, and invasion by non-native trees, bracken and bramble. More than 60% of the South African Grassland Biome Habitat has already been irreversibly transformed. One of the most important Blue Swallow breeding sites was recently the subject of a successful land claim and as a result disturbance has increased dramatically, placing this site under threat.

Evaluation Summary

- Status The number of active nests per annum is below the target level – therefore target is Not Achieved.
- 2. **Trend** The number of active nests has shown a virtually continuous decline since 1990 therefore trend is **Declining**.

Key Management Actions

Key management actions for 2014 include:

- 1. Implementation of the Monitoring Plan.
- 2. Employment of at least one full time monitor.
- 3. Continued monitoring of certain sites by Blue Swallow Working Group members.
- 4. Protection of all known existing and historical nesting sites under programmes such as the EKZNW Stewardship Programme.
- 5. Surveillance of potentially suitable habitat in the remainder of KZN for nesting activity.



Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Blue Swallow <i>Hirundo</i> <i>atrocaerulea</i>	Number of nests in KZN	80 by 2020	27	Not Achieved	Declining
	Number of nests that have successfully fledged chicks	No target	22	N/A	Not assessed
	Number of chicks fledged	No target	64	N/A	Not assessed

References

Marchant, A. 2012. Ezemvelo KZN Wildlife Monitoring Plan: Blue Swallow. Unpublished document, Ezemvelo KZN Wildlife, Pietermaritzburg.

Marchant, A. 2013. Status of Blue Swallow (*Hirundo atrocaerulea*) in KwaZulu-Natal: 2012-2013 breeding season, with comparisons to historical data. Unpublished document, Ezemvelo KZN Wildlife, report.





APPENDIX 19.

Biodiversity Asset: African wild dog *Lycaon pictus pictus*

Group	Mammals
Common Name	African wild dog
Scientific Name	Lycaon pictus pictus
Assessment period	2013
Monitoring period	Annually since 2005
Author	Dr. P.S. Goodman and J. Craigie, Ezemvelo KZN Wildlife
Assessment report date	1 December 2014

Strategic Objective

To collaboratively conserve a demographically viable sub population of African wild dogs on state, communal and private land in the province, as part of the national vision and goal for the species.

Biodiversity Target

A provincial wild population comprising 15 free ranging breeding packs of dogs (approximately 200 individuals) in a minimum of two subpopulations.

Abundance Parameters

The following abundance parameters are reported:

a. Number of geographically isolated sub populations in the province.

- b. Number of free ranging breeding packs in the province.
- c. Number of individuals in the KZN population. Number derived from annual surveys on all protected areas and properties – includes a breakdown of adults, yearlings and pups, and reported as of the end of the calendar year.

Indicator Relevance

African wild dogs are an internationally **Endangered** species (IUCN 2008) and **Endangered** in South Africa (Friedman and Daly, 2004). African wild dogs were driven to near extinction in South Africa and KZN by eradication, largely driven by the





perception that their presence was not compatible with domestic stock farming, and perceptions that its hunting method was cruel and decimated game stocks. This is an extremely wide ranging species which requires an abundance of medium sized prey for its existence. The achievement of the target, signals that there are adequate areas set aside with appropriate prey densities, where land owners are tolerant of their presence i.e. there are large enough areas managed with wildlife to support the desired population.

Assessment

Data adequacy

A monitoring plan has been developed and adopted in the province towards the end of the reporting period (Druce 2014). Data are derived and collated from the annual CITES and Rare Large Mammal Survey. These data are in turn derived and summarised from data reported quarterly to the KZN African wild dog Management Group.

- Quality data are collected annually from protected area managers, property owners and from the KZN African Wild Dog Management Group. African wild dogs are extremely mobile and not contained by game fences. Unless individually identifiable, packs attributed to a protected area (PA) or property will sometimes be found outside of the property, so the potential for double counting exists. In addition, African wild dogs are very susceptible to various sources of mortality (e.g. disease, snaring, human persecution), but at the same time can increase very rapidly in suitable areas. Throughout a year therefore, the variance in the population size can be very high. The population estimate for status reporting has been standardised as the estimate of the whole population (incl. young of the year) at the end of each calendar year.
- **Quantity** The population estimate is derived from estimates of all known packs in the province.
- Overall confidence in estimates:
 - Number of sub populations High

• Population estimate - High

Status

The numerical status of the KZN African wild dog population which comprises 6 sub populations and 11 breeding packs in the north east Zululand region is shown in Table 1. African wild dogs occur in the following state protected areas: Tembe Elephant Park, Umkhuze Game Reserve (part of ISWP) and Hluhluwe-iMfolozi Park. Dispersing animals have been occasional visitors to Ithala Game Reserve and Opathe Game Reserve.

Trend

- KZN population the population appears to have has increased rapidly initially (2005 to 2010, reaching a peak of 169 individuals), and over the last three years has declined to just below 120 animals (Figure 1).
- Protected areas the population trend in state protected areas has dominated the provincial pattern and has largely been the cause of the recent decline.
- Private land the established population has remained relatively small averaging 20 animals (excluding dispersing individuals).

Existing pressures and future threats

The primary pressures on this population have been human persecution when packs and dispersing groups leave the security of a protected area; and in the case of uMkhuze Game Reserve incidental losses to snaring. The limited availability of suitable habitat and potential impact upon on the intensive and selective game industry limits the willingness of landowners to accommodate expanding populations. Rabies and canine distemper remain threats, especially given the increasing feral dog populations surrounding protected areas and within the dispersal areas.

Evaluation

Summary

1. **Status** - the number of sub populations, the number of breeding packs and the total population size is below the desired target level, therefore

Table 1.	Numerical	status o	f African	wild	dogs i	n KZN	at the	end of 2013
----------	-----------	----------	-----------	------	--------	-------	--------	-------------

	Protected Areas	Private & Communal	Total
Number of sub- populations	3	3	6
Number of free ranging breeding packs	9	2	11
Population estimate	88	29	117





Figure 1: Trend in the population of African wild dogs in protected areas and on private and communal land in KZN.

target is Not Achieved.

2. **Trend** - the population showed an initial growth rate of 14% per annum over the first 7 years since reporting began, but has over the last three years declined to an equivalent level seen in 2009, therefore trend is **Declining**.

Key Management Actions Key management actions for 2014 and 2015 include:

- 1. Continue intensive monitoring and reporting of all existing free ranging populations.
- 2. Finalise monitoring parameters and finalise the monitoring plan.

- 3. Contribute to the National Biodiversity Management Plan for African wild dogs and develop a KZN strategy for its implementation.
- 4. Facilitate cooperation by adjoining properties to establish contiguous wild dog management/ stewardship land units.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
African wild dog <i>Lycaon pictus</i> <i>pictus</i>	Number of sub populations	≥2	6	Achieved	Stable
	Number of free ranging breeding packs	15	11	Not Achieved	Not Assessed
	Population Estimate	200	117	Not Achieved	Declining

References

- Druce, D. 2014. Ezemvelo KZN Wildlife Monitoring Plan: African Wild Dog (*Lycaon pictus*). Unpublished document, Ezemvelo KZN Wildlife, Pietermaritzburg.
- Friedmann, Y. and Daly, B. (eds.) 2004. Red Data Book of the Mammals of South Africa: A Conservation Assessment: CBSG (SSC/IUCN), Endangered Wildlife Trust, South Africa.



APPENDIX 20.

Biodiversity Asset: Cheetah Acinonyx jubatus

Group	Mammals
Common Name	Cheetah
Scientific Name	Acinonyx jubatus
Assessment period	2013
Monitoring period	2008 to present, annual estimates
Author	Brent Coverdale & John Craigie, Ezemvelo KZN Wildlife
Assessment report date	1 December 2014

Strategic Objective

To collaboratively conserve a demographically viable subpopulation of cheetah on state, communal and private land in the province, as part of the national vision and goal for the species.

Biodiversity Target

No biodiversity target for cheetahs has been recommended or adopted for KZN yet.

Abundance Parameters

Monitoring norms and standards have neither been developed nor adopted in the province. Data are derived from the annual CITES and Rare Large Mammal Survey which attempts to cover all properties having wild populations. The following abundance parameters are reported:

- a. The number of properties having cheetah.
- b. Number of individuals in the KZN population.

Indicator Relevance

Cheetahs are considered to be **Vulnerable** Internationally (IUCN, 2008) and **Vulnerable** in South Africa (Friedman and Daly, 2004). They are listed on CITES Appendix I. The achievement of the target, shows that there are adequate areas with appropriate prey densities set aside, where land owners are tolerant of their presence. Therefore there are large enough areas managed with wildlife to support the desired population.





Assessment

Data adequacy

- Quality data are collected annually from protected area (PA) managers and private property owners via the Annual CITES and Important Vertebrate Species Survey. Since cheetah surveys are complex and manpower intensive, these are seldom undertaken. Besides small populations on small properties, population estimates are largely derived from protected area managers and land owner observations and from this the population size is estimated. Data quality is therefore rated as **low**.
- **Quantity** The CITES Survey combined with research project data and incidental sightings from throughout the province have resulted in a moderate but consistent coverage of the province. Data quality in terms of distribution and number of records is therefore rated as **moderate**.

Overall confidence in estimates:

- Number of populations Moderate to High
- Population estimate Low to Moderate.

Status

- Protected areas Two protected areas in KZN have cheetahs. Overall the population estimate is 36, Hluhluwe-iMfolozi Park with a guessed population of 30 and Umkhuze with a population of 6 (Table 1).
- Private land Eight private properties have reported cheetahs. Overall, the population estimate is 49, with population sizes per property varying from 1 to 22.
- Cheetahs were found on 10 protected areas and private properties in the province and the population size was estimated as 85.

Trend

Trend data is only available for 6 years.

- Protected areas The number of PAs reporting cheetah populations has not changed. There has been a slight decrease in the population size since 2010.
- Private land The number of private properties

reporting cheetah has decreased to 10, in one instance due to fence-dropping between neighbouring properties rather than a genuine loss of a population (Figure 1a), while the population estimate on private and communal land has increased slightly (from 43 to 49) (Figure 1b).

• Overall the population is thought to have declined from 93 to 85 (Figure 1b) and has demonstrated a continual decline since 2010.

Current Pressures and Future Threats

The primary pressures and future threats to this population are speculated to be:

- Disease primarily canine distemper.
- Illegal hunting primarily illegal killing of problem animals and the illegal hunting of animals for skins.
- Competition Cheetahs compete with and are killed by lions, which are increasing in KZN.

Evaluation

Summary

- 1. **Status** since no provincial target has been accepted, a status evaluation cannot be undertaken **Not evaluated.**
- 2. **Trend** the population size and distribution appears to be decreasing in the short term (last 4 years) therefore trend is **Declining**.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. In collaboration with the designers of the national management plan, determine a provincial target for cheetahs.
- 2. Re-establish populations in suitable large protected areas such as Ithala.
- 3. Continue with the surveillance and monitoring of the provincial population.
- 4. Intensify monitoring of key populations such as Hluhluwe-iMfolozi Park and Phinda.
- 5. Maintain strict surveillance on illegal hunting of cheetah.

	Protected Areas	Private & Communal	Total
Number of populations	2	8	10
Population estimate	36	49	85

Table 1. Numerical status of cheetah in KZN at the end of 2013









Figure 1b

Figure 1. Trend in (a) the number of protected areas and private and communal properties with cheetahs and (b) population size of cheetah in state protected, and private and communal land in KZN.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Cheetah Number of individuals	No target	85	N/A	Declining	
Jubatuo	Number of properties	No target	10	N/A	Increasing, but decline in 2013

Reference

Friedmann, Y. and Daly, B. (eds.) 2004. Red Data Book of the Mammals of South Africa: A Conservation Assessment. CBSG (SSC/IUCN) Endangered Wildlife Trust, South Africa.



APPENDIX 21.

Biodiversity Asset: Lion Panthera leo

Group	Mammals
Common Name	Lion
Scientific Name	Panthera leo
Assessment period	2013
Monitoring period	2004 to present
Author	Dr. Peter Goodman, Conservation Solutions; John Craigie, Ezemvelo KZN Wildlife
Assessment report date	24 July 2014

Strategic Objective

To collaboratively conserve a demographically viable sub population of lions on state, communal and private land in the province, as part of the national vision and goals in the draft Biodiversity Management Plan: Species lion.

Biodiversity Target

No biodiversity target for lions has been recommended or adopted for KZN yet.

Abundance Parameters

Monitoring norms and standards have neither been developed nor adopted in the province. Data are derived from the annual CITES and Rare Large Mammal Survey which attempts to cover all properties having wild populations. The following abundance parameters are reported:

- a. The number of properties having lions.
- b. Number of individuals in the KZN population.

Indicator Relevance

Lions are considered to be **Vulnerable** Internationally and **Vulnerable** in South Africa (Friedman and Daly, 2004). They are listed on CITES Appendix II. The achievement of the target signals that there are adequate areas set aside with appropriate prey densities, and where land owners are tolerant of their presence i.e. there are large enough areas managed with wildlife to support the desired population.





Assessment Data adequacy

- Quality-data are collected annually from protected area managers and private property owners via the Annual CITES and Important Vertebrate Species Survey. Lion surveys are manpower intensive, nevertheless population estimates are normally derived using call-up and marking techniques or on small properties. Population estimates are largely derived from protected area manager and land owner observations and from this the population size is estimated. Data quality is therefore rated as Moderate to High.
- **Quantity** The CITES Survey combined with research project data and incidental sightings from throughout the province have resulted in consistent coverage of the province. Properties with lions are well known owing to the rigorous permitting requirements. Data quality in terms of distribution and number of records is therefore rated as **High**.
- Overall confidence in estimates:
 - Number of populations High
- Population estimate Moderate

Status

- Protected areas three state protected areas in KZN have an estimated 168 lions, comprising Hluhluwe-iMfolozi Park (120), Tembe Elephant Park (44) and uMkhuze with a newly introduced population of 4 (Table 1).
- Private land seven private properties have reported lions. The population estimate is 92 (Table 1), with population sizes varying from 3 to 35.
- Lions were found on 10 protected areas and private properties in the province and the population size was estimated as 260 (Table 1).

Trend

- Trend data are available for 10 years.
- Protected areas The number of protected areas reporting lion populations is now three with the addition of uMkhuze Game Reserve. The population size however has shown an apparent decline in 2013 (Figure 1), driven by the reduced

estimate for lions in Hluhluwe-iMfolozi Park (200 in 2012 and 120 in 2013). However, the change in the Hluhluwe-iMfolozi Park population is likely to represent primarily a change/improvement in estimates rather than a real decline of such magnitude, and the 2013 estimate of 120 is thought to be the best estimate available for some time while the estimate of 200 for 2010 through 2012 is now believed to be an overestimate (Dave Druce, pers. comm.). The trend graph will be adjusted in the 2014 report to reflect the revised estimates.

- Private land The number of private properties reporting lions has increased from 3 to 7, while the population estimate on private and communal land has increased from 33 to 92 over the last 10 years (Figure 1).
- Overall the KZN lion population has increased from 115 to 260 in the last 10 years (Figure 1).

Existing Pressures and Future Threats

The primary pressures and future threats to this population are speculated to be:

- Disease primarily bTB and canine distemper.
- Inbreeding small populations are vulnerable to inbreeding. The population size distribution in KZN is heavily weighted towards populations of less than or equal to 50 (Figure 2) making these populations extremely vulnerable to inbreeding; there is only one population of over 100 animals.
- Illegal hunting illegal killing of problem animals and the illegal hunting of animal for skins are thought to be minor threats; however, incidental snaring in Umkhuze Game Reserve is likely to have an impact on population growth.

Note: As a top predator lions have a direct impact on the abundance of other predators notably leopards, cheetahs, African wild dogs and hyenas. Cheetahs (**Vulnerable**) and African wild dogs (**Endangered**) occur sympatrically with lions in protected areas. Both these species are the focus of intensive conservation programmes which would be hampered by excessive co-occurring lion populations.

Table 1. Numerical status of lions in KZN at the end of 2013

	Protected Areas	Private & Communal	Total
Number of populations	3	7	10
Population estimate	168	92	260







Protected Areas
Private Properties



Figure 1b





Figure 2: Size class distribution of properties with lions in KwaZulu-Natal.

Evaluation

Summary

- 1. **Status** since no provincial target has been accepted, a status target evaluation cannot be undertaken therefore target **Not Evaluated**.
- 2. **Trend** the population size and distribution has increased in the medium term (last 10 years), therefore trend is **Increasing**.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Determine a provincial target for lions.
- 2. Continue with the surveillance and monitoring of the provincial population.
- 3. Maintain strict surveillance on illegal hunting of lions.
- 4. Contribute to the national Biodiversity Management Plan: Species for lions.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Lion <i>Panthera leo</i>	Population size	No target	260	N/A	Increasing
	Number of properties with lions	No target	10	N/A	Increasing

Reference

Friedmann, Y. and Daly, B. (eds.) 2004. Red Data Book of the Mammals of South Africa: A Conservation Assessment. CBSG (SSC/IUCN), Endangered Wildlife Trust, South Africa.





APPENDIX 22.

Biodiversity Asset: Leopard Panthera pardus

Group	Mammals
Common Name	Leopard
Scientific Name	Panthera pardus
Assessment period	2013
Monitoring period	2004 to present, annual estimates
Author	Brent Coverdale & John Craigie, Ezemvelo KZN Wildlife
Assessment report date	1 December 2014

Strategic Objective

To collaboratively conserve a demographically viable subpopulation of leopards on state, communal and private land in the province, as part of the national vision and goal for the species.

Biodiversity Target

No biodiversity target for leopards has been adopted for KZN yet. In the interim, a target of 500 individuals in a single connected population is adopted.

Abundance Parameters

Monitoring norms and standards have neither been developed nor adopted in the province. Data are derived from the annual CITES and Rare Large Mammal Survey as well as the Panthera/Ezemvelo KZN Wildlife Survey (Balme et. al. 2013).

- The following abundance parameters are reported:
- 1. Number of individuals in the KZN population.

Use and use related parameters include:

- 2. Total number and sex of legally hunted leopard.
- 3. Body length of hunted leopard.

The collection of data pertaining to illegal utilisation as well as the issuance of and implementation of problem animal permits is being collected and will be reported upon in future assessments.

Indicator Relevance

Leopards are **Near Threatened** internationally (IUCN, 2008) and **Least Concern** in South Africa (Friedman and Daly, 2004). In KZN the population was probably at its lowest between the 1960's





Protected Area	Population Estimate (confidence limits)	Source	Date of Last Estimate
Coastal Forest Reserve	2	Conservation Manager estimate	2013
Maloti-Drakensberg Park World Heritage Site	0	Occasional sightings for this park are recorded but no confirmation that there are resident animals	
Eastern Shores (iSWP)*	20	Eco-advice estimate	2012
Hluhluwe-iMfolozi Park	72 (53-90)	Panthera survey	2013
Ithala Game Reserve	28 (24-31)	Panthera survey	2013
Makasa Nature Reserve	3	Conservation Manager estimate	2012
uMkhuze Game Reserve (iSWP)*	40 (29-45)	Panthera survey	2013
Ndumo Game Reserve	1 (1-3)	Eco-advice estimate	2013
Nyalazi (iSWP)*	10	Eco-advice estimate	2012
Phongola Nature Reserve	7 (5-10)	Eco-advice estimate	2013
Sodwana/Ozabeni (iSWP)*	12	Eco-advice estimate	2012
Tembe Elephant Park	14 (14-18)	Internal survey	2013
Weenen Nature Reserve	1	Conservation Manager estimate	2013
eMakhosini-Ophathe Heritage Park	5	Conservation Manager estimate	2013
False Bay Park (iSWP)* (* iSimangaliso Wetland Park)	5	Conservation Manager estimate	2012

and late 1970s, only surviving in Hluhluwe-iMfolozi Park and potentially in other inaccessible parts of the province. The demise of the KZN population is speculated to be a result of human persecution due to perceived incompatibility with domestic stock farming, traditional hunting for tribal regalia and disease. During the early 1980s leopards were reestablished in uMkhuze Game Reserve and on the Eastern Shores of St Lucia. In conjunction with the exponential growth of 'game ranching' operations these populations have expanded and grown throughout the province and north eastern Zululand

region in particular. The achievement of the target, shows that there are adequate areas set aside with appropriate prey densities, where land owners are tolerant of their presence. Therefore there are large enough areas managed with wildlife to support the desired population.

As the population has expanded in Zululand, so its potential for exploitation through the hunting industry has become a reality. A hunting quota is issued by the South African Department of Environmental Affairs to hunt male leopards on permits issued by provincial authorities. These quotas are based



on estimates and recommendations made in the national leopard Population and Habitat Viability Assessment (PHVA) (Daly, et. al., 2005). Clearly it is important to monitor the execution of this quota and its impact. One expects that the population is being hunted sustainably, that trophy quality (in this case size as reflected by total length) would either be constant or increasing.

Assessment

Data adequacy

- Quality data are collected annually from protected area managers (indicated in Table 1) and private property owners via the annual CITES and Important Vertebrate Species Survey, as well as population estimates given from hunting licence applications. Since leopard surveys are complex and manpower intensive, these are seldom undertaken. Population estimates are largely derived from PA manager and land owner observations and from this the population size is estimated. Data quality for the population estimate is therefore rated as low, except in instances where camera trap surveys have been undertaken, wherein the data quality is considered moderate to high. Hunting permit returns are the source of data for the number of legally hunted animals in the province. This includes the measurements reported upon which are included as a permit condition. - data quality is rated as moderate to high.
- **Quantity** The CITES Survey combined with hunting permit applications and returns, research project data and incidental sightings from through out the province have resulted in a moderate but consistent coverage of the province. Data quality in terms of distribution and number of records is therefore rated as moderate. Data quality with respect to hunting returns has improved in the last 3 years. Prior to this it was low. Currently data quality is rated as **Moderate**.
- Overall confidence in estimates:
- Population estimate Moderate to Low.
 of
 Table 2. Numerical status of leopard in KZN at the end of 2013

• Hunting data - Moderate to High.

Status

The numerical status of the KZN leopard population at the end of 2013 is summarised in Table 2.

The number of leopards hunted in KZN during 2013 was six of the potential quota allocation of seven (Table 3). Of these, four were males and two were females (Table 3).

Trend

- Protected areas the population appears to have remained relatively constant within the error of the estimation technique used. The average population over the 10 years reported is 203. The camera trap survey suggests an average of 8.4 leopards/100 km² which would equate to a provincial population of 270 individuals, somewhat less than the 220 reported by the 10 protected areas providing returns indicating the presence of leopards.
- Private land the population appears to have increased markedly from 2004 to 2013 with the population now estimated to be nearly twice that that found in protected areas. However, this apparent trend must be seen in the light of how the population estimates are derived. Records indicate that the number of private and communal properties declaring population estimates has increased from 17 in 2004 to 81 in 2013. The 2013 returns show a decrease from the 94 in 2012. The camera trap surveys suggest a much lower average leopard density of 5.04 leopards/100 km² in comparison to protected areas. This average is extrapolated to estimate the population on privately owned land suggests a population of 117 individuals. This is considerably lower than the reported 415 individuals. In the event that leopard populations occurred at the same densities as within the provinces protected areas, the resulting estimate of 195 individuals is still considerably less than the number reported. While there is little doubt that the distribution and abundance of leopards in northern Zululand has increased

	Protected Areas	Private & Communal	Total
Population estimate	220	415	635

 Table 3. Number of leopards hunted under permit in KZN during 2013

	Males	Females	Total
Number hunted	4	2	6





Protected Area Private & Communal

Figure 1: Trend in the population of leopards in protected areas and on private and communal land in KZN.

markedly over the last 30 years, it is doubtful whether the increase in the KZN population illustrated in Figure 1, is a true reflection of the population increase over the last 8 years.

Current Pressures and Future Threats

The primary pressures and future threats to this population are speculated to be:

- **Disease** primarily canine distemper.
- Illegal killing legal hunting is strictly controlled in the province, however the illegal killing of problem animals and the illegal hunting of animals for skins (religious and cultural ceremonies) would appear to be the main threats to the population. There are strong signs that this increased conflict is resulting in less tolerance for free ranging leopards in the agricultural landscape and within the intensive game breeding industry. The Red Meat producers Association have expressed concern with the leopard density populations and its impact upon cattle farming in Zululand.
- Hunting legal hunting in the province has not achieved the allocated quota in the last 8 years. Only in the last three years has more than half the quota been achieved (Figure 2a). There has been an effort to target only male leopards but females are still being hunted (Figure 2a). In addition, the small sample of body size measurements from males hunted indicates a decline in size, although this is not statistically significant (Figure 2b). Ezemvelo KZN Wildlife supports the notion of sustainable utilisation. More effective control measures are required to ensure that individual leopards are hunted on the

property to which the permit has been issued and that the measurements provided are for the specific individual that has been hunted.

Evaluation

Summary

- 1. **Status** the provincial population is estimated to be above the interim target therefore target is **Achieved**. However, as noted in the text there is a possibility of over-reporting by private landowners.
- 2. **Trend** the population size and distribution appears to have increased in the long term and is at least stable in the short term (last 5 years) is **Increasing** to **Stable**.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Continue with the monitoring of the provincial population in collaboration land owners and the hunting industry and improve on this through the development of a monitoring plan.
- 2. Intensify monitoring of key populations such as Hluhluwe-iMfolozi Park, uMkhuze, Ithala, Tembe and Munyawana Game Reserves, through the Panthera/Ezemvelo KZN Wildlife monitoring project.
- 3. Use densities from published surveys to obtain a better estimate of the provincial population size.
- 4. Improve on the quantity and quality of data from legal hunts.
- 5. Maintain strict surveillance on illegal hunting of leopards.





Figure 2b

Figure 2: Trend in the number leopards legally hunted (a), and the size of male leopards legally hunted in KZN (b).

Species	Abundance Parameter	Target	2013 Measure	Target Assessment	Trend Assessment
Leopard Panthera pardus	Population size	500+	635	Achieved	Stable to Increasing

References

- Daly, B. Power, J. Camacho, G. Traylor-Holzer, K. Barber, S. Catterall, S. Fletcher, P. Martins, Q. Martins, N. Owen, C. Thal, T. and Y. Friedmann (editors). 2005. Leopard (*Panthera pardus*) PHVA. Workshop Report. Conservation Breeding Specialist Group (SSC / IUCN) / CBSG South Africa. Endangered Wildlife Trust.
- Balme, G. Chapman, S. Kelly, C. Morgan, S. Hue, C. Pickering, C. Barichievy, C. Bodasing, T. Druce, D. Craigie, J. Hughes, S. and P. Goodman. 2013. KwaZulu-Natal Leopard Monitoring Project 2013 Annual Report. Unpublished Monitoring report.



APPENDIX 23.

Biodiversity Asset: White Rhinoceros Ceratotherium simum simum

Group	Mammals
Common Name	White rhinoceros
Scientific Name	Ceratotherium simum simum
Assessment period	2013
Monitoring period	2004 to present, annual estimates
Author	Dr. P.S. Goodman, Conservation Solutions; John Craigie, Ezemvelo KZN Wildlife, & A.J. Conway, Ezemvelo KZN Wildlife
Assessment report date	7 April 2014

Strategic Objective

To collaboratively conserve a demographically viable sub population of white rhinos on state, communal and private land in KwaZulu-Natal.

Biodiversity Target

No biodiversity target for white rhinos has been adopted for KZN yet. In the interim, a population target of 3000 individuals in at least 5 sub populations (protected areas) and a number of smaller sub-populations on private and communal land is proposed.

Abundance Parameters

Monitoring norms and standards for white rhinos have neither been developed nor adopted in the province.

Data are derived from the annual CITES and Rare Large Mammal Survey. The status of Protected Area populations are reported on, three times each year to the KZN Rhino Management Group. Larger populations are normally counted from the air, (fixed wing aircraft or helicopter) or ground based line transect sampling, while the size of smaller populations are derived from known individual and group counts. The following abundance parameters are reported:

- a. Number of discrete sub populations;
- b. Number of individuals in the KZN population. Number derived from annual surveys on all protected areas and private properties.





Indicator Relevance

Assessment

Data adequacy

White rhinos are considered a Near Threatened species internationally (IUCN 2012) and Least Concern in South Africa (Friedman and Daly, 2004). This species was driven to near extinction in South Africa and KZN by hunting as human populations expanded their settlements and agricultural practices onto the fertile plains and valleys of the province. By the 1950s the only populations remaining in the country were to be found in the iMfolozi Game Reserve and adjacent Corridor land. White rhinos occur naturally at moderate densities in semi-arid savannah. The achievement of the population target shows that there are adequate areas set aside with appropriate habitat for white rhinos. Land owners are accepting and able to benefit from their presence on their land and the appropriate levels of protection for white rhinos are in place.

· Quality - data are collected annually from

protected area managers and private and

communal property owners. Population estimates are pinned to the end of the calendar year. Animals are contained within the properties so no double counting of rhinos occurs.

- **Quantity** The provincial population estimate is derived from estimates of all known sub-populations in the province.
- Overall confidence in estimates:
 - Number of sub populations **High** (little error under estimate)
 - Provincial population estimate Moderate to High (<10% error)

Status

The KZN white rhino population at the end of 2013, which comprises 13 sub-populations in state protected areas and 38 sub-populations on private and communal land throughout the province, comprises 2 871 animals in protected areas and 553 animals on private and communal land (Table 1). **Trend**

The population trend is evaluated for the 10 year period from 2004 to 2013.

Table 1. Numerical status of white rhinos in KZN at the end of 2013

	Protected Areas	Private & Communal	Total
Number of sub populations	13	38	51
Population estimate	2 871	553	3 424



Protected Area Private

Figure 1: Trend in the population of white rhinos in protected areas and on private and communal land in KZN.





Figure 2: Trend in the poaching rate (proportion of the population) of white rhinos in KZN.

- **Protected areas** the population has grown steadily between 2004 (2284) and 2013 (2871) at an average of 2.6% per annum.
- **Private land** the population is much smaller than on state land but showed a much greater initial growth from 193 in 2004 and then peaked at 655 in 2011. Subsequent to this, the population has declined to 553, which amounts to an 8.5% per annum decline over the last three years.
- Overall the provincial population grew at an average rate of 3.7 % per annum over the last nine years, slowing to 3.1% if averaged over the last five years and slowing further to 1.5 % per annum if averaged over the last three years. In 2013, the population of white rhinos showed a decline from that estimated in 2012.

Existing Pressures and Future Threats

The primary pressure on, and future threat to, this population is that of poaching. Poaching was generally low prior to 2008, but this situation has changed radically in the last five years indicating an exponential increase in poached mortality (Figure 2). In 2013 the poaching rate was the highest on record amounting to 2.44% of the population.

Regulated legal hunting is not considered a threat to the population. Data available for the period 2005 to 2013 indicate an average harvest rate of 20 per annum, with 2010 and 2012 falling well below this figure (Figure 3). This harvest has declined since its peak in 2007 and is easily sustained by the current population. In 2013, the number hunted



Figure 3: Trend in the number of permitted white rhino hunts since 2005.

was equivalent to 0.44% of the population which is considered sustainable, especially given that the revenue generated from hunting is ploughed back into rhino protection and habitat management.

Evaluation

Summary

- 1. **Status** the number of sub-populations making up the KZN white rhino population exceeds the target level. In addition the overall provincial population size is in excess of the minimum target proposed, therefore target is **Achieved**.
- 2. **Trend** the overall provincial population has shown slow but consistent growth over the nine years from 2004 to 2012. 2013 showed a decline as a result of the decline in the population found on private and communal land - **Stable/ Declining**.¹

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Improve capacity and level of legal compliance minimise poaching risk.
- 2. Complete the revision of white rhino management strategy and submit for adoption and implementation.
- 3. Intensify the status monitoring and reporting of all existing free ranging populations.
- 4. Finalise monitoring parameters and draft monitoring plan.
- 5. Allocate scarce resources available for rhino conservation to the most strategic and critical rhino conservation management actions.
- 6. Develop norms and standards for hunting permit allocation and monitoring.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
White rhinoceros	Population size	3000+	3 424	Achieved	Stable/ Declining
Ceratotherium simum simum	Number of sub populations in state protected areas	5+	13	Achieved	Stable
	Poaching rate	≤2%	2.44%	Not Achieved	Worsening

¹ It is important to note that references to growth rates and trend in this report refer to actual provincial population trends and growth rates not taking account of live removals and subsequent translocations out of the province.

Reference

Friedmann, Y. and Daly, B. (eds.) 2004. Red Data Book of the Mammals of South Africa: A Conservation Assessment. CBSG (SSC/IUCN) & Endangered Wildlife Trust, South Africa.





APPENDIX 24.

Biodiversity Asset: Black Rhinoceros Diceros bicornis minor

Group	Mammals
Common Name	Black rhinoceros
Scientific Name	Diceros bicornis minor
Assessment period	2013
Monitoring period	2003 to present, annual estimates
Author	Dr. P.S. Goodman, Conservation Solutions; A.J. Conway, Ezemvelo KZN Wildlife
Assessment report date	2 April 2014

Strategic Objective

To conserve a free ranging viable meta-population of black rhinoceros, throughout its historical range in KZN, supported through a shared commitment on private, community and state land.

Biodiversity Target

To conserve and sustainably manage a free ranging meta-population of black rhinoceros comprising at least 740 individuals throughout its historical range in KZN, supported through a shared commitment on private, community and state land (Conway and Goodman, 2013).

Abundance Parameters

Refer to Goodman (2013) for full monitoring and reporting protocols and standards for the black rhino population in the province. Only two parameters are reported here:

- a. Number of discrete sub populations.
- b. Number of individuals in the KZN population. Estimate derived from annual surveys in all protected areas and private and communal properties on which they occur.





	Protected Areas	Private & Communal	Total
Number of sub populations	10	8	18
Population estimate	348	137	485

Indicator Relevance

Black rhinoceros (ssp. minor) world-wide is a Critically Endangered species (Emslie 2012), which is evaluated as Vulnerable in South Africa (Friedmann and Daly, 2004). It was driven to near extinction in South Africa and KZN by hunting as human populations expanded their settlement and agricultural practices onto the fertile plains and valleys of the province. By the early 1960's the only populations remaining in the country were to be found in the current Hluhluwe-iMfolozi Park, uMkhuze Game Reserve and the Makhatini flats adjacent to the latter. Black rhino occur naturally at low densities and the achievement of the population target, signals that there are adequate areas with suitable habitat of appropriate size set aside for its survival, where land owners are tolerant of their presence, and where the appropriate levels of protection can and are provided.

Assessment

Data adequacy

• **Quality** - data are collected annually from protected area managers and private and communal property owners. Population estimates are pinned to the end of the calendar year. Animals are contained within the properties so no double counting of rhino's occurs.

- Quantity The provincial population estimate is derived from estimates of all known sub populations in the province.
- Overall confidence in estimates:
- Number of sub populations High (no error)
- Provincial population estimate **High** (<2% error)

Status

The numerical status of the black rhino in KZN at the end of 2013, which comprised 10 sub-populations in protected areas and 8 sub populations on private land, is estimated to be 485 (Table 1).

Trend

- Provincial population the population has shown a mean annual growth rate of 2.5% over the preceding 10 years, 0.96% over the preceding 5 years and 0.62% growth over the preceding year. Clearly the growth rate has slowed dramatically over the review period, most likely in response to an increase in poaching mortality which has risen from 0.7% to 1.2% and 1.4% over the same time periods.
- Protected areas the population of black rhino in protected areas has shown a small decline in the 10 year interval from 2003 to 2013 (Figure



Figure 1: Trend in the population size of black rhinos in protected areas, and on private and communal land in KZN.



1). These declines are most likely explained by the expected decline resulting from harvesting to establish new populations, in conjunction with possibly competition for browse (HluhluweiMfolozi Park, Ndumo, uMkhuze), loss of habitat to human invasion (Ndumo), poaching loss (Opathe, Tembe and Western Shores) and overestimation of initial carrying capacity (Eastern Shores, Tembe Elephant Park and Western Shores).

 Private land and communal land - the population on private and communal land has grown steadily over the review period (both as a function of population establishment and growth), from zero in 2003 to 137 at the end of 2013 (Figure 1).

A summary of the performance statistics (Table 2) indicates the following:

- Three sub-populations (Weenen, Ithala, Munyawana and Zululand Rhino Reserve) have exceeded the 5 % growth rate target.
- Three sub-populations (Hluhluwe-iMfolozi Park, Tembe and uMkhuze) have not achieved the 5% growth rate target but have experienced positive growth.
- Four sub-populations (Eastern Shores, Western Shores, Ndumo and Ophate) have experienced negative growth, with the Ophate population having gone extinct in the period under review.
- The primary causes of poor performance are low birth rates (five reserves), high natural mortality rates (Eastern Shores, Western Shores, Ndumo) and high poaching rates (Weenen, Tembe, Eastern Shores, Western Shores, Ndumo).
- The populations with the best performance had the highest live removal rates.

Existing Pressures and Future Threats

The primary pressures and future threats to this population are poaching. This was relatively low

(<1% of the population over last 11 years) but the mean annual poaching rate for the last 3 years is 1.4%, which exceeds the 1% per annum threshold set by the KZN Black Rhino Management strategy (Conway and Goodman, 2013). This is now affecting the productivity of the population significantly and with it, the ability of KZN to achieve its population growth target.

Note: there are no perceived risks to biodiversity with the continued growth and expansion of this population. However, the fight against poaching is diverting scarce resources away from other important conservation programmes.

Evaluation

Summary

- Status the total population size is below the desired target level, therefore target is as yet Not Achieved.
- 2. **Trend** the population trend has shown an average **positive** growth rate of 2.2 % per annum over the last 10 years. However, this falls short of the growth rate target of 5 % per annum, therefore growth target is **Not Achieved**.

It must be noted that the populations that are being "harvested" for removals are achieving this growth rate over the 10 year period - see Table 2.

Key Management Actions

Key management actions for 2014 must be seen in the light of the current manageable limitations to the population size and its growth rate which in order of priority are:

- 1. Minimise poaching loss minimise poaching risk.
- 2. Secure existing and acquire more land for black rhino conservation
 - a. Two Ezemvelo protected areas with suitable black rhino habitat must be properly secured for rhino population establishment - Ndumo (particularly the east bank of the Phongolo River) and EOHP.
 - b. Continue to actively support the black rhino range expansion programme - in particular support public/private/community partnerships.
- 3. Implement highest level of monitoring standards in all black rhino reserves.
- 4. Allocate scarce resources available for rhino conservation to the most strategic and critical rhino conservation management actions.





 Table 2. Long term summary statistics for individual sub-populations ten years prior to and including 2013.

 Performance colour codes: Green – good, Yellow – moderate, Red - poor. Grey - Private properties

Protected Area	Nt	Nt- ₁₀	Rem ₁₀	Rem. (% ann⁻¹)	rn (% ann⁻¹)	Mean Nat. Mort. Rate	Mean Poaching Rate	Mean Birth Rate
Ithala	41	39	32	7.66	8.72	0.033	0.000	0.30
Weenen	12	9	5	4.47	7.78	0.037	0.020	0.38
Hluhluwe- iMfolozi	192	230	107	4.82	2.96	0.024	0.003	0.16
Tembe	16	19	7	3.93	1.05	0.034	0.022	0.16
Mkhuze	48	60	13	2.13	0.00	0.042	0.004	0.24
Eastern Shores	10	23	4	1.67	-4.78	0.045	0.020	0.10
Western Shores	4	10	0	0.00	-6.00	0.045	0.020	0.07
Ndumo	7	9	0	0.00	-7.78	0.082	0.042	0.13
Munyawana GR ¹	29	15	1	0.44	5.33	0.029	0.009	0.28
Zululand RR ²	36	21	0	0.00	3.86	0.034	0.000	0.22

¹ Munyawana Game Reserve statistics calculated for the nine years post release (2004 - 2013)

² Zululand Rhino Reserve statistics calculated for the eight years post release (2005 - 2013)



Figure 2: Trend in the number of black rhinos recorded as being poached on private and communal land and state protected areas over the last ten years. NB: data adjusted to reflect estimated date of death not date of detection or case date.



Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Black rhinoceros <i>Diceros bicornis</i> <i>minor</i>	Population size	740	485	Not Achieved	Stable
	Number of sub-populations	No target	18	N/A	Not Evaluated*
	Population growth rate	≥5%	2.2%	Not Achieved	Positive, Increasing
	Poaching rate	≤1%	1.4%	Not Achieved	Worsening

*Number of private and communal populations has increased over the last 10 years; Opathe Game Reserve population went extinct in 2013 due to poaching

References

- Conway, A.J and Goodman, P.S. (2013) Strategy for the Management of Black Rhinoceros (*Diceros bicornis minor*) in KwaZulu-Natal. Ezemvelo KZN Wildlife, Pietermaritzburg, South Africa.
- Emslie, R. 2012. *Diceros bicornis* ssp. *minor.* In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. www.iucnredlist.org>. Downloaded on 02 April 2014.
- Freidmann, Y. and Daly, D. (2004) Red Data Book of the Mammals of South Africa: A Conservation Assessment. CBSG Southern Africa, Conservation Breeding Specialist Group (SSC/IUCN), Endangered Wildlife Truct, South Africa.
- Goodman, P.S. (2013) Ezemvelo KZN Wildlife Monitoring Plan: Black rhinoceros (*Diceros bicornis minor*). Unpublished, Ezemvelo KZN Wildlife, Pietermaritzburg, South Africa.





APPENDIX 25.

Biodiversity Asset: African Elephant Loxodonta africana

Group	Mammals		
Common Name	African elephant		
Scientific Name	Loxodonta africana		
Assessment period	2013		
Monitoring period	Annually since 2004		
Author	Dr. P.S. Goodman, Conservation Solutions; J. Craigie, Ezemvelo KZN Wildlife		
Assessment report date	10 July 2014		

Strategic Objective

To collaboratively conserve a demographically viable subpopulation of elephant on state, communal and private land in the province.

Biodiversity Target

No biodiversity target for elephants has been adopted for KZN yet. In the interim, a target of 2000 individuals in at least 3 disjunct sub-populations (protected areas) and a number of smaller disjunct sub-populations on private and communal land is proposed.

Abundance Parameters

Monitoring norms and standards for elephant have neither been developed nor adopted in the province. Data are derived from the annual CITES and Rare Large Mammal survey. Larger populations are normally counted from the air from fixed wing aircraft, while the size of smaller populations are derived from known group counts. The following abundance parameters are reported:

- 1. Number of sub-populations.
- 2. Number of individuals in the KZN population. Number derived from annual surveys on all pa's and private properties.





Indicator Relevance

Elephants are considered **Vulnerable** internationally (IUCN, 2008) and **Least Concern** in South Africa (Friedman and Daly, 2004). All populations are found either in protected areas or fenced private game ranches. The indicator therefore reflects the amount of suitable habitat in units of >5000 ha, falling into the formal and privately owned protected area system, where land owners are tolerant of, or require elephants for ecological process maintenance or nature based tourism purposes.

Assessment

Data adequacy

- Quality data are collected annually from protected area managers and private property owners via the annual CITES and Important Vertebrate Species Survey. Population estimates emanate from aerial census figures undertaken every alternate year or in some instances each year. In a few instances, population estimates are derived from projection modelling, and little ground truthing has been done. In many instances on private properties, populations are small and known to the last individual. Data quality is therefore rated as **Moderate**.
- **Quantity** The annual CITES Survey results are derived from a consistent coverage of the province. Data quality in terms of distribution

and number of records is therefore rated as High.

• Overall confidence in population estimate is **Moderate to High.**

Status

The KZN elephant population comprised 1720 individuals at the end of 2013, distributed in five sub-populations in state protected areas and 15 sub-populations on private and communal land (Table 1).

Trend

- **Protected areas** The population has grown consistently over the past 9 years (6.9% p.a.) from 685 in 2004 to 1269 in 2013 (Figure 1).
- **Private land** The population grew rapidly between 2004 (148) and 2006 (420), primarily due to introductions. Since 2006 the population has shown a much slower growth (3.4% p.a.) to its current level of 542 at the end of 2013.

Over the past nine years the provincial population has grown on average at 7.8% per annum.

Existing Pressures and Future Threats

Elephants were relatively recently introduced to larger protected areas and private properties in the province following extermination of the oncewidespread species from the province, barring a small population of migratory animals in northern Maputaland. Since the re-introductions, with the exception of Tembe Elephant Park, past pressures

Table 1. Numerical status of elephants in KZN at the end of	of 2013
---	---------

	Protected Areas	Private Property	Total	
# Populations	5	15	18	
Population estimate	1 269	542	1 720	



Figure 1: Trend in the population of elephant in protected areas and on private land in KZN.

have been low (zero poaching events reported between 2004 and 2012). However, 2013 saw the first confirmed poaching record in KZN since systematic monitoring was initiated. Based on trends elsewhere in Africa, the threat of poaching is expected to increase, although currently still low.

Note: With a population growth of 8% per annum, poorly conceptualised and implemented elephant management will have long term negative consequences for biodiversity in protected areas and private land, and potentially on the elephant populationsthemselves. Concernhasbeen expressed that in the longer term elephants will reduce nesting opportunities for tree-nesting vultures, threatened group of species which are almost entirely restricted to protected areas containing elephants.

Evaluation Summary

- 1. **Status** the number of sub-populations making up the KZN elephant population exceeds the target level, therefore target **Achieved**. However, the overall population size falls short of the interim target, therefore target **Not Achieved**.
- 2. **Trend** the number of properties with elephant has been **Increasing**, and the overall provincial population has shown a consistent growth of approximately 7.8% per annum over the last 9 years, therefore trend is **Increasing**.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Continue with, and intensify the status monitoring and reporting of all existing free ranging populations.
- 2. Finalise monitoring parameters and draft provincial monitoring plan.
- 3. Finalise and implement elephant management plans for all protected areas and private properties containing elephants.
- 4. Secure expanded range for elephants at both Ithala (into the community owned area north of the Pongola River) as well as at Tembe Elephant Park through the Usuthu Tembe Futhi Transfrontier Conservation Area programme.
- 5. Remove the fence between uMkhuze Game Reserve and Lower Mkhuze to allow population expansion into the Ozabeni Section.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Elephant <i>Loxodonta</i> <i>africana</i>	Population size	2000	1720	Not Achieved	Increasing
	Number of sub populations in state protected areas	3+	5	Achieved	Increasing (medium term)
	Number of sub populations in KZN	None set	18	N/A	Increasing

Reference

Friedmann, Y. and Daly, B. (eds.) 2004. Red Data Book of the Mammals of South Africa: A Conservation Assessment. CBSG (SSC/IUCN) & Endangered Wildlife Trust, South Africa.



APPENDIX 26.

Biodiversity Asset: Tsessebe *Damaliscus lunatus lunatus*

Group	Mammals		
Common Name	Tsessebe		
Scientific Name	Damaliscus lunatus lunatus		
Assessment period	2013		
Monitoring period	2008 to present, annual estimates		
Author	Dr. P.S. Goodman, Conservation Solutions; Dr. Chris Barichievy, Ezemvelo KZN Wildlife; John Craigie, Ezemvelo KZN Wildlife		
Assessment report date	22 April 2014		

Strategic Objective

To collaboratively conserve a demographically viable subpopulation of tsessebe on state, private and communal land in the province.

Biodiversity Target

No population target has been proposed or adopted for tsessebe in KZN.

Abundance Parameters

A surveillance plan for tsessebe has been developed (Barichievy 2013) but not yet fully implemented. Data are derived from the annual CITES and Rare Large Mammal Survey. Data reported in these surveys are either derived from formal (sample based) or informal ('known group estimates') property surveys. The following abundance parameters are reported: a. Number of populations

b. Total number of individuals in the KZN population. Number derived from annual surveys on all protected areas and private properties.

Indicator Relevance

Tsessebe are **Least Concern** internationally (IUCN, 2008) and **Endangered** in South Africa (Friedman and Daly, 2004). They are at the very edge of their range in KZN. Although a numerical target for free ranging tsessebe has not been set yet, the





	Protected Areas	Private & Communal	Total
Number of populations	2	1	3
Population estimate	55	48	103

achievement of such a target would signal that there are adequate areas of moist grassland set aside to support the desired target and that these populations are adequately protected from indiscriminate use.

Assessment

Data adequacy

- Quality data are collected annually from protected area managers and private property owners via the Annual CITES and Important Vertebrate Species Survey. Population estimates are largely derived from protected area manager and land owner observations, and from this the population size is estimated. Data quality is therefore rated as Moderate.
- **Quantity** As far as we are aware the CITES Survey covers all properties in the province with tsessebe. Data quality in terms of distribution and coverage of records is therefore rated as **Moderate to High.**
- Overall confidence in estimates:
- Number of populations Moderate to High.
- Population estimate Moderate.

Status

The numerical status of the KZN tsessebe population which comprise three sub-populations, two in protected areas (Ithala and iSimangaliso Wetland Park (Nyalazi and Eastern Shores sections)) and one on private land (Helicon Game Ranch) was 103 (Table 1). Twenty tsessebe were introduced to Pongola Nature Reserve in 2002; after declining for many years, the last two tsessebe (one male, one female) were removed from Pongola Nature Reserve in 2013 (and relocated back to Ithala Game Reserve).

Trend

Data for the years 2001 to 2008 are unreliable and therefore not presented; however, the population of Ithala Game Reserve, the only population in the province at the time, was estimated through intensive surveys to be 169 individuals in 2000 (Barichievy 2013), so the 2008 population was significantly smaller than in the early 2000's. The KZN population increased by 14% between 2008 and 2010, but then declined to its lowest level on record in 2011. Subsequently, the population has staged a slow recovery to the current estimate of 103 in 2013, although the protected area population is still declining (Figure 1).

The decline is largely due to the decline in the population at Ithala from 169 in 2000 to 60 in 2010 and 19 in 2013 (Barichievy 2013). The cause of the decline is not known, but is correlated to an accumulative deficit in rainfall. Furthermore, the re-established population at Phongola Nature Reserve has due to natural causes gone extinct and



Figure 1: Short term trend in the population of tsessebe in KZN.



must now be considered a failed translocation and establishment attempt. The single population on private property appears to be faring well.

Population Estimates

Ithala Game Reserve Population

The Ithala Game Reserve tsessebe population has undergone a population crash since 2002 (Figure 2). At present there is no causal mechanism identified, other than a correlation to cumulative rainfall deficit which is the subject of on-going research.

Phongolo Nature Reserve Population

The Introduction of Tsessebe into Phongolo Nature reserve was a failure. The population crashed almost immediately (Figure 3) with 7 mortalities being recorded in the year following the reintroduction. By 2009 the population was reduced to two individuals which were relocated back to Ithala Game reserve in 2013.

Over the last 25 years there has been a gentle negative trend in the number of calves recruiting into the Ithala Game Reserve population, per female (Figure 4). Although only 21 percent of the variations in the data are explained, there seems to be a lack of success in new born calves reaching the next rut; or females are not falling pregnant or having calves.

Current Pressures and Future Threats

KZN is marginal for Tsessebe in terms of habitat suitability and historical distribution. Future threats are anticipated to be:

• **Inbreeding** resulting from a small founder population and small isolated sub-populations.

- Competition with other grazing herbivores.
- **Fire regime** inappropriate fire regime applied to sour grasslands.

There is a significant correlation (0.7, p=0.0018, Spearmann's correlation coefficient) between the cumulative rainfall deficit (Defined in Dunham 2004) and the Ithala Game Reserve Tsessebe population (Barichievy, EKZNW, unpublished data). The correlation is rainfall related, however the actual mechanism is one of the leading questions in rare antelope conservations (Owen-smith 2013, pers. comm.), and requires research projects to investigate.

Evaluation

Summary

- 1. **Status**-no target for this species has been for KZN.
- Trend the KZN population initially increased, then declined, and recently (last three years) has showed signs of a slow recovery, despite the continuing decline in protected areas, therefore trend is **Increasing**. The number of properties with Tsessebe has declined from 4 to 3 in 2013, therefore trend is **Declining**.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Develop and seek acceptance for a tsessebe management strategy including population targets for KZN.
- 2. Develop a habitat suitability model for tsessebe in KZN.
- 4. Investigate the cause of the decline at Ithala.



Figure 2: Trend in tsessebe population at Ithala Game Reserve from 1987 to 2013 (population estimates obtained from census of known groups during the rut). Population has undergone a major population decline since 2000 where the population was estimated to have achieved its maximum at 169 individuals. In 2013, only 14 animals were confirmed to be alive during the rut season. Gaps in the dashed line indicate missing data points.





Figure 3: Tsessebe population for Phonogolo Nature reserve since introduction in 2002. The population declined almost immediately with seven mortalities being recorded within a year, and another three in the next few years. By 2009 the population was down to two individuals which were removed in 2013. Gaps in the dashed line indicate missing data points.



Figure 4: Ratio of juveniles (most recent calves) to number of adult females in the population. This reflects a measure of the fecundity of the population. These measures are recorded in March in the rut census. Although only explaining 21% of the variation (r²=0.21) the linear trend line indicates a general decline in the fecundity of the population through time.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Tsessebe Damaliscus Iunatus Iunatus	Population size	No target	103	N/A	Increasing, but Declining in protected areas
	Number of properties with tsessebe	No target	3	N/A	Declined from 4 to 3 in 2013

References

Barichievy, C. 2013. Ezemvelo KZN Wildlife Monitoring Plan: *Damaliscus lunatus lunatus* (Tsessebe). Unpublished document, Ezemvelo KZN Wildlife, Pietermaritzburg.

Friedmann, Y. and Daly, B. (eds.) 2004. Red Data Book of the Mammals of South Africa: A Conservation Assessment. CBSG (SSC/IUCN) & Endangered Wildlife Trust, South Africa.


APPENDIX 27.

Biodiversity Asset: Oribi Ourebia ourebi

Group	Mammals
Common Name	Oribi
Scientific Name	Ourebia ourebi
Assessment period	2013
Monitoring period	2008 to present, annual estimates
Author	Brent Coverdale, Ezemvelo KZN Wildlife
Assessment report date	e 1 December 2014
1	

Strategic Objective

To collaboratively conserve a demographically viable subpopulation of oribi on state, private and communal land in the province.

Biodiversity Target

The biodiversity target currently adopted for the systematic conservation plan is population of 1030 (Ne = 500) individuals north of the Tugela basin and an equivalent number south of the Tugela basin under protection in protected areas (PA) or by management agreement with private or communal land owners i.e. a total of 2060 animals in KZN. Subpopulations should be \geq 25 to ensure demographic and genetic sustainability.

Abundance Parameters

A monitoring plan for oribi has not been developed in the province. Data are derived from the annual CITES and Rare Large Mammal Survey. In addition some data may emanate from the annual oribi survey. Data reported in these surveys are either derived from formal (sample based) or informal ('known group estimates') property surveys. The following abundance parameters are reported:

- a. Total number of individuals in the KZN population which is the sum of the number derived from annual surveys on all protected areas and respondent private properties.
- b. Number of populations with ≥ 25 individuals.





Table 1. Numerical status of oribi in KZN at the end of 2013.

	Protected Areas	Private & Communal	Total
Population estimate	595	843	1438
Number of populations with ≥25 individuals	6	10	16

Indicator Relevance

Oribi are **Least Concern** internationally (IUCN, 2008) and **Endangered** in South Africa (Friedman and Daly, 2004). Their decline has been attributed to a decline in moist grassland, a decline in the condition of these grasslands and indiscriminate hunting. The achievement of the target would signal that there are adequate areas of moist grassland set aside which are managed to an appropriate level and that the oribi populations are adequately protected from the depredation of indiscriminate hunters. As the target has not yet been achieved, it indicates that the threats to the provinces oribi population have not yet been adequately addressed and reduced to a level which is no longer impacting upon the population. **Assessment**

Data adequacy

- Quality data are collected annually from protected area managers and private property owners via the Annual CITES and Important Vertebrate Species Survey. Population estimates are largely derived from protected area manager and land owner observations and from this the population size estimated. Estimating the population size in the Maloti Drakensberg Park World Heritage Site, the largest oribi population, is extremely difficult and subject to large uncertainty. Data quality is therefore rated as Moderate.
- **Quantity** The CITES Survey, does not cover all properties with oribi on them. However the annual landowner survey probably accounts for 90% of the oribi distribution in the province. Data quality in terms of distribution and number of records is therefore rated as **Moderate to Low**.
- Overall confidence in estimates:
- Population estimate Moderate.
- Distribution across the sub ranges Moderate to Low.
- Size class distribution Moderate to Low.
- Trend Moderate

Status

The numerical status of the KZN oribi population which comprise numerous sub-populations throughout the province but mainly in the midlands and south coast at the end of 2013 is summarised in Table 1.

Trend

Data for the years prior to 2008 are unreliable and therefore not presented. The population appears to be relatively stable from 2009 to 2013 (Figure 1). However, data quality is only moderate. The oribi census became an annual event in 2011, therefore the figures represented for private land for 2008 to 2010 are obtained from the CITES survey returns and thus many properties were not counted. During 2012, the number of returns was considerably lower than in 2011 due to survey problems; this may have resulted in a lower population estimate on privately owned land.

There has been an apparent decrease in the number of oribi within Ezemvelo KZN Wildlife managed reserves since 2010 (population about 250 animals smaller in 2013 than in 2010). Four Ezemvelo KZN Wildlife controlled protected areas that had previously reported oribi reported no oribi populations for 2013. It is not known to what extent this represents a real loss of populations, or is as a result of no Conservation Managers being present on the reserve or, if present, failing to submit data. It is known that at least two significant populations (Midmar and Blinkwater) have declined dramatically as a result of poaching associated with reduction in law enforcement staff. The population at Chelmsford Nature Reserve appears to be significantly smaller than previously reported. Obtaining reliable estimates for the Maloti-Drakensberg Park remains a challenge.

Current Pressures and Future Threats

The primary pressures that are thought to have caused the continued decline in the provincial population are:

- Habitat transformation and fragmentation the majority of oribi habitat has been transformed for agriculture and settlement, particularly in the KZN Midlands and Northern KZN. This transformation is continuing particularly through intensification of agriculture and settlement of people in farms previously used for extensive cattle farming.
- **Illegal hunting** primarily dog hunting; reduction in staff in Ezemvelo KZN Wildlife protected areas is resulting in increased poaching.





Protected Area Private Land

Figure 1: Trend in oribi numbers in KZN.

- **Poor veld management practice** primarily heavy grazing by domestic livestock, inappropriate burning regimes.
- Inbreeding depression and extinction of smaller isolated populations due to stochastic demographic effects - this is likely to be happening already, but will become more important in the future as populations become more fragmented.

Evaluation

Summary

- 1. **Status** current population is below the stated target, therefore target is **Not Achieved**.
- 2. **Trend** the surveyed population is perceived in the longer term to have declined and in the short term (last five years) appears to have stabilised, therefore trend is **Stable**.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Develop and seek acceptance for an oribi management strategy including population targets for KZN.
- 2. Develop and implement a monitoring and reporting plan for oribi in KZN, with special emphasis on monitoring methods for private land and the Maloti-Drakensberg Park World Heritage Site.
- 3. Continue to encourage and support private custodianship of oribi in suitable habitats, especially with respect to the impact of illegal dog hunting.
- 4. Ensure that all Ezemvelo KZN Wildlife reserves submit returns to the Endangered Wildlife Trust as part of the annual oribi census.
- 5. Formalise oribi reporting into the Ezemvelo KZN Wildlife biodiversity database.
- 6. Evaluate apparent decline in oribi in Chelmsford Nature Reserve

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Oribi <i>Ourebia ourebi</i>	Population size	2060	1418	Not Achieved	Stable
	Number of properties with ≥25 oribi	No target	16	N/A	Not Evaluated

Reference

Friedmann, Y. and Daly, B. (eds.) 2004. Red Data Book of the Mammals of South Africa: A Conservation Assessment. CBSG (SSC/IUCN) & Endangered Wildlife Trust, South Africa.



APPENDIX 28.

Biodiversity Asset: Hippo *Hippopotamus amphibius*

Group	Mammals
Common Name	Нірро
Scientific Name	Hippopotamus amphibius
Assessment period	2013
Monitoring period	2004 to present
Author	Dr. Peter Goodman, Conservation Solutions; John Craigie, Ezemvelo KZN Wildlife
Assessment report date	8 July 2014

Strategic Objective

To collaboratively conserve a demographically viable subpopulation of hippos on state, communal and private land in the province.

Biodiversity Target

No biodiversity target for hippos has been adopted for KZN yet. In the interim, a target of 2000 individuals in at least four separate populations is proposed.

Abundance Parameters

Monitoring norms and standards have neither been developed nor adopted in the province. Data are derived from the annual CITES and Rare Large Mammal Survey. Larger populations are normally counted from the air from fixed wing aircraft, while smaller populations are counted from the land. The following abundance parameters are reported:

- 1. Number of sub-populations.
- 2. Number of individuals in the KZN population. Number derived from annual surveys on all protected areas and private properties.

Indicator Relevance

Hippos are considered **Vulnerable** internationally (IUCN, 2008) and **Least Concern** in South Africa (Friedman and Daly, 2004). Most populations are found in protected areas and private game ranches (many in dams) with a very small proportion of the population existing on non-protected private, communal and municipal land. The indicator therefore reflects the amount of suitable habitat falling into the formal and privately owned protected area system.





	Protected Areas	Private & Communal	Total
Number of sub populations	10	22	32
Population estimate	1545	252	1797

Assessment

Data adequacy

- Quality-data are collected annually from protected area managers and private property owners via the annual CITES and Important Vertebrate Species Survey. Population estimates emanate largely from aerial census figures undertaken every alternate year or in some instances each year. In many instances on private properties populations are small and known to the last individual. Data quality is therefore rated as Moderate to High.
- Quantity The annual CITES Survey results are derived from a consistent coverage of the province however some small populations are missed. Data quality in terms of distribution and number of records is therefore rated as Moderate.
- Overall confidence in estimates:
 - Number of sub populations **High** (little error under estimate)
 - Population estimate Moderate (< 15% error

Status

The number of hippos in KZN as at the end of 2013 is 1797, comprising 10 sub populations in state protected areas and 22 sub-populations on private and communal land (Table 1).

Trend

- Protected areas the population grew slowly at an average of 1% p.a. over the seven years from 2004 to 2011, but appears to have declined in the past two years (Figure 1).
- Private land the population is small (252) but has increased gradually from 67 (2004) to 252 (2013) (Figure 1), a growth rate of 13% per annum.

Current Pressures and Future Threats

The primary pressures and future threats to this population are:

- Land transformation particularly drainage of wetlands and the encroachment of agriculture onto floodplains.
- Poaching as far as records show this has been generally low (Figure 2). The estimate of the number poached in 2010 is a known underestimate, since reporting of these incidents ceased on the east bank of the Pongolo River in Ndumo mid-way through the year following the land invasion. On average there were six hippo poached per year over the last eight years (<1% of the population). While this proportion is small, there is however an increasing trend in poaching to 2013 (running mean poached increasing by 21% p.a.), which is a cause for concern (Figure 2).



Figure 1: Trend in the population of hippos in protected areas and on private and communal land in KZN





Figure 2. Trend in the number of hippos recorded as being poached in KZN since 2004; 2010 is known to be an underestimate.

Evaluation

Summary

- 1. **Status** the number of sub-populations making up the KZN hippo population exceeds the target level. The overall population size has dropped and has moved below the desired target therefore target is **Not Achieved**.
- 2. **Trend** the overall provincial population has demonstrated a fairly consistent increase of 4% per annum between 2004 and 2011, but has stabilised and even possibly declined recently, therefore population trend is **Stable**.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Develop provincial targets for hippos.
- 2. Continue with and intensify the status monitoring and reporting of all existing free ranging populations.
- 3. Finalise monitoring parameters and prepare a monitoring plan.
- 4. Secure populations in protected areas, in particular Ndumo.
- 5. Strengthen reporting of illegal mortalities.

Species	Biodiversity Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Hippo Hippopotamus	Population size	2000	1797	Not Achieved	Stable
amphibius	Number of sub populations in KZN	4	32	Achieved	Not Evaluated

Reference

Friedmann, Y. and Daly, B. (eds.) 2004. Red Data Book of the Mammals of South Africa: A Conservation Assessment. CBSG (SSC/IUCN) & Endangered Wildlife Trust, South Africa.



APPENDIX 29.

Biodiversity Asset: Biodiversity Response: Terrestrial Area under Protection

Feature	Biodiversity Response Indicator
Name	Terrestrial area under protection
Assessment period	2013
Monitoring period	2001 to end of 2013
Author	Ian Rushworth, Dr. Clinton Carbutt & Dr. Peter Goodman, Ezemvelo KZN Wildlife
Assessment report date	15 December 2014

Strategic Objective

To secure representative samples of KwaZulu-Natal's indigenous biodiversity in a network of state, private and community managed protected areas, formally proclaimed under the National Environmental Management: Protected Areas Act and managed specifically to achieve biodiversity targets.

Biodiversity Target

The Protected Area Expansion Strategy (Ezemvelo KZN Wildlife, 2010) targets, which are aligned nationally, are as follows:

• By 2013, 10% of the inland area of the province proclaimed protected area - a total area of 980,642 ha.

- By 2028, 19% of the inland area of the province proclaimed protected area - a total area of 1,823,042 ha.
- The long term provincial inland protected area target determined using species accumulation curves for vegetation types is 24.5% - a total area of 2,322,181 ha.

Assessment Parameters

A single parameter is used namely: estimated surface area of land under formal protection (i.e. proclaimed as a protected environment, nature reserve or World heritage site under the NEM: Protected Areas Act. This area can be expressed as an absolute area in ha or simultaneously as a proportion (%) of the total



area of the province.

Indicator Relevance

Protected areas (PAs) are amongst the most efficient and cost-effective ways of conserving biodiversity and are central to most conservation strategies as they fulfil a number of critical functions within the landscape. Given their many benefits, PAs are important instruments for meeting biodiversity targets. The areas under formal proclamation are therefore a good response indicator but such an indicator is meaningful only if management integrity of such areas in terms of biodiversity target achievement is simultaneously being achieved. While this document reports target achievement in terms of hectares under protective management, the representivity of this area is measured in terms of proportion of different vegetation types protected (separate response indicator - Ecosystem Protection Status, Appendix 30). To ensure representivity the location of new areas to be protected is guided by the KZN systematic conservation assessment, documented in the KZN Protected Area Expansion Strategy.

Assessment

Data adequacy

- Quality the quality of the data and the trends that emerge there from, depend to a large extent on standardisation of geographic information system (GIS) coverages used for assessing area. In this analysis, the following coverages from the GIS archive were used:
 - The KZN boundary, including the uMzimkhulu Local Municipality formerly of Eastern Cape (EC) and excluding the portion of Sisonke District Municipality that has been incorporated into the Alfred Nzo District Municipality of the Eastern Cape - total area 9 445 102 ha. Some previous assessments have included both the uMzimkhulu Local Municipality (LM) and the portion ceded to the EC as there was a legal dispute regarding the transfer of that land to the EC. This dispute appears to have been resolved and all government departments are reporting based on the 'new' area.
 - The 2013 protected area coverage for the Protected Area boundaries, based on proclaimed and not GIS-calculated area. The calculation of PAs was done using the 2013 areas and back dated to the proclamation date; in the period from 2001 to 2013 any additions to protected areas are recorded in the year in which the additional land was added.
 - · In recent years many protected areas that

were state owned have changed ownership through the land restitution process. These are still proclaimed, and still managed on behalf of the new owners by Ezemvelo KZN Wildlife, and are included as part of the protected area estate. The area owned by the state had decreased considerably as a result of this process, but in this assessment these areas are shown as "state managed".

- The proclaimed size is used, but in several instances the fenced or managed size is different (usually smaller) as a result of local arrangements to deal with land disputes or for practical/cost-effective fencing reasons e.g. river boundaries.
- The full area of proclaimed protected environments has been used even though these are often production landscapes incorporating transformed areas. Future analyses incorporate more may а nuanced approach of excluding the transformed areas from the calculations.
- State forests managed by the Department of Agriculture, Forestry and Fisheries (DAFF) are not included. However, some of these are scheduled to come across for nature conservation and are likely to contribute to the area protected in future.
- Where proclamation dates were not known, an establishment date was used, or in the case of the ex-KwaZulu Department of Nature Conservation (KDNC) reserves, the date they were handed over to Ezemvelo. The terrestrial component includes dams, lakes and estuaries but excludes the marine component. Inclusion of the dam surfaces for terrestrial protected areas results in a slight overestimation of the area of natural habitat protected as these are essentially transformed environments, even if protected in law. The new linkage areas of iSimangaliso Wetland Park (iSWP) were added at its World Heritage Site (WHS) proclamation date of 2000.
- A few areas proclaimed pre-1994 by the KDNC but which are not being managed as nature reserves have been excluded. These need to be either deproclaimed or appropriately managed going forward.

Data quality is therefore rated as **Moderate to High**.

- **Coverage** All Ezemvelo managed PAs, the iSWP, and all proclaimed nature reserves and protected environments established through the Biodiversity Stewardship Programme were included up to the end of 2013. Sample coverage is complete and therefore rated as **High**.
- Overall confidence Moderate to High.



 Table 1. The area of KZN that is proclaimed and/or managed for biodiversity conservation for the period ending 2013

	State Managed	Private & Communal	Total Area Proclaimed
Area (ha)	750 557.72	60 195.24	810 752.95
Area (%)	7.95	0.64	8.58

Response

A total of 8.58% (810 752.95 ha) of the province is proclaimed as protected area (Table 1). This is made up of 750 557.72 ha (7.95%) of the province managed by the state as nature reserve or WHS (there are no national parks in KZN), and a further 60 195.24 ha (0.64%) of the province which is formally proclaimed and managed by private or communal land owners, established through the KZN Biodiversity Stewardship Programme.

Whilst 8.58% is proclaimed, the actual area being managed for biodiversity is smaller than this as (1) portions of this are dam water surfaces and do not contribute to vegetation conservation targets, (2) portions are fenced out and not managed as protected areas for practical/cost-effective fencing reasons (and some of this has been converted to agriculture), and (3) portions of land no longer have conservation as their primary land use, such

as the 1128 ha of land lost to the land invasion in eastern Ndumo, most of which has been converted to subsistence agriculture; the Ozabeni grazing concession which has reduced the area of the iSWP being managed for biodiversity conservation by 5399 ha; and several forest protected areas are severely degraded with unregulated use of timber products and are in essence no different to nonprotected areas. Future analysis of the extent of formal protection of the province's land surface will need to take this into account, using an approved and standardised methodology.

Trend

 The first proclaimed reserve in the province was Phongola in 1894. Since then, an average of 61 118 ha has been added to the protected area network per decade (Figure 1). Very little was added to the protected area network during the 1930s and 1940s probably as a result of



Figure 1: Accumulated area of KZN province proclaimed and managed as terrestrial protected area between 1894 and 2013 (Note: last bar represents only three years).





Figure 3: Accumulated area of KZN province proclaimed and managed as terrestrial protected area between 2001 and 2013. Note: State contribution largely static since 2006; increase in protected area extent since 2009 due to the contributions of private and communal landowners, facilitated through the KZN Biodiversity Stewardship Programme.



Figure 2: Land added to the protected area estate per decade. Note declining contribution by the state since 1970.



the Second World War. During the 1950's there were large additions made to the protected area network in the form of State Forests.

- The area of land owned or managed by the state added to the protected area network has declined each decade from 1970 (Figure 2).
- Since 2009 19 additional nature reserves or protected environments, totalling 60 195.24 ha, have been added to the protected area estate in KZN through the KZN Biodiversity Stewardship Programme (Figure 3). These additional areas have to a large extent offset the declining state contribution to protected area expansion.

Existing Pressures and Future Threats

The primary pressures and future threats to achieving the protected area targets for KZN is the lack of adequate resources and the rapid rate at which landscape transformation is taking place. Specifically, these relate to:

- a. Lack of adequate funding to purchase priority land for biodiversity conservation.
- b. Lack of adequate funds and skilled human resources to drive the Biodiversity Stewardship Programme at an appropriate pace.
- c. Lack of adequate funds and skilled human resources to manage newly acquired land.
- d. The lack of an innovative and coordinated response to the Ndumo land invasion.
- e. Declining management effectiveness of existing protected areas due to land transformation in buffer zones, declining resources for management, and possible change of focus of areas based on economic imperatives and lack of delivery on comanagement expectations/promises.

Note: the risk of not expanding the PA network at an acceptable rate is that the options to do so diminish

each year into the future given the rapid rate of land transformation in the province. The failure to safeguard critical water catchments and land in general for the future socio-economic needs of the people of KZN is highly problematic.

Evaluation

Summary

- Response the total proportion of the province under formal protection, currently 8.58%, is 134 120 ha below the nominal 10% set by the IUCN for achievement by 2000 and is below the 2013/14 Protected Area Expansion Strategy (PAES) target (also 10%) -n therefore target is Not Achieved.
- Trend the short and medium term PAES target requires 42,120 ha to be added to the protected area network annually. The average rate of protected area expansion from 2001 to 2013 is 9 585 ha annum-1. The trend is Increasing, but not at the required rate.

Key Management Actions Key management actions for 2014 and 2015 must include:

- 1. The development and adoption of a standardised monitoring protocol for 'Terrestrial Area Under Protection'.
- 2. The development and implementation of a land acquisition fund as described in the PAES.
- 3. Acquisition of key priority land parcels and appointment of a land acquisition manager.
- 4. The increased capacitation and funding of the KZN Biodiversity Stewardship Programme.
- 5. The urgent finalisation and implementation of comanagement agreements with communities who now own a substantial portion of the protected area estate previously owned by the state.

Feature	Response Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Terrestrial protected area	Proportion of KZN protected	10% by 2013; 19% by 2028	8.58%	Not Achieved	Increasing but rate of increase significantly below the required rate

Reference

Ezemvelo KZN Wildlife. 2010. KZN Protected Area Expansion Strategy and Action Plan (2009-2028). Unpublished report, Ezemvelo KZN Wildlife, Pietermaritzburg.





Figure 4: Map showing protected areas in KwaZulu-Natal.



APPENDIX 30.

Biodiversity Asset:

Biodiversity Response: Protection Levels of Terrestrial Ecosystems

Feature Name	Biodiversity Response Indicator Protection Levels of Terrestrial Ecosystems
Assessment period	2011
Monitoring period	Land cover has been monitored in 1994, 2000, 2005, 2008 and 2011; terrestrial area protected is monitored continuously and reported annually
Author	Debbie Jewitt, Ezemvelo KZN Wildlife
Assessment report date	December 2014

Strategic Objective

To secure representative samples of each of KwaZulu-Natal's indigenous ecosystems in a network of state, private and community managed protected areas which have been formally proclaimed under the National Environment Management: Protected Areas Act.

Biodiversity Target

The long term provincial protected area target for ecosystems (=vegetation types) is determined using species accumulation and is specific to each vegetation type. This is most frequently expressed as a % of the area of the original extent of the vegetation type and varies between 19 and 31 % for non-forest vegetation types, and 61.6 and 100% for forest. The overall aim is to have each vegetation type formally protected to its vegetation or biodiversity target level.

Assessment Parameter

No province-wide surveillance or monitoring document exists for protection status of terrestrial





ecosystems. The assessment was undertaken against the following thresholds for ecosystem protection namely:

Protection Class	Protection Category
0%	Not Protected
>0 %,< 1%	Nominally protected
≥1 %,< 10%	Poorly protected
≥10 %,< Biodiversity Target	Moderately protected
≥ Biodiversity target	Fully protected

The assessment parameters are as follows:

a. The number of vegetation types falling into each one of the protection categories.

b. The proportion of vegetation types that are fully protected.

Indicator Relevance

Protected areas are amongst the most efficient and cost-effective ways of conserving biodiversity and are central to most conservation strategies as they fulfil a number of critical functions within the landscape. Given their many benefits, protected areas are important instruments for meeting biodiversity targets. This is therefore a response indicator which assesses the state's commitment to meeting its public obligation to set aside land to conserve representative samples of KZN's biodiversity.

Assessment

Data adequacy

• Quality - Data quality and the trends that emerge there from, depend to a large extent on

standardisation of coverages used for assessing area. In this analysis, a provincial boundary which included the Eastern Cape portion of the Alfred Nzo District Municipality and the uMzimkhulu Local Municipality (2008 KZN boundary), the 2013 Protected Area coverage for the protected area boundaries, the December 2013 Stewardship sites proclaimed as nature reserves and the 2011 KZN Vegetation coverage were used. All area calculations were made from two dimensional GIS coverages. Data quality is therefore rated as High. Coverage - All EKZNW managed PAs were included up to the end of 2013 and proclaimed Stewardship sites were included up to the end of December 2013. Sample coverage is therefore complete and is rated as High.

• Overall confidence - High.

Response

Protection status of vegetation types in KZN are as follows (Table 1, Figure 1):

- a) Grassland and savanna vegetation types are the least well protected with more than 74% of the grassland and 57% of the savanna vegetation types falling into poorly protected or worse categories. Forests types were the best protected with the majority of categories falling into the moderately protected category or better.
- b) Only 26 vegetation types or 25.7 % of vegetation types occurring in KZN are considered fully protected; 11 (10.9%) of vegetation types have no protection whatsoever.

Trend

Not evaluated.

Existing Pressures and Future Threats

The primary pressures and future threats to achieving the protected area targets for KZN are the lack of

Protection Category	Grassland	Savanna	IOCB ¹	Wetlands	Forests	Total
Not protected	6	3	0	2	0	11
Nominally protected	5	5	1	1	1	13
Poorly protected	9	3	1	6	2	21
Moderately protected	1	5	2	5	17	30
Fully protected	6	3	2	12	3	26
Total	27	19	6	26	23	101

Table 1. The number of vegetation types falling into protection categories for each biome in KZN

¹IOCB – Indian Ocean Coastal Belt





Figure 1: Proportional protection levels of vegetation types per biome (IOCB – Indian Ocean Coastal Belt).

adequate resources and the rate at which landscape transformation is taking place. There are three resource related areas hindering target achievement:

- a. Lack of adequate funding to purchase priority land for biodiversity conservation.
- b. Lack of adequate funds and skilled human resources to drive the Stewardship programme at an appropriate pace.
- c. Lack of adequate funds and skilled human resources to manage newly acquired land.

Evaluation

Summary

1. Response

a. 44.5 % of all KZN vegetation types fall into the "poorly protected" category (<10 %) or worse. Non-forest vegetation types have 53.8% falling into the "poorly protected" (or worse) category whilst forest vegetation types have 13% falling into the poorly protected (or worse) category – therefore target is **Not Achieved**.

- b. Only 25.7 % of all KZN vegetation types are considered fully protected. Non-forest vegetation types have 29.5% fully protected whilst forest vegetation types have 13% fully protected – therefore target is Not Achieved.
- 2. Trend Not Evaluated.

Key Management Actions Key management actions for 2014 and 2015 include:

- 1. Prioritisation of acquisitions of land representing vegetation types that are either not protected at all or only nominally protected.
- 2. Increased capacity to grow the protected area network through additional support to Biodiversity Stewardship and land acquisition programmes.

Feature	Response Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Protection levels of terrestrial ecosystems	Proportion of vegetation types per biome that are moderately to fully protected (\geq 10%)	100%	Grassland 25.9%; Savanna 42.1%; IOCB 66.7%; Wetland 65.4%; Forest 86.6%	Not Achieved	Not Assessed

References

- Berliner, D. 2005. Systematic Conservation Planning for the forest biome of South Africa. Department of Water Affairs and Forestry, South Africa.
- Government of South Africa. 2009. National Protected Area Expansion Strategy for South Africa 2008. Priorities for expanding the protected area network for ecological sustainability and climate change adaptation. Pretoria, South Africa.
- Jewitt, D. 2009. Conservation targets for KZN Vegetation Types in KZN. Internal Report, Biodiversity Division, Ezemvelo KZN Wildlife, Pietermaritzburg
- Mucina, L. & Rutherford, M.C. (eds). 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19, SANBI, Pretoria.



Biodiversity Asset:

Biodiversity Asset: Marine area under protection and protection levels of marine ecosystems

Feature	Biodiversity response indicator
Name	Marine area under protection and protection levels of marine ecosystems,
Assessment period	2013
Monitoring period	1979 to present
Author	Tamsyn Livingstone, Ezemvelo KZN Wildlife
Assessment report date	30 May 2013

Strategic Objective

To secure representative samples of KwaZulu-Natal's marine biodiversity in a network of marine protected areas (MPA) which have been formally proclaimed under the s,ection 43 of the Marine Livings Resources Act (MLRA), 1998 (Act No.18 of 1998).

Biodiversity Target

The KwaZulu-Natal marine province consists of two inshore bioregions, the Delagoa and Natal bio-region. National targets are set within each of these bioregions. The KZN Protected Area Expansion Strategy targets, which are aligned nationally, are as follows:

Marine Zone Bio-regio		2013	2028
lucher	Delagoa	25	25
Insnore	Natal	8	25
Offshore		3	20
Overall	3	20	

• The 2028 protection target for marine systems is 25% of the inshore zone and 20% of the offshore zone within a marine protected area, where 15% of each must be in a no-take (Sanctuary or MPA zone in which no resource use is permitted) marine protected area.





Assessment Parameter

A single parameter is used namely: estimated surface area of ocean under formal protection i.e. proclaimed as a marine protected area under the Marine Living Resources Act, and the area is being managed to achieve specified biodiversity targets. This area may be expressed as follows:

 Area protected % = Area Protected / Area zone x 100 and is reported by the zone and bio-region.

Indicator Relevance

MPA's are amongst the most efficient and costeffective ways of conserving biodiversity and are central to most conservation strategies as they fulfil a number of critical functions within the seascape. Given their many benefits, MPA's are important instruments for meeting biodiversity targets. This is therefore a response indicator which assesses the state's commitment to meeting its public obligation to set aside parts of the marine environment to conserve representative samples of KZN's marine biodiversity. While this document reports target achievement in terms percentage under conservation, the actual areas acquired will be guided by the Marine Protected Area Expansion Strategy which emanates from the KZN marine systematic conservation plan, thus ensuring representivity across zones and bioregions.

Assessment

Data adequacy

 Quality - Data quality and the trends that emerge therefrom, depend to a large extent on standardisation of coverages used for assessing area. In this analysis, the exclusive economic zone (EEZ) boundary is legally defined as extending 200 nautical miles offshore as deemed by the United Nations Convention on the Law of the Sea. The marine protected areas were mapped according to their proclamations and the co-ordinates within the Government Gazette. Data quality is therefore rated as **High**.

Coverage - All proclaimed MPA's up to the end of 2013 were included in the GIS coverage, therefore coverage quality rated as High.
Overall confidence - High.

Response

Currently, 0.4% (958 km²) of the KZN marine environment is formally proclaimed as marine protected area (Table 1). Protection within the major marine zones and bio-regions is distinctly biased towards the inshore area (0 to -30 m) with 18.3% protected while only 0.28% of the offshore area (deeper than 30 m) protected (Table 2). Protection is also biased within the inshore zone, with 100 % of the Delagoa bio-region protected and only 6 % of the Natal bio-region protected (Table 2).

Trend

Formal protection of the marine environment commenced in KZN with the proclamation of the Trafalgar Marine Reserve in 1979 under Natal Conservation Ordinance and then in 2000 under the MLRA. This was followed by the St Lucia Marine Protected Area proclaimed in 1979 under the Sea Fisheries Act (No. 58 of 1973). The Maputuland Marine Protected Area was proclaimed in 1986 originally under the Provincial ordinance 15 of 1974, and later under the Marine living Resources Act (1998) in 2000. Over the last four decades, the

Table 1. The overall area (expressed as a %) of marine protected areas in KZN at the end of 2013

	Marine Protected Area Zone					
	Sanctuary Restricted Controlled Total					
EEZ	0.1	0.1	0.2	0.4		

Table 2. The zonal breakdown of marine protection in KZN as at the end of 2013. Figures are presented as a % of the total area of each respective zone

	Bio-Region		Overall			
Marine Zone		Sanctuary	Restricted	Controlled	Sub-Total	Iotal
Inshore	Delagoa	37	28	35	100	10.0
	Natal	0	0.2	5.8	6	18.3
Offshore		0.08	0.095	0.1	0.28	0.28





Figure 1: Accumulated area of KZN EEZ proclaimed as marine protected area between 1970 and 2013. Blue shades represent different zones or levels of protection.

area under marine protection has grown by 28 % per decade, but no further marine protected areas have been proclaimed since the Aliwal Shoal Marine Protected Area was proclaimed in 2004 (Figure 1).

Current Pressures and Future Threats

The marine areas off the KZN coast are increasingly under pressure for mining, oil and gas extraction, electricity generation and growing demand for food. The primary threats to achieving the protected area targets for KZN, in addition to increasing competition for other uses, are the lack of adequate resources to manage future marine protected areas. The resource related areas hindering target achievement are the following:

- a. Lack of adequate funds and skilled human resources to manage and maintain existing marine protected areas.
- b. Lack of adequate funds and skilled human resources to guard future marine protected areas, especially offshore marine protected areas, which would require expensive equipment such as patrol boats.
- Note: There are no perceived biodiversity or socioeconomic risks with the continued growth of the protected area network as envisaged by the strategic objective; on the contrary, increasing marine protected areas should assist in ensuring sustainability of many marine fisheries.

Evaluation

Summary

1. Response

- The overall proportion of the KZN EEZ under formal protection is currently 0,4 %. The target for 2013 is 3%, therefore target is **Not Achieved**.
- · The inshore Delagoa bio-region has currently

met all targets including the 15% no-take target, therefore 2013 target is **Achieved**.

- The inshore Natal bio-region has 6% of the 2013 target of 8 % currently within a marine protected area; however none of this occurs within a sanctuary or no-take zone. Neither the total nor no-take target are met, therefore 2013 target is **Not Achieved**.
- The 2013 target for the offshore area is calculated to be 3% and currently the total proportion of the offshore area formally protected is 0.28%, with 0.08% falling within a sanctuary zone, 0.095% within a restricted zone and 0.1% within a controlled zone, therefore the 2013 target is Not Achieved.
- 2. Trend

Over the last four decades the marine protected estate has grown at 28.3% per decade. No trend acquisition rate has been set, therefore target is **Not Evaluated**.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Set and adopt a protected area acquisition rate required to achieve area targets by 2028.
- 2. Prioritisation of the focus areas identified from the marine systematic conservation plan, and adoption of the marine protected area expansion plan in order to meet the 2028 protected area targets. This must focus on the Natal bio-region and increasing 'no-take' targets.
- 3. Encouragement and collaboration with the stakeholders championing the proposed marine protected areas in order to proclaim these areas as part of the marine protected area network.



Feature	Response Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Protection levels of marine ecosystems	Overall proportion of the KZN EEZ under formal protection	3% by 2013	0.4%	Not Achieved	Stable
	Delagoa bio- region	25% by 2013	100%	Achieved	Stable
	Natal bio-region	8% by 2013	6%	Not Achieved	Stable
	Offshore	3% by 2013	0.28%	Not Achieved	Stable

References

Greater St Lucia Wetland Park Integrated Management Plan. Internal working draft for discussion between Ezemvelo KZN Wildlife and the Greater St Lucia Wetland Park Authority, May 2007.

St Lucia Marine Reserve Management Plan, 1st edition, April 1985. Natal Parks.





Biodiversity Asset:

Biodiversity Response Indicator: Protected Area Management Effectiveness

Feature	Biodiversity Response Indicator
Name	Marine area under protection, and protection levels of marine ecosystems
Assessment period	2013
Monitoring period	1979 to present
Author	Tamsyn Livingstone, Ezemvelo KZN Wildlife
Assessment report date	30 May 2013

Strategic Objective

To ensure that protected areas managed by Ezemvelo meet or exceed the minimum management effectiveness targets set nationally and adopted by KZN as part of the Ezemvelo strategy.

Biodiversity Target

The target for 2013/2014 is 70% of the Ezemvelo¹ protected area estate (381,993 ha) meeting the national minimum standard of 67% effectiveness. The national minimum standard was set by national Department of Environmental Affairs and was communicated via Working Group 1. This standard is based on a publication by Leverington et al. (2008).

Assessment Parameter

An Ezemvelo-refined version of the WWF-World Bank Management Effectiveness Tracking Tool (METT) is used to assess PA management effectiveness (Ezemvelo-METT Version 3). From this assessment, a management effectiveness score (%) is derived for each PA. Two parameters are derived to help track management effectiveness of state PAs:

- a. Mean and spread of management effectiveness scores from each assessment.
- b. The proportion (%) of PAs achieving the national minimum management effectiveness standard.

¹This EXCLUDES the iSimangaliso Wetland Park World Heritage Site which has a different management authority and assessment process, although on-the-ground management is carried out by Ezemvelo staff.





Indicator Relevance

PAs are amongst the most efficient and cost-effective ways of conserving biodiversity and are central to most conservation strategies as they fulfill a number of critical functions within the landscape. Given their many benefits, PAs are important instruments for meeting biodiversity targets, and ensuring the states obligation to the public in this respect. This is a response indicator which assesses the State's commitment and efficiency in meeting its public obligation with respect to the efficient and effective management of public assets, namely its protected areas.

Assessment

A full report on the management effectiveness of Ezemvelo KZN Wildlife protected areas has been produced (Carbutt 2014).

Data adequacy

Quality - Data were collected at a series of interactive regional workshops attended by Conservation Managers, Ecological Advice and Regional Managers from different Parks and the East and West management regions. Each PA score was subject to peer review and moderation (all scores were moderated by the relevant regional conservation managers during the particular workshop). All PA managers and supervisors had to sign the assessment forms at the end of the workshops stating that the scores were an honest and accurate estimate of management effectiveness. Scores were normalized because not all questions (assessed criteria) were applicable to all PAs. The nature of the questionnaire survey and potential differences in interpretation of questions allows some subjective bias to occur. Data quality is therefore rated as **Moderate to High.**

- **Coverage** All Ezemvelo PAs, with the exception of Soada Forest and Manguzi Forest, were assessed in 2013/14. The sample coverage of 64 protected areas is therefore rated as **High**.
- Overall confidence in assessment Moderate to High.

Response

- 387,050 ha of the protected area estate is effectively managed at or above the minimum standard of 67% effectiveness (Table 1, Figure 1). This is narrowly above the target of 381,993 ha. The current result is some 101,374 ha less than the previous year (488,424 ha), indicating a significant decrease in the effectiveness of protected area management compared to 2012/2013.
- A total of 28 protected areas (44%) achieved the minimum standard, whilst 36 protected (56%) did not achieve the minimum standard (Figure 1; Table 1).
- The scores ranged from 88.31% (Enseleni Nature Reserve) to 22.22% (Blinkwater Nature Reserve), with a mean score of 62.14% effectiveness (Table 1).

Trend

Although management effectiveness has improved since the first (baseline) assessment in 2009/2010, there is a recent decline in the proportion of the PA estate meeting the minimum targets (Figure 1).



Area achieving or exceeding minimum score

Area not achieving minimum standard

Figure 1: The area of the Ezemvelo protected area estate meeting minimum management effectiveness targets relative to the baseline of 2009/2010.



Current Pressures and Future Threats

Protected areas across the province are experiencing high levels of threat. The top threats, based on the assessments, are PA isolation (land transformation in buffer zones and corridors); alien plants; climate change; transportation and service corridors; alien animals; pollution; and poaching.

Note: There are no risks associated with improving PA management effectiveness in KZN. On the contrary, there is a risk that should Ezemvelo not show an improvement in protected area management effectiveness, it could lose its status as a competent nature conservation authority and possibly even loose its funding for PA management from Treasury.

Evaluation Summary

1. Response

The summed area of all PAs achieving the national minimum standard is 387,050 ha. This narrowly exceeds the target of 381,993 ha (or 70% meeting the minimum management effectiveness standard), therefore Target **Achieved**.

2. Trend

The area achieving the national minimum standard in 2013/14 is less than 2012/13, therefore Trend **Declining**.

Key Management Actions

Key management actions for 2014 and 2015 include:

- 1. Prioritisation of PA management effectiveness and the improvement of PA management effectiveness as an organisational HLD, as captured in the actions plans of the GMs.
- 2. Increased involvement of ecotourism staff in future assessments, given the high impact of tourism on management effectiveness.
- Concluding the proclamation process and boundary surveys for PAs currently unproclaimed and un-surveyed.
- 4. Prioritisation of PA expansion, especially the acquisition of land bordering PAs into a network of corridors and linkages which in so doing will mitigate PA isolation and enhance buffering.
- 5. Addressing invasive alien plants threat as a priority, and put measures in place to address climate change.
- Concluding the drafting of up-to-date management plans which must get signed off by the MEC and at the same time have Ezemvelo assigned as the management authority.
- 7. Filling of vacant posts.
- 8. Maintaining or increasing operational budgets.
- 9. More maintenance of protected area equipment, infrastructure and fleet.

Feature	Response Indicator	Target	2013 Measure	Target Assessment	Trend Assessment
Protected area management effectiveness	Area (proportion) of Ezemvelo PA estate scoring ≥67%	≥381,993 ha (70%) of Ezemvelo PA estate scoring ≥67%	387,050 ha	Achieved	Declining

References

Carbutt, C. 2014. Management effectiveness of Ezemvelo KZN Wildlife Protected Areas (2013/2014). Unpublished report, Ezemvelo KZN Wildlife, Pietermaritzburg.

Leverington, F., Hockings, M. & Costa, K.L. 2008. Management effectiveness evaluation in protected areas - a global study. Report for the project 'Global study into management effectiveness evaluation of protected areas'. The University of Queensland, Gatton, IUCN, WCPA, TNC and WWF, Australia.



Table 1. The protected areas assessed in 2013/2014. The protected areas that achieved a management effectiveness score equal to or exceeding the national minimum standard (67%), and thereby contributing to the area target, are coloured in blue; protected areas scoring below the national minimum standard are coloured in orange. The solid red line denotes the national standard of 67% effectiveness

Protected Area	Region	Score 2013/2014 (%)	Area (ha) contributed to target
Enseleni	East	88.31	297
Umtamvuna	East	86.37	3257
Vernon Crookes	East	83.77	2201
Hluhluwe-iMfolozi Park	East	83.70	94 984
Umlalazi	East	79.47	1200
Harold Johnson	East	78.15	104
Umhlanga Lagoon	East	77.92	32
Coleford	West	77.78	1272
Oribi Gorge	East	77.27	1917
Mpenjati	East	77.27	66
Krantzkloof	East	75.50	584
Bluff	East	75.50	45
Beachwood Mangroves	East	75.32	76
Kenneth Stainbank	East	75.32	237
Impendle	West	75.32	8759
UDP WHS	West	75.16	242 813
North Park	East	73.65	53
Amatikulu	East	72.97	1476
Umgeni Vlei	West	72.86	985
Skyline	East	72.73	15
Ongoye	East	72.19	3904
Mt Currie	West	71.97	1777



Protected Area	Region	Score 2013/2014 (%)	Area (ha) contributed to target
Mbumbazi	East	70.47	2100
Ntsikeni	West	69.87	9233
Dlinza	East	69.59	208
Entumeni	East	69.01	393
Nkandla	East	68.24	2217
Chelmsford	West	67.33	6845
Ndumo	East	66.24	-
Spioenkop	West	66.24	-
Ubombo Mountain	East	66.22	-
Tembe	East	65.61	-
Ithala	West	64.29	-
Weenen	West	63.06	-
Midmar	West	61.59	-
Richards Bay	East	60.00	-
Himeville	West	60.00	-
Ophathe	West	59.46	
Karkloof	West	58.50	-
Phongolo	West	58.44	-
Isandlwana	West	58.22	-
Wagendrift Dam	West	56.05	-
Sileza	East	53.85	-
Ncandu	West	53.52	-
Vryheid Mountain	West	53.19	-
Ntinini	West	53.10	-



Protected Area	Region	Score 2013/2014 (%)	Area (ha) contributed to target
Queen Elizabeth Park	West	53.06	-
Fort Nottingham	West	52.70	-
Umvoti Vlei	West	50.76	-
Hlatikulu	East	50.68	-
Erfs 179, 180 & 181	West	48.68	-
Indhloveni	West	48.68	-
Ingelabantwana	West	48.68	-
Marutswa	West	48.68	-
Marwaqa	West	48.68	-
Xotsheyake	West	48.68	-
Pongola Bush	West	47.55	-
The Swamp	West	44.44	-
Tugela Drift	West	39.02	-
Lake Eteza	East	35.51	-
iGxalingenwa	West	35.07	-
Kwa Yili	West	35.07	-
Doreen Clark	West	27.89	-
Blinkwater	West	22.22	-
Mean (%)		62.14	
Total Area (ha)			387,050



