

# Research priorities for the North West Subregion of the West Region

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The purpose of this document is to list research needs for the achievement of Ezemvelo KZN Wildlife's (EKZNW) objectives in the savannah protected areas (PAs) within the North West sub-region of the West Region. Among other things, the document also took into consideration the action projects identified in the protected area management plans (PAMPs) of the respective PAs (where available) in the North West subregion of the West Region. This list will assist in focussing attention and limited resources on priority needs/knowledge gaps, and will also be made available to tertiary institutions for distribution to students looking to undertake applied research in EKZNW PAs.

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### Focus Area 1: Biodiversity planning

- Develop *Conservation District Management Plans* on the basis of the KZN Critical Biodiversity Areas Assessment and integrate these into the Integrated Development Plans (IDPs) of the respective District Municipalities of the subregion.

## **Focus Area 2: Investigating threats to biodiversity**

### **Accelerated soil loss**

#### **Alien species invasions**

- Map the distribution and determine the densities and status of all alien plants in protected areas in the north-west subregion of the West Region. Identification and recording of all alien plants and their percentage densities per size class (e.g. 5% adult; 8% young; 10% seedling) per management block in all PA's is essential as a first step towards the planning and implementation of an integrated invasive alien clearing instead of an ad hoc approach as has been the case in the past. In terms of the National Environmental Management Biodiversity Act (Act 10 of 2004): Alien and Invasive Species Regulations, every management authority of a protected area must prepare a plan for the monitoring, control and eradication of invasive alien species. The KZN Biodiversity Bill of 2009, chapter 11 also stipulates this requirement and the information as well as the process that should be followed to produce such a document.
- Determine how fire might be integrated into alien plant control (e.g. bramble) as a management tool? Fire, as one of the cheapest management tools, could be used in combination with other alien plant control measures to suppress and kill alien plants provided its timing is appropriate. It could potentially be effectively used during follow-ups to kill seedlings and resprouting material where there is sufficient grass biomass to support hot enough fires. For such purposes, fire would need to be burned under hot enough weather conditions for it to cause maximum damage to the target plants.
- Determine the effect of alien invasive plants on invertebrate diversity and distribution. For example, i) How does bramble surrounding the edges of forests influence invertebrates that depend on forest edge habitats (e.g. Northern KwaZulu-Natal Mistbelt Forest at Ncandu NR) for breeding, foraging, etc? and ii) How do alien invasive plants alter fire behaviour and consequences for (especially forest) invertebrates and vertebrates? For instance, is there a difference in invertebrate/vertebrate diversity and abundance between areas infested with alien plants and those that aren't?
- Investigate soil condition changes resulting from alien plant infestations and implications for grassland rehabilitation. It is hypothesized that alien plant infestations have a potential to alter soil chemistry as well as fertility and that this may negatively affect the re-establishment of indigenous plants used for rehabilitation of such sites.

- Determine the loss of biological diversity in areas previously infested with alien plants in comparison to areas never infested with alien plants (e.g. is there differences in species richness/diversity between such areas?).

#### **Disease**

- Investigate and understand the ecology and transmission of the bovine malignant catarrhal fever (BMCF) or snotsiekte from wildebeest to cattle. This is a fatal, viral disease caused by a group of ruminant gamma herpes viruses including ***Alcelaphine Herpes Virus 1*** (AIHV-1) and ***Ovine Herpes Virus 2*** (OvHV-2). A better understanding of the ecology and transmission of snotsiekte from wildebeest to cattle is important; especially as to which stage are cattle more vulnerable to contract the disease from wildebeest. This would, at least, enable timeous management interventions to minimise transmission of the disease to cattle. Establish the difference in virulence between the African strain of the disease (i.e. transmitted by wildebeest) and the European strain (i.e. transmitted by sheep to cattle).
- Investigate the possibility of the existence and the extent of tuberculosis in some ungulates (e.g. eland, kudu, rhino, red hartebeest, etc.) at Weenen, Spioenkop, Chelmsford and Ntinini Nature Reserves.

#### **Focus Area 3: Managing natural resource use**

- Identify what resource management alternatives there are for meeting natural resource demand and simultaneously conserving biodiversity. Natural resource management has become a challenge in the face of increasing resource use demands facing conservation areas. This calls upon natural resource management organizations to come up with effective management alternatives and strategies to meet natural resource use demands without jeopardising biodiversity conservation (e.g. engaging nurseries to propagate high demand species).
- Determine the potential impacts of firewood collection from protected areas on the invertebrate assemblages. Firewood collection for local use inside the PA as well as the removal of wood following bush-clearing does occur in some PA's. However, the impact that this practice may have on invertebrates using logs as their habitat is not understood. It is hoped that the results of this project could shed some light on this issue.

**Focus Area 4: Management effectiveness**

**Focus Area 5: Understanding natural processes**

**Competition**

- Investigate and understand the ecological processes involved in bush encroachment in an effort to enable the implementation of the most cost-effective counter measures. The thickening and encroachment of certain woody species (e.g. Acacias) is occurring at a very rapid rate of late and this is threatening the grassland patches in the savannah areas. Therefore, an understanding of the factors that drive bush encroachment would assist in establishing and implementing appropriate management measures.
- Determine the rates of, and trends in, bush encroachment at Weenen; Spioenkop; Wagendrift and iSandlwana Nature Reserves based on photographic analysis. It is useful to understand at what rate the abovementioned PAs are being encroached as well as the trends of encroachment dating back to the period when these areas were fairly open.

**Disturbance**

- Determine the effect of fire on bush encroachment in semi-arid savannas with a history of cultivation. The pattern of bush encroachment appears to be more pronounced on previously cultivated land than in pristine areas (Breebart et al. 2001). Although fire plays an important role in maintaining open savannas and grasslands there is a wide held view that fire doesn't kill trees. However, it has also been observed that bush encroachment accelerates when fire is excluded from the system, to a point where fairly open grassland patches shift to thickets.
- Investigate the impact of fire on the Northern KwaZulu-Natal Mistbelt forests at Ncandu NR in terms of forest expansion or contraction. Ncandu NR has been vulnerable to runaway fires on a regular basis and this has had a negative impact on the mistbelt forests potentially resulting in fragmentation as well as contraction of the forests. It would be useful to assess and understand the impact these fires have had on the expansion or contraction of the forest.
- Determine the effect of fire on re-colonization and re-establishment of invertebrate communities and how this differs for flying and flightless taxa? It is suspected that fire has some negative impacts on invertebrates but the degree of the impact varies

between flying and flightless invertebrates due to their limited means of dispersal during a fire event. So, are the flightless invertebrates affected more than the flying invertebrates?

- Determine the effects of fire management regimes on reptiles; amphibians and small mammals at Chelmsford; Ncandu; Weenen; Spioenkop; Wagendrift and iSandlwana. Spring burn is the most common burning regime in the North West sub-region reserves, however, the effect of this burning regime on the abovementioned taxa is not understood hence the necessity of this study.
- Investigate the long-term impact of fire preclusion on transformation of grassland to woody vegetation. Although fire is thought to be unable to kill trees, visual evidence seems to show that areas where fire has been excluded for a long time tend to be vulnerable to woody plant invasion. It would be interesting to establish empirical evidence for this in the semi-arid savannas as well as what length of fire exclusion leads to woody plant invasion.
- Determine how fire influences the survival and spread of bracken fern (*Pteridium aquilinum*) at Ncandu NR. Bracken fern has become more abundant in pristine grasslands, especially where burning occurs on a regular basis at Ncandu NR. Its association with fire is not understood. It would be useful to establish whether it is favoured by a certain fire regime since this would enable management to adapt fire regime to counter the spread of bracken fern. The spread of bracken fern could potentially be a threat to biodiversity as it seems to form dense stands without any other species growing amongst it.

#### **Evolution and speciation**

#### **Predation**

#### **Restoration / rehabilitation**

#### **Focus Area 6: Ecotourism**

- Determine the ecotourism potential of Spioenkop Nature Reserve with a view to advising Ezemvelo KZN Wildlife (EKZNW) on the necessary and appropriate ecotourism facilities development and the feasibility thereof.

**Focus Area 7: Ecosystem services**

- Initiate a resource economics study to determine the economic value of Chelmsford Nature Reserves regarding the provision of ecosystem services and their contribution to the local and regional economy. The recreational and tourism opportunities offered by Chelmsford NR should have a reasonable contribution to both local and regional economy through tourist spending at Newcastle as well as visiting and spending at the nearby historical sites such as the battlefields. There is no clear understanding of the value these activities add to the economy and it needs to be investigated and documented.

**Focus Area 8: Cultural assets**

As land managers EKZNW is responsible for the management of cultural heritage. EKZNW staff are not well equipped with skills to perform this function and require support and recommendations based on an understanding of cultural, physical and spiritual factors (e.g. Weenen; Ncandu NRs, etc?).

- Undertake anthropological studies, incorporating participatory research, on the various living heritage sites (e.g. pilgrimage, graves in the region) and incorporate the relevant indigenous knowledge into the management plans/strategies of the relevant sites both for conservation management and tourism purposes (e.g. Weenen; Chelmsford; Wagendrift; Spioenkop; Ncandu, Isandlwana, etc) and also to comply with National Heritage Resources Act No. 25 of 1999. Cultural heritage resources at the abovementioned PA's is poorly understood due to either being superficially studied or not studied at all. A proper study of these resources could provide a documentation of their locality and value which would in turn enable its marketing for tourism purposes.

**Focus Area 9: Social ecology**

- Investigate the community perceptions of (EKZNW) reserve management and the existence and conservation options for Weenen Game Reserve expansion. Weenen Game Reserve has been subjected to a land claim by a neighbouring local community (i.e. iZigqoza). Therefore, it is of importance for the organisation to understand what perceptions this community might have towards nature conservation and the existence of Weenen GR in particular. Would they support Weenen GR to continue functioning as a protected area? The same community has successfully claimed a game ranch adjacent to Weenen GR, so it would be useful establish from the community whether they would support incorporating this area into Weenen GR and become managed as part of Weenen GR although the ownership remains with the community. Should this be successful, the black rhino habitat expansion would become possible thus reducing the habitat constraints that currently exist at Weenen GR.

**Focus Area 10: Climate change and adaptation**

- Investigate the effect of climate change on bush encroachment, with a particular focus on *Acacia* species at Weenen; Spioenkop; Isandlwana and Moor Park NRs. Bush encroachment appears to be happening at an accelerated rate lately, especially where *Acacia* species are involved. There has been anecdotal information that the accelerated bush encroachment is a result of climate change, which includes increased atmospheric CO<sup>2</sup>. Bond et al. (2010) provided first experimental evidence that *Acacia* species grow rapidly under high CO<sup>2</sup> levels, however, the results were from an open-top chamber lab experiment in a greenhouse without any field trials. Field studies would be necessary in order to prove beyond any doubt the role of CO<sup>2</sup> in the rapid thickening and encroachment of woody plants.
- Investigate the possible effects of climate change on the natural expansion of the Nile Crocodile's distribution range, particularly, from the uThukela Catchment onto the Bushman's Catchment in the Weenen areas. The need for this study came about as a result of the regular sightings, in the past couple of years, of lone Nile Crocodiles in the Weenen area which is way far from the uThukela River system. This has not been the case in the past ten years or so and has sparked suspicions that the Nile Crocodile might have expanded their geographical distribution range into the Bushman's River system. The regular sightings of the Nile Crocodile in the Weenen areas have kept the EKZNW DCO busy since he has had to capture and relocate the reptiles following callouts by concerned local people.

**Focus Area 11: Biophysical inventory and mapping**

- Mapping and description of soils and geology of Chelmsford, Ncandu, Wagendrift and Isandlwana Nature Reserves. The understanding of the distribution of soil and geology types within a protected area is important for the understanding of vegetation dynamics. Certain geology tends to give rise to certain soil types and certain soil types tend to be associated with certain plant species due to their nutrient status. Some soils are highly susceptible to erosion, therefore, it would be useful for management purposes to know the soil types occurring in the reserve.
- Undertake the vegetation mapping and description of vegetation communities at Ncandu, Wagendrift; Chelmsford; Spioenkop and Isandlwana NRs. A description of vegetation communities would assist in producing a vegetation map reflecting all the vegetation communities occurring in a reserve. This would provide an understanding of existing species assemblages within a reserve and perhaps trigger some thinking around what drives such assemblages as well as their implications for management.

**Focus Area 12: Genetics**

- Determine the genetic heterozygosity of black rhino (*Diceros bicornis minor*) at Weenen Game Reserve. The Weenen black rhino population was established from a very small founder population of only four individuals (i.e. 2 males from HiP; 1 female from Mkhuze GR and 1 female from Ndumo GR). Since its establishment only two instances of population augmentation have taken place, with one male re-introduced from HiP in October 1997 only to die of fighting in May the following year. This re-introduction followed translocations of two founder males and this appeared to have disrupted breeding in this population since it only left the resident male offspring to interbreed with their siblings as well as their parents. This situation is suspected to have affected the breeding success due to, probably, inbreeding in this small population. This study is necessary to establish the level of genetic diversity that presently exists in the population with a view to informing the metapopulation management strategy. The only other augmentation took place ten years later, in 2007 when an adult male was introduced from HiP. Since this introduction there has been improvement in breeding success, with four calves having been born.
- Determine the genetic heterozygosity of white rhino (*Ceratotherium simum simum*) at Weenen Game Reserve and Spioenkop Nature Reserve. Rhino populations are said to have gone through a genetic bottleneck at some point in their life history. This would have negatively affected the genetic heterozygosity of the species. It would be useful to undertake a study to investigate the levels of

genetic diversity that presently exist in this small white rhino population in comparison with the source population. This would be beneficial in informing our metapopulation management strategy in terms of how frequently should translocations be implemented between the sub-populations.

- Establish the genetic purity and heterozygosity of the black wildebeest (*Connochaetes gnou*) at Chelmsford Nature Reserve. There is uncertainty regarding the genetic purity of the black wildebeest population at Chelmsford NR due to the fact that some of the individuals in the population were introduced from an area where both black and blue wildebeest occur. Due to potential hybridization that might have occurred at the source area it is essential that a study be undertaken to investigate the genetic purity of this valuable South African endemic. Should its genetic purity be confirmed, it would enable management to implement a metapopulation management strategy between the few sub-populations that exist in some Ezemvelo protected areas as well as auction the excess individuals as live sales through our annual game auction.

#### **Focus Area 13: Population biology and ecology**

- Determine the population status and distribution of priority species such as the undescribed dwarf chameleon species at Ncandu Nature Reserve and the surrounding biodiversity stewardship properties:
  - i. A dwarf chameleon species was discovered at Ncandu NR in 2001 but it has not yet been described. Tail clippings were taken from it by PhD students from the Swedish University of Uppsala for DNA study but no results have come out of it yet. It is necessary to conduct a study to describe the species as well as assess its population status and spatial distribution. Considering that Ncandu NR is prone to unplanned fires which regularly burn into the forest, it would be useful to also investigate what impact fire has on the dwarf chameleon population.
- Determine the habitat selection and utilization of black rhino (*Diceros bicornis minor*) and their home ranges and overlap at Weenen Game Reserve. Weenen GR is well above 4000 ha in size, however, we do not have a good idea of how much of the reserve area is actually being utilized or preferred by the black rhino population. A few black rhinos have been lost due to intra-specific fighting, so it would be useful to understand how much home range overlap exists among individuals in this population so as to establish the extent of intra-specific competition among individuals.

- Determine the population status, threats and habitat requirements of African grass-owl (*Tyto capensis*), White-bellied korhaan (*Eupodotis senegalensis*) and Denham's bustard (*Neotis denhami*) in CNR. These Red Data Book bird species are not well studied and their population status within Chelmsford NR is poorly understood. Understanding of their population status, habitat requirements and threats would assist management in ensuring that certain areas of the reserve are managed for the persistence of these species.
- Determine the presence and status of herpetofauna occurring at iSandlwana Nature Reserve. Except for one reptile species recorded incidentally in 2009, there are no records of herpetofauna for iSandlwana NR due to the fact that there have been no studies conducted. In order to fully understand the value of the protected area for biodiversity conservation it is necessary to conduct a biological survey of the reserve in order to determine its species diversity as well as compile species checklists (i.e. birds; mammals; insects and other invertebrates; fish & herpetofauna).
- Investigate the status of the rock hyrax (*Procavia capensis*) population at Moor Park Nature Reserve and Weenen Game Reserve, including Tugela Drift NR following its suspected decline due to an unknown disease. The rock hyrax populations at the abovementioned reserves, except Tugela Drift, are known to have been decimated by an unknown disease a few years back, which is thought to have been the reason for the disappearance of the black eagle from Moor Park Nature Reserve. As a result the rock hyraxes were re-introduced to both Weenen GR and Moor Park NR subsequently; however, there is no understanding of how successful their re-introduction was. This study is expected shed some light on the rock hyrax population status since their re-introduction.
- Ground-truthing the occurrence of, as well as determining the status of, the Rudd's Lark (*Heteromirafra ruddi*) and the Yellow-breasted Pipit (*Anthus chloris*) populations at Ncandu NR and the surrounding biodiversity stewardship properties. The Rudd's Lark is suspected to occur at Ncandu NR but has never been recorded. So it would be useful for a formal investigation to be undertaken to confirm its occurrence or non-occurrence. Should its occurrence be confirmed, the profile of Ncandu NR will be elevated in terms of its biodiversity value. The Yellow-breasted Pipit has been recorded at Ncandu and the surrounding properties but its population status and trends are not unknown.

- Determine the population status and distribution of priority species such as *Barleria greenii* & *Barleria argillicola*; *Calpurnia woodii*; *Crassula obovata* var. *dregeana*; *Lotononis amajubica* at Weenen GR; Wagendrift NR and Ncandu NR respectively. Although the abovementioned species have been recorded in the respective PAs above, their population status and distribution are poorly understood. It would be useful, therefore, to conduct a study that would establish their spatial distribution and population status. *Barleria greenii* and *B. argillicola* are respectively classified as Vulnerable (VU) and Critically Endangered (CR) on the IUCN Red List.