

KAPAMA GAME RESERVE

TERRESTRIAL ECOLOGICAL ASSESSMENT



APRIL 2019

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EIA REGULATIONS SPECIALISTS REPORT CHECKLIST

(1) A specialist report prepared in terms of the 2014 Environmental Impact Assessment Regulations must contain-

(a) details of-		
✓	(i) the specialist who prepared the report; and	page 07
✓	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	page 87
✓	(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	page 88
✓	(c) an indication of the scope of, and the purpose for which, the report was prepared;	page 07
✓	(d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	page 12
✓	(e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	page 12
✓	(f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	page 41
✓	(g) an identification of any areas to be avoided, including buffers;	page 54
✓	(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	page 45
✓	(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	page 14
✓	(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	page 41
✓	(k) any mitigation measures for inclusion in the EMPr;	page 54
✓	(l) any conditions for inclusion in the environmental authorisation;	page 54
✓	(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	page 54
(n) a reasoned opinion-		
✓	(i) as to whether the proposed activity or portions thereof should be authorised; and	page 55
✓	(ii) if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	page 55
X	(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	n/a
X	(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n/a
✓	(q) any other information requested by the competent authority.	none

Abbreviations

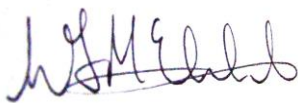
BODATSA	Botanical Database of Southern Africa
GKNP	Greater Kruger National Park
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
LEMA	Limpopo Environmental Management Act (No. 7 of 2003)
LPBCA	Limpopo Province Biodiversity Conservation Assessment
mamsl	Metres Above Mean Sea Level
NEMBA ToPS	National Environmental Management: Biodiversity Act Threatened or Protected Species Lists (No. 10 of 2004)
NFA	National Forest Act (No. 30 of 1998)
PRECIS	National Herbarium Pretoria (PRE) Computerised Information System
QDGS	Quarter Degree Grid Square, for example 2530 BD
SABAP2	Southern African Bird Atlas Project 2
SANBI	South African National Biodiversity Institute

Terminology

Alien	Introduced from elsewhere: neither endemic nor indigenous.
Biodiversity	The structural, functional and compositional attributes of an area, ranging from genes to landscapes.
Geophyte	Plants that produce their growth points from organs stored below the ground, an adaption to survive frost, drought and / or fire.
Palearctic	Ecozone consisting of North Africa, Europe and Asia north of the Himalayan foothills.
Transformed	Transformed ecosystems are no longer natural and contain little or no indigenous flora. Examples include agricultural lands, plantations, urban areas, etc.

Declaration of Independence

We declare that we have been appointed as independent consulting ecologists with no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2010. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. Remuneration for our services by the proponent is not linked to approval by any decision-making authority responsible for authorising this development.



W.L. McClelland

30 April 2019



D.R. McKenzie

30 April 2019

1. INTRODUCTION

Kapama Game Reserve (Pty) LTD, situated in south-eastern Limpopo Province, carried out construction activities during the period of 1989-2018 without the necessary environmental authorization. They are now applying for approval under Section 24(G) of the National Environmental Management Act 107 of 1998 (NEMA). Peter Velcich of NuLeaf Planning & Environmental appointed Ecorex Consulting Ecologists CC to perform a terrestrial ecology survey (flora, mammals, avifauna and herpetofauna) of the development areas. This study will provide a basis for a retrospective assessment of the potential impacts of the developments on the terrestrial ecology of the study area as well as providing a baseline of surrounding untransformed vegetation. The key deliverables for this study were a report on terrestrial ecosystems survey and an integrated Ecological Sensitivity Assessment.

The study team was as follows:

Duncan McKenzie (Terrestrial Ecologist). Duncan has been involved in biodiversity assessments for Ecorex for eleven years and countries of work experience include Lesotho, Swaziland, Mali, Mozambique, Sierra Leone, Guinea, South Africa, Tanzania and Democratic Republic of the Congo. Duncan has previously worked as a Regional Coordinator for the Mondi Wetlands Project and has lectured on many aspects of conservation in Mbombela and the Kruger National Park. He is currently the Mpumalanga Regional Co-ordinator for the South African Bird Atlas Project, formerly sat on the KZN Bird Rarities Committee, is co-author of The Birds of Mbombela and is a co-author on the Wildflowers of the Kruger National Park project. A more detailed CV is presented in Appendix 6.

Linda McKenzie (GIS Specialist). Linda is a GIS Specialist/GIS Analyst with over 13 years' experience in the industry. For the last five years she has operated her own GIS Consultancy called Digital Earth. She has extensive experience in both the private and public sector, as has worked on a wide variety of projects and GIS applications. These include, most recently, vegetation and sensitivity mapping, landcover data capture, municipal roads master planning, hydroelectric scheme and wind farm feasibility mapping and town planning, land surveyor and engineering support services. Linda formerly served as Vice Chairperson and Treasurer for GISSA Mpumalanga and is a registered Professional GISc Practitioner (PGP0170).

2. OBJECTIVES

The objectives of the Ecology Survey were to:

- Provide an assessment of the ecological sensitivity of affected ecosystems;
- Provide an overview of key potential impacts that the project has had on terrestrial ecosystems;
- Make recommendations regarding infrastructure layout, where applicable.

The primary deliverable will be a report on Terrestrial Ecosystems, including:

- Biodiversity Baseline Description;
- Ecological Sensitivity Assessment;
- Broad-scale Vegetation Map;
- Ecological Sensitivity Map;
- Recommendations regarding infrastructure layout, where relevant.

3. STUDY AREA

Kapama Private Game Reserve (KGR), a commercial tourism venture, is situated approximately 10 km south of the town of Hoedspruit, Mopani District, Limpopo Province (Figure 1). KGR is approximately 16 000 ha in size¹ and is situated between the tarred R40 in the west and the perennial Klaserie River in the east. Although it is not part of the Greater Kruger National Park (GKNP), it is situated adjacent to it with the closest portion being Thornybush Game Reserve. Fourteen Application Sites within KGR were sampled in the survey; the details and co-ordinates of each are presented in Table 1. These Application Sites are situated on the following farm portions:

- Remainder of Portion 1 of the farm Hoedspruit 82 KU
- Remainder of Portion 4 of the farm Moria 83 KU
- Portions 35, 67, 204, 211, 213, 229 & the Remainder of Portion 3 of the farm Guernsey 81 KU

The study area is situated within the quarter-degree grid 2431 AC with an altitudinal gradient of 470 metres above mean sea level (mamsl) in the far north-eastern portion along the Klaserie River up to 590 mamsl in the central western section. The topography of the general area is flat to undulating with shallowly incised drainage lines. Most of the study area contains untransformed vegetation, but existing infrastructure is present within the Application Sites listed in Table 1. Furthermore, the southern portions adjacent to the Airstrip, Karula Lodge and Hongonyi Gate were formerly cultivated but are in various stages of re-vegetation.

¹ <https://www.kapama.com/about/>

Table 1. Application Site Details

APPLICATION SITE	DESCRIPTION	AREA (ha)	BEDS GUEST	BEDS STAFF	LONG	LAT
River Lodge	Expansion of old day visitor facility (pre-1989) including tourist accommodation, main complex, reception, spa, waste water treatment works, staff accommodation etc.	8.4	164	40	-24.42715	31.02747
Karula Lodge	New camp. Guest villas, main complex, staff accommodation, waste water treatment works	5.2	24	40	-24.45911	31.10622
Buffalo Camp	Expansion on old farmstead site. Guest tents, main complex, staff accommodation.	1.8	10	8	-24.46648	31.05126
Southern Camp	Guest villas / suites, main complex, staff accommodation, waste water treatment works	5.9	20	40	-24.45518	31.08312
Drakensig Staff Village & Workshop	Separate staff village for River lodge	2.8	n/a	60	-24.43418	31.01733
Waste Incineration Site	Adjacent to an old farmhouse	1	n/a	n/a	-24.43394	31.02062
Main Gate	Main entrance gate to Kapama from the R40	0.5	n/a	n/a	-24.42930	31.01380
Hongonyi Gate	Upgrade to existing gate & add generator room and staff accommodation	0.6	n/a	n/a	-24.47435	31.09860
Reservoirs	2 x 800 000l water reservoirs	0.2	n/a	n/a	-24.44422	31.05131
Airstrip	Extension to existing airstrip (500m)	18.1	n/a	n/a	-24.46474	31.08968
Water Purification Plant	New facility adjacent to the Klaserie River	0.1	n/a	n/a	-24.43657	31.11230
Klaserie River Crossing 2	Kubu Dam Weir / River Crossing	7.2	n/a	n/a	-24.43590	31.11295
Klaserie River Crossing 1	River Crossing	0.2	n/a	n/a	-24.44554	31.11947
Bosplaas	Owner's House adjacent to Klaserie River	0.5	0	8	-24.39842	31.10149

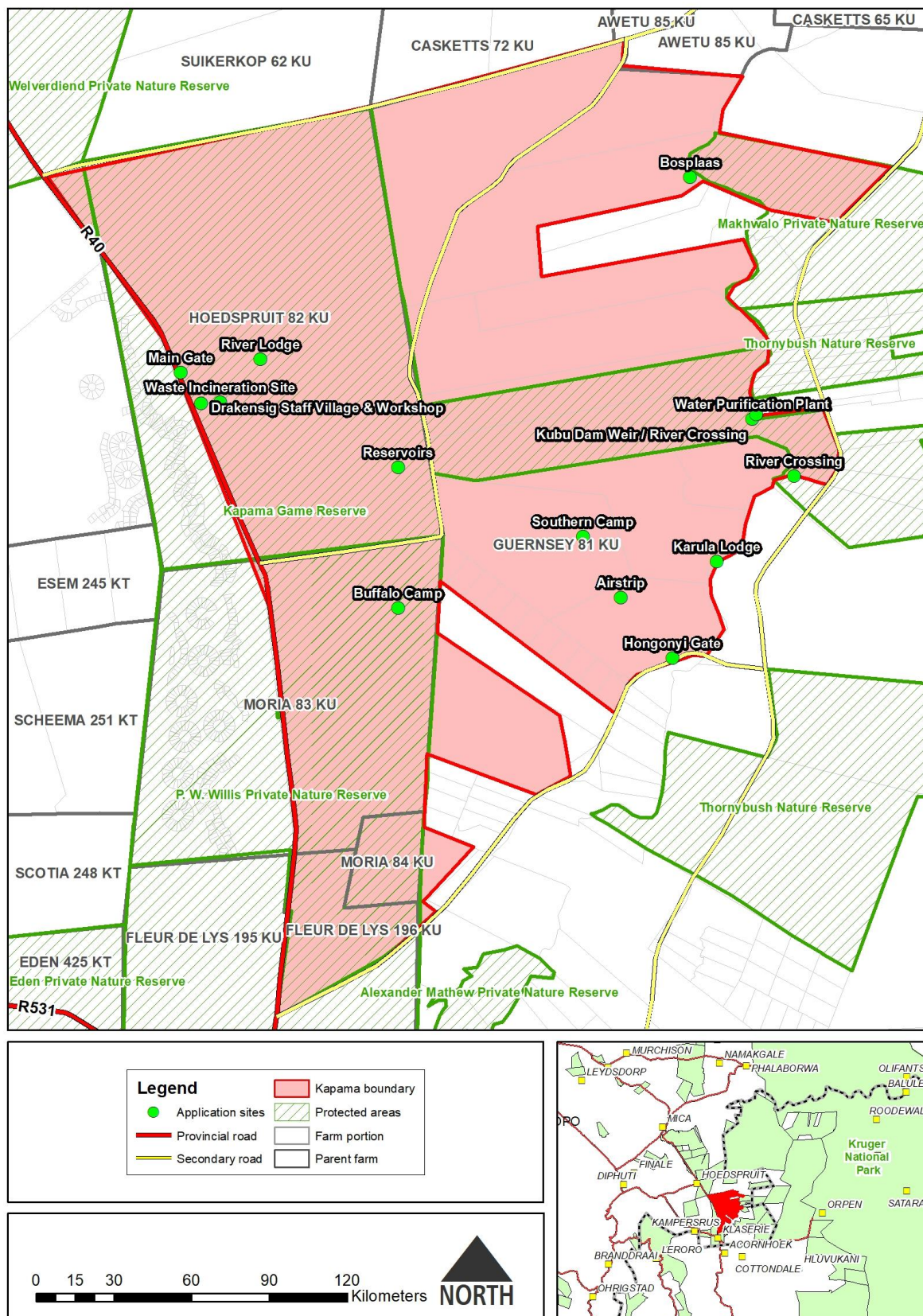


Figure 1. Location of Study Area

4. METHODS

4.1 Flora

Desktop

The Botanical Database of Southern Africa (BODATSA)¹, which is curated by the South African National Biodiversity Institute (SANBI), was queried for a list of plant species that have been recorded from a 20 km radius of the study area. BODATSA contains records from the National Herbarium in Pretoria (PRE), the Compton Herbarium in Cape Town (NBG & SAM) and the KwaZulu-Natal Herbarium in Durban (NH). This list was used to produce a list of the most likely threatened species, which were searched for during fieldwork.

Fieldwork

Each Application Site was sampled during site visits on the 3rd and 4th of April 2019. Vegetation within each Application Site as well as the surrounding, untransformed vegetation, was surveyed on foot and the location of species of conservation-importance captured onto a Samsung S7 phone using LocusMap ProTM software. Species lists were compiled for each vegetation community located.

4.2 Fauna

Desktop

Lists of conservation-important mammals, birds, reptiles and frogs potentially occurring within KGR were prepared using data from the KGR website², Child *et al.* (2016), the Southern African Bird Atlas Project 2³, Taylor *et al.* (2016), Minter *et al.* (2004) and Bates *et al.* (2014). The above data were captured mostly at a quarter-degree spatial resolution, but were refined by excluding species unlikely to occur within the study area, due to unsuitable habitat characteristics (e.g. altitude and land-use). Bat species thought to only forage over the study area (i.e. mostly cave-roosting species) were not included in the assessment due to the lack of suitable caves within the study area. Potential occurrence of fauna in the study area was predicted based on knowledge of known habitat requirements of local fauna species.

¹ <http://newposa.sanbi.org/>

² <https://www.kapama.com/>

³ <http://sabap2.adu.org.za/>

Fieldwork

Birds were identified audially and visually using Bushnell 10x42 binoculars. Observations were made incidentally during the time that the vegetation survey was conducted, and limited to birds seen and heard within the study area and immediate surrounds. Mammals, reptiles and frogs were recorded incidentally as they were encountered during the survey through direct evidence (sightings) and indirect evidence (spoor, dung).

4.3 Ecological Sensitivity

For the purposes of this study, Ecological Sensitivity (ES) is considered to be a function of Conservation Value (CV) of the receptor (e.g. habitat unit) and its sensitivity to impacts or Receptor Sensitivity Index (RSI). CV is assessed according to presence of populations of Species of Conservation Concern (SCC) as well as suitability of habitat for supporting populations of SCC. RSI is calculated as a function of Vulnerability to impacts and Resilience, i.e. capacity to be restored to original state with limited human intervention.

Ecological Sensitivity is calculated as follows:

$ES = CV + RSI$, where

$RSI = V + R$

Table 2 indicates how ES is interpreted in relation to these variables.

Table 2. Ecological Sensitivity Matrix

Receptor Sensitivity Index		Resilience				
		Very Low	Low	Medium	High	Very High
Vulnerability	Very High	Very High	High	Med-High	Medium	Medium
	High	High	Med-High	Medium	Medium	Low
	Medium	Med-High	Medium	Medium	Low	Low
	Low	Medium	Low	Low	Low	Low
	Very Low	Low	Low	Low	Low	Low

Ecological Sensitivity		Conservation Value				
		Very High	High	Med-High	Medium	Low
Receptor Sensitivity Index	Very High	Very High	Very High	High	Med-High	Medium
	High	Very High	High	Med-High	Medium	Medium
	Med-High	High	Med-High	Medium	Medium	Low
	Medium	Med-High	Medium	Medium	Low	Low
	Low	Medium	Medium	Low	Low	Low

The Ecological Sensitivity values are indicated spatially in Figure 9.

4.4 Assumptions, Limitations and Knowledge Gaps

4.4.1 Seasonality

The assessment was based on a single field visit in the growing season. It is possible that plants which flower at other times of the year were underrepresented, although this is not seen as a limitation that could affect the Record of Decision as the specialist has extensive experience in the area. Sufficient data were collected in order to assess habitat suitability for potentially occurring threatened plant species.

4.4.2 Overlooked Species

Certain plant species, particularly geophytes, will only flower in seasons when conditions are optimal and may thus remain undetected, even over a survey that encompasses several seasons. Other plant species may be overlooked because of very small size and / or extreme rarity. A sampling strategy will always represent merely a subset of the true diversity of the study area. However, the level of sampling effort for this study was appropriate for the objectives of the study.

4.4.3 Sampling Effort

The survey took place over two days, within which all 14 Application Sites scattered across KGR were visited. This resulted in a fairly limited amount of time sampling each site but sufficient sampling of adjacent natural vegetation was performed in each vegetation community to assess the impacts of the sites on untransformed habitat.

5. BIODIVERSITY BASELINE DESCRIPTION

5.1 Flora

5.1.1 Regional Context

According to the current National Vegetation Map (SANBI, 2018), the vegetation type present within the study area is Granite Lowveld. This occurs in a narrow strip from Phongola in northern KwaZulu-Natal in the south, through central Swaziland, and to Giyani in Limpopo Province in the north. Granite Lowveld originally covered about 19 838 km², of which 21% has been transformed, mostly through agriculture and urbanisation. Mucina & Rutherford (2006) assessed this community to be Vulnerable, but it is not situated within any Threatened Ecosystems as listed in Government Gazette No. 34809 of 9 December 2011 (DEAT, 2011).

Typical Granite Lowveld is dominated by tall trees such as *Acacia nigrescens* and *Sclerocarya birrea*, as well as a variety of smaller trees and shrubs such as *Combretum zeyheri* and *C. apiculatum*, *Terminalia sericea*, *Euclea divinorum* and *Peltophorum africanum*. Common herbaceous plants include *Waltheria indica*, *Aspilia mossambicensis*, *Commelina* species and *Kohautia virgata*. Dominant grasses are *Digitaria eriantha*, *Panicum maximum* and *Pogonarthria squarrosa* (Mucina & Rutherford, 2006).

The study area is not situated in any of southern Africa's floristic centres of endemism, which are areas that have an unusually high number of plants unique to that area (Van Wyk & Smith, 2001).

5.1.2 Local Context – Plant Species Richness and Vegetation Assemblages

SANBI's Botanical Database of Southern Africa (BODATSA) lists 240 plant species from 75 families for a 20 km radius of the project area, below the Escarpment. This area is somewhat under sampled as 197 plants species from 56 families were recorded from the project area during April 2019 fieldwork alone, representing 82% of the BODATSA total. The true plant species diversity of the district is likely to be significantly higher. The full list of 197 plant species confirmed to occur in the project area during fieldwork is provided in Appendix 1. The dominant plant families in the flora are Poaceae (29 spp), Fabaceae (28 spp), Asteraceae (14 spp), Malvaceae (12 spp) and Combretaceae (8 spp).

Four untransformed vegetation communities were identified within the study area on the basis of distinctive vegetation structure (grassland, woodland, thicket, etc.), floristic composition (dominant and diagnostic species) and position in the landscape (mid-slopes, terrace, crest, etc.). Figure 7 provides an overview of the vegetation communities across the study area. The untransformed vegetation communities are described in detail below, with alien plant species indicated by an asterisk:

5.1.2.1 *Combretum erythrophyllum* – *Diospyros mespiliformis* Riparian Forest

This vegetation community occurs along the Klaserie River in the eastern border of Kapama (Figure 7). The following Application Sites are situated within Riparian Forest:

1. Karula Lodge
2. Water Purification Plant
3. Klaserie River Crossing 1
4. Klaserie River Crossing 2 (Kubu Dam)
5. Bosplaas (owner's house)

Approximately 11 ha of this vegetation community has been impacted by the above-listed developments. Vegetation structure is mostly Tall Forest (sensu Edwards, 1983) (Figure 2). Tall riparian trees such as *Combretum erythrophyllum* and *Diospyros mespiliformis* dominate in the canopy, while other common trees are *Ficus sycomorus*, *Schotia brachypetala*, *Acacia xanthophloea* and *A. robusta*. Smaller trees and woody shrubs that are commonly encountered in the understory include *Searsia gueinzii*, *Mystroxydon aethiopicum*, *Azima tetracantha* and *Gymnosporia senegalensis*. The ground layer is sparse in places due to the dense canopy and mid-stratum, but the herbs *Barleria elegans* and *Commelina benghalensis*, as well as the shade-loving grasses *Panicum deustum* and *P. maximum* occur throughout. In places, the sandier riverbed is dominated by the reed *Phragmites australis*, while various alien invasive species such as **Xanthium spinosum*, **Sesbania punicea*, **Ricinus communis* and **Lantana camara* are well established. The sedges *Cyperus dives* and *C. sexangularis* are evident where muddier sediments have deposited, as well as the grass *Leersia hexandra*.

A total of 60 species (30% of the entire list) was recorded from *Combretum erythrophyllum* – *Diospyros mespiliformis* Riparian Forest (Appendix 1), the lowest species list of the four

communities present. Species fidelity, which is closely linked to community uniqueness, is high with 18 species (30% of the community list) occurring nowhere else in the study area.

Six conservation-important species were recorded from this community (Table 3), although all are rarely encountered within the community and none are considered to be national Species of Conservation Concern (SCC) as defined by Raimondo *et al.* (2009)¹. The International Union for Conservation of Nature (IUCN) considers the epiphyte *Ansellia africana* to be Vulnerable (VU) and the small tree *Dalbergia melanoxylon* to be Near Threatened (NT). The trees *Sclerocarya birrea*, *Philenoptera violacea* and *Breonadia salicina* are protected under the National Forests Act (No. 30 of 1998, NFA), while the tree *Spirostachys africana* is protected under the Limpopo Environmental Management Act (No. 7 of 2003). Riparian Forest was assessed as having **Medium-High** Ecological Sensitivity (ES) from a combination of Medium RSI value and Very High Conservation Value (Table 5). Riparian forest is situated in a CBA1 Irreplaceable area and is an important community for faunal migration corridors and habitat for specialised and VU species such as Nile Crocodile *Crocodylus niloticus* and Hippopotamus *Hippopotamus amphibius*.

¹ Species of Conservation Concern include those with a status of Rare, Critically Rare, Near Threatened, Data Deficient, Vulnerable, Endangered and Critically Endangered



Figure 2. Photographs of Application Sites situated within Riparian Forest

5.1.2.2 *Schotia brachypetala* – *Euclea divinorum* Riparian Thicket

Riparian Thicket occurs along the banks of seasonal drainage lines throughout Kapama (Figure 7). It is characterised by moderately tall riparian trees with a clumped, dense understory layer. Vegetation structure is mostly Short Thicket (*sensu* Edwards, 1983) (Figure 3). The following Application Sites contain Riparian Thicket:

1. River Lodge
2. Buffalo Camp

Approximately 7 ha of this vegetation community has been impacted by the above-listed developments.

The tree *Schotia brachypetala* dominates the canopy of this community with a lower abundance of additional trees such as *Mystroxydon aethiopicum*, *Spirostachys africana*, *Acacia robusta*, *Combretum hereroense*, *Elaeodendron transvaalense* and *Commiphora neglecta*. Smaller trees and shrubs found include *Euclea natalensis* and *E. divinorum*, *Gymnosporia senegalensis*, *Acacia exuvialis*, *Croton menyharthii*, *Pappea capensis*, *Searsia gueinzii*, *Grewia flavescens*, *Dalbergia melanoxylon* and *Phyllanthus reticulatus*. Dwarf shrubs and herbs found include *Hypoestes forskoolii*, *Barleria elegans*, *B. obtusa* and **Ageratum conyzoides*. Grasses are sparse but include *Panicum maximum* and *Eragrostis trichophora*.

A total of 95 species (48% of the entire list) was recorded from Riparian Thicket (Appendix 1), the second highest species list of the four vegetation communities present. Species fidelity, which is closely linked to community uniqueness, is high, with 27 species (28% of the community list) occurring nowhere else in the study area.

Five conservation-important species were recorded (Table 3) with one considered to be a national SCC. *Elaeodendron transvaalense* is assessed as NT by Raimondo *et.al.* (2009) while the IUCN has assessed the epiphyte *Ansellia africana* to be VU and the small tree *Dalbergia melanoxylon* to be NT. *Sclerocarya birrea* and *Elaeodendron transvaalense* are protected under the National Forests Act (No. 30 of 1998) and *Spirostachys africana* is protected under the Limpopo Environmental Management Act (No. 7 of 2003). Riparian Thicket was assessed as having **Medium** ES through a combination of High Conservation Value and Medium RSI. It is situated in a CBA1 Irreplaceable area, houses nationally threatened mammal and bird species and is an important community for faunal migration corridors (Table 5).



Figure 3. Photographs of Application Sites situated within Riparian Thicket

5.1.2.3 *Combretum apiculatum* – *Sclerocarya birrea* Closed Woodland

This is the dominant vegetation community on KGR, occurring in eight of the Application Sites (Figure 7). Vegetation structure is Short to Tall Closed Woodland (Figure 4) (Edwards, 1983). The following Application Sites contain Closed Woodland:

1. River Lodge (incl. staff accommodation and waste water treatment works)
2. Karula Lodge (incl. staff accommodation)
3. Southern Camp (incl. staff accommodation and waste water treatment works)
4. Drakensig Staff Quarters and Workshop
5. Main Gate
6. Reservoirs & Cell Tower
7. Bosplaas (owner's house)
8. Buffalo Camp

Approximately 15 ha of this vegetation community has been impacted by the above-listed developments.

A high diversity of trees dominate the canopy with the most dominant including *Sclerocarya birrea*, *Combretum apiculatum*, *C. zeyheri*, *C. hereroense*, *Peltophorum africanum*, *Acacia nigrescens*, *Strychnos madagascariensis* and *Terminalia sericea*. Common shrubs found include *Euclea divinorum*, *Acacia gerrardii*, *Dichrostachys cinerea* and *Mundulea sericea*. Dominant forbs, bulbs and herbs found include *Ocimum americanum*, *Waltheria indica*, *Kyphocarpa angustifolia* and *Agathisanthemum bojeri*. The dominant grasses found include *Eragrostis rigidior*, *Urochloa mosambicensis*, *Sporobolus pyramidalis*, *Eragrostis superba* and *Heteropogon contortus*.

A total of 106 species (54% of the entire list) was recorded in *Combretum apiculatum* – *Sclerocarya birrea* Closed Woodland (Appendix 1), the highest of the four communities present. Species fidelity is high, with 36 species (34% of the community list) occurring nowhere else in the study area.

Six conservation-important species were recorded (Table 3). One of these is listed by the IUCN as VU, namely *Ansellia africana*, and one as NT, namely *Dalbergia melanoxylon*. Four species are protected under the NFA, namely *Sclerocarya birrea*, *Philenoptera violacea*, *Combretum imberbe* and *Balanites maughamii*. Closed Woodland was assessed as having **Medium** ES through a combination of High Conservation Value and Medium RSI. It is situated in a CBA1 Irreplaceable area and houses nationally threatened mammal and bird species (Table 5).



Figure 4. Photographs of Application Sites situated within Closed Woodland

5.1.2.4 *Acacia nilotica* – *Dichrostachys cinerea* Degraded Woodland

Acacia nilotica – *Dichrostachys cinerea* Degraded Woodland occurs in the southern parts of Kapama, in areas that were possibly historically old lands or other degraded areas (Figure 7). Vegetation structure is Short Closed Woodland (Figure 5) (Edwards, 1983). The following Application Sites are situated within Degraded Woodland:

1. Waste Incineration Site
2. Hongonyi Gate (incl. staff accommodation)
3. Air Strip
4. Karula Waste Water Pond

Approximately 20 ha of this vegetation community has been impacted by the above-listed developments.

The dominant canopy species in this community are the pioneer trees *Acacia nilotica* and *A. tortilis*, while other prevalent trees and shrubs include *Dichrostachys cinerea*, *Ziziphus mucronata*, *Combretum hereroense* and *C. imberbe*. A number of alien herbs dominate the ground layer, including **Richardia brasiliensis*, **Acanthospermum australe*, **Alternanthera pungens*, **Bidens pilosa* and **Zinnia peruviana*. Grasses are sparse due to overgrazing but include *Heteropogon contortus*, *Cynodon dactylon* and *Eragrostis superba*.

A total of 65 species (33% of the entire list) was recorded from Degraded Woodland - the third most species-rich of the vegetation communities in the study area (Appendix 1). Species fidelity is moderate, with 13 species (20% of the community list) occurring nowhere else in the study area. A total of 16 alien plant species were recorded from this community, reflecting the high levels of degradation.

Only two conservation-important species were recorded from this community, namely the trees *Sclerocarya birrea* and *Combretum imberbe* which are protected under the NFA (Table 3). Degraded Woodland was assessed as having **Medium** ES through a combination of High Conservation Value and Medium RSI. It is situated in a CBA Irreplaceable area and houses nationally threatened mammal and bird species (Table 5).



Figure 5. Photographs of Application Sites situated within Degraded Woodland

5.1.3 Conservation-Important Flora

A total of 197 plant species in 56 families was recorded during fieldwork (Appendix 1). One of these is considered VU by the IUCN, namely the epiphytic orchid *Ansellia africana*. This species is discussed below.

***Ansellia africana* Lindl.** Leopard Orchid

This familiar epiphytic orchid occurs from South Africa to Senegal and assessed as VU by the IUCN due to over-collection for a wide variety of traditional uses such as the medicinal medicine trade, for use as a love charm, to ward off lightning and as an antidote against bad dreams. It is also highly desirable in the horticultural trade¹. Despite these threats, this species is still relatively common in protected areas in South Africa, specifically the GKNP (*pers. obs.*) and is not listed as a SCC by Raimondo *etal.* (2009). A number of plants were observed in most of the lodges in Kapama (Figure 6) where it appears they have been harvested from the surrounding vegetation and planted within the camps. Mortality appears to be fairly high, as a number of transplanted specimens were dying.

¹ Crook, 2013

Two additional species are also considered SCC, namely *Elaeodendron transvaalense* which is assessed as NT by Raimondo *et.al.* (2009) while *Dalbergia melanoxylon* is assessed as NT by the IUCN. These two species are dealt with below:

***Elaeodendron transvaalense* (Burt Davy) R.H.Archer** Bushveld Saffron

This is a small to medium-sized evergreen tree occurring in northern and eastern South Africa, and further afield through Namibia, Botswana, Zimbabwe, Mozambique and Zambia. The species is heavily harvested in South Africa for traditional medicine and some sub-populations have declined as a result; as such it has been assessed as NT (Williams *et al.*, 2008a). A moderate number of plants were located within the Riparian Thicket community, particularly in River Lodge.

***Dalbergia melanoxylon* Guill. & Perr.** Zebra Wood

This species usually grows as a small to medium-sized tree and is found throughout the Lowveld and as far north and west as Senegal. Although not nationally listed, it is assessed by the IUCN as NT due to over-collection for the wood carving industry and in the manufacturing of musical instruments¹. However, this species is still common in the Lowveld of South Africa, including KGR (*pers.obs.*). Moderate numbers were located mostly within the Closed Woodland community.

One of the remaining potentially occurring SCC has a moderate likelihood of occurring within the study area and is discussed below.

***Drimia sanguinea* (Schinz) Jessop** Red Drimia

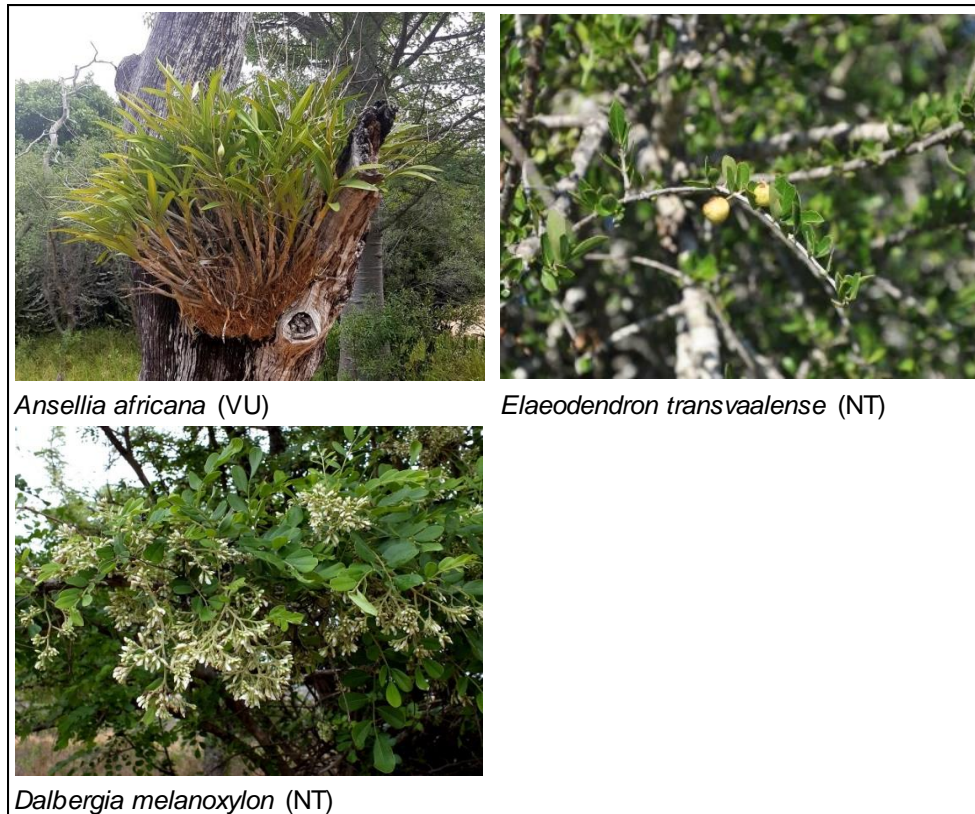
This small bulb is invisible for most of the year either through dormancy or being inconspicuous due to its grass-like leaves. It is only in the flowering season that they are visible. This takes place in early spring and it is therefore likely that this bulb was not located during fieldwork due to the timing of the survey. This plant is listed as NT due to over-collection for the medicinal plant trade².

The remaining two SCC have a Low likelihood of occurring within the study area due to unsuitable habitat present or regional rarity (Appendix 2).

¹ World Conservation Monitoring Centre. 1998. *Dalbergia melanoxylon*. The IUCN Red List of Threatened Species 1998: e.T32504A9710439. <http://dx.doi.org/10.2305/IUCN.UK.1998.RLTS.T32504A9710439.en>. Downloaded on 24 April 2019.

² Williams *et al.*, 2008b

Six plant species recorded during fieldwork are protected under the NFA, namely *Sclerocarya birrea*, *Elaeodendron transvaalense*, *Philenoptera violacea*, *Combretum imberbe*, *Balanites maughamii* and *Breonadia salicina*, and two are protected under the LEMA, namely the tree *Spirostachys africana* and the epiphyte *Ansellia africana* (Table 3).



Ansellia africana (VU)

Elaeodendron transvaalense (NT)

Dalbergia melanoxyton (NT)

Figure 6. Photographs of Species of Conservation Concern recorded during fieldwork

The co-ordinates of the conservation-important plants located within and around each Application Site during fieldwork are presenting in Appendix 3. These points are spatially presented in Figure 7.

Table 3. Conservation-important plant species confirmed during fieldwork

Taxa	Growth Form	Red Data	Protected	Vegetation Communities			
				Riparian Forest	Riparian Thicket	Closed Woodland	Degraded Woodland
				Karula Lodge Klaserie Weirs / Crossings Bosplaas	River Lodge Karula Lodge Water Purification Plant Buffalo Camp	River Lodge Drakensig Main Gate Reservoirs & Cell Tower Southern Camp Karula Lodge Bosplaas	Airstrip Hongonyi Gate Waste Incineration
Family Anacardiaceae <i>Sclerocarya birrea</i> (A.Rich.) Hochst. subsp. <i>caffra</i> (Sond.) Kokwaro	tree		NFA	r	r	d	r
Family Balanitaceae <i>Balanites maughamii</i> Sprague subsp. <i>maughamii</i>	tree		NFA			r	
Family Celastraceae <i>Elaeodendron transvaalense</i> (Burt Davy) R.H.Archer	tree	NT	NFA		r		
Family Combretaceae <i>Combretum imberbe</i> Wawra	tree		NFA			u	r
Family Euphorbiaceae <i>Spirostachys africana</i> Sond.	tree		LEMA	r	u		
Family Fabaceae <i>Dalbergia melanoxydon</i> Guill. & Perr. <i>Philenoptera violacea</i> (Klotzsch) Schrire	tree tree	NT‡	NFA	r r	u	r r	
Family Orchidaceae <i>Ansellia africana</i> Lindl.	epiphyte	VU‡	LEMA	r	r	r	
Family Rubiaceae <i>Breonadia salicina</i> (Vahl) Hepper & J.R.I.Wood	tree		NFA	r			
TOTAL	9	3	8	6	5	6	2

NFA = National Forests Act
LEMA = Limpopo Environmental Management Act
NT = Near Threatened
‡ = IUCN assessment
* = exotic species

d = dominant
f = frequent
u = uncommon
r = rare

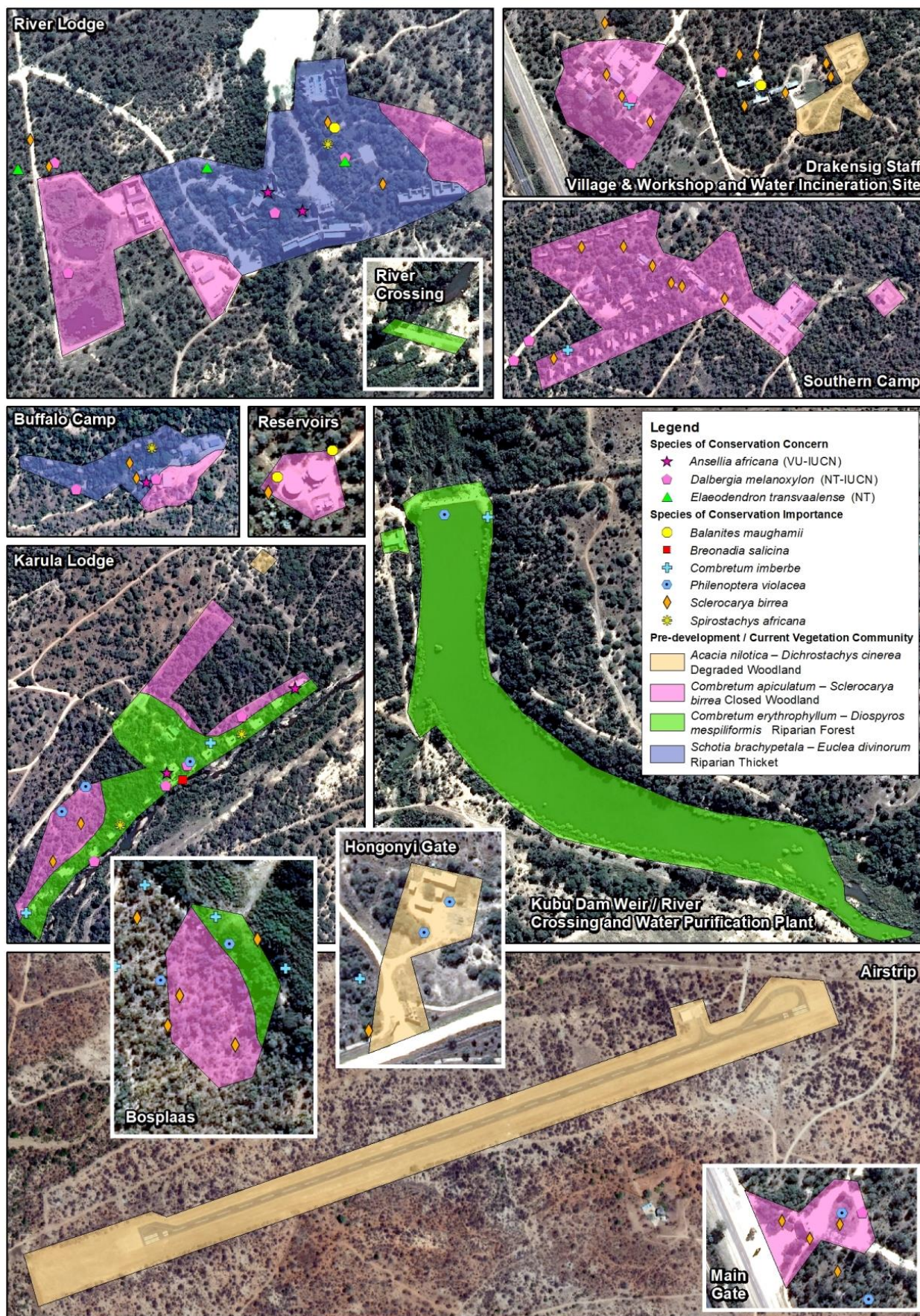


Figure 7. Pre-development Vegetation Communities within the 14 Application Sites

5.2 Terrestrial Fauna

5.2.1 Mammals

5.2.1.1 Regional Overview

KGR is situated in the savanna biome adjacent to the GKNP and therefore has very high mammal diversity, relatively low numbers of endemics and a relatively high number of Red Data species⁹. Most of the surrounding area is formally conserved with roads and lodges the primary types of development. Mammal populations, therefore, are well protected and reasonably secure. A total of 57 mammals have been recorded in the QDGS 2530 DD in the Animal Demography Unit's Virtual Museum's database¹⁰. As all virtual museum submissions require the inclusion of at least one photograph of the mammal, the actual number of species present is likely to be significantly higher as many mammals are small, cryptic or nocturnal in habit and therefore difficult to photograph. Six of the confirmed Virtual Museum mammals are SCC.

5.2.2.2 Confirmed Species

Twenty-six mammal species were recorded during fieldwork (Appendix 3), 23 of which were recorded from Closed Woodland. These included many common and widespread species such as Impala *Aepyceros melampus*, Greater Kudu *Tragelaphus strepsiceros*, Plains (Burchell's) Zebra *Equus quagga burchelli* and Chacma Baboon *Papio ursinus*. Seven species were recorded from Forest / Thicket habitats, including Nyala *Tragelaphus angasii* and Vervet Monkey *Chlorocebus pygerythrus*, while two mammals were recorded from aquatic habitat, namely Hippopotamus *Hippopotamus amphibius* and African Elephant *Loxodonta africana*. Additional sampling, including small mammal trapping, bat sampling and camera traps, would result in additional species but would not change the findings of the report.

5.2.1.3 Conservation-Important Species

An estimated 28 conservation-important mammals potentially occur within the project area (Appendix 4), which is an extremely high total but this is due to the study area being situated within a large, formally protected conservation area in the savanna biome. Several cave-

⁹ Child *et al.*, 2016

¹⁰ http://vmus.adu.org.za/vm_sp_list.php accessed 24/04/2019

roosting bat species of conservation concern are likely to occur overhead, but these species are only likely to feed over the site because of the shortage of suitable roosting sites and have been excluded from this assessment.

Of the 28 potentially occurring species, 17 are considered to be SCC¹¹ with only nine considered threatened (Appendix 4). Of these, four were confirmed during fieldwork and are discussed in more detail below:

African Elephant

Despite South Africa only having 4% of Africa's elephant population, they are the best protected and most intensely managed¹². Elephants are now mostly restricted to larger conservation areas in South Africa and the adjacent GKNP area supports an estimated 13 750 animals¹³. KGR supports approximately 50 elephants¹⁴. Although assessed as Least Concern in South Africa, the world's largest land mammal is listed as VU by the IUCN due to poaching for ivory and meat, loss and fragmentation of habitat and conflict with humans in agricultural areas¹⁵. Extensive evidence of these animals was observed at most of the Application Sites and they probably frequently visit adjacent water holes and dams.

Leopard *Panthera pardus*

Upgraded to VU in the latest Red Data assessment¹⁶, leopards are severely threatened outside protected areas mainly due to habitat loss, direct and indirect persecution including hunting and extermination from wildlife ranchers and for traditional attire (Child *et al.*, 2016). The adjacent GKNP supports the largest population of these large cats in South Africa¹⁷. Tracks were observed adjacent to River Lodge although they probably regularly forage around all the Application Sites.

Hippopotamus

This large aquatic mammal is listed as VU by the IUCN due to habitat loss, range contraction, conflict from farmers and a decline in water quality¹⁸. They are resident in the

¹¹ The same approach as Raimondo *et al.* (2009) has been followed here regarding species of conservation concern (i.e. those with a status of Near Threatened and Data Deficient) and threatened species (Vulnerable, Endangered and Critically Endangered)

¹² Blanc, 2008

¹³ Ferreira *et al.*, 2012

¹⁴ KGR staff *pers. comm.*

¹⁵ Blanc, 2008

¹⁶ Child *et al.*, 2016

¹⁷ Child *et al.*, 2016

¹⁸ Lewison & Pluháček, 2017

larger dams in KGR, as well as along the Klaserie River in the east, and were recorded at a number of localities.

Lion *Panthera leo*

Although assessed as Least Concern in South Africa, Africa's largest member of the cat family is listed as VU by the IUCN due to indiscriminate killing in defense of human life and livestock, habitat loss, and prey base depletion¹⁹. This species is resident in KGR and probably regularly forages around all the Application Sites. Spoor was observed within Buffalo Camp in the southern portion of KGR but they are expected to wander widely within the reserve.

One threatened species is regularly recorded in KGR and is discussed below.

Ground Pangolin *Smutsia temminckii*

Threatened by an insatiable demand in its scales for the traditional medicine market in Asia, electrocutions on fences and harvesting for bush meat, Ground Pangolin is listed as VU in South Africa²⁰. This species is regularly recorded in KGR²¹ as many tourist game drives take place twice a day and the likelihood of finding one is relatively high, although the actual population size may be fairly low.

The remaining potentially occurring threatened species have a Low likelihood of occurrence due to general scarcity or absence in KGR (Appendix 5).

Seven potentially occurring species are assessed as Near Threatened, which are species close to or likely to soon qualify for the status of Vulnerable. Two species were located during fieldwork, and are described below:

Spotted Hyaena *Crocuta crocuta*

This large carnivore is dependent on conservation areas in South Africa for survival as it is frequently persecuted by stock farmers outside²². An estimated 2000-5340 animals reside within the adjacent GKNP (SANParks, 2011). Tracks were located at a number of Application Sites and they are likely to regularly forage around the camps and staff villages.

¹⁹ Bauer *et al.*, 2016

²⁰ Child *et al.*, 2016

²¹ KGR staff *pers. comm.*

²² Child *et al.*, 2016

White Rhinoceros *Ceratotherium simum*

A continued and increased threat from poaching and increasing illegal demand for rhino horn has resulted in this species being assessed as NT²³. This is a resident species in KGR and faeces were observed near Hongonyi Gate. It is expected to forage widely across KGR.

One additional Near Threatened mammal has a moderate likelihood of occurring within the study area and is described below.

African Clawless Otter *Aonyx capensis*

This small carnivore in the Mustelidae family is assessed as NT due to habitat destruction and pollution of rivers²⁴. This species has a high likelihood of residing along the Klaserie River on the eastern boundary of KGR.

The remaining potentially occurring NT species have a Low likelihood of occurrence due to general scarcity or absence in KGR (Appendix 5).

Twenty-five potentially occurring species are protected under either the LEMA or the National Environmental Management: Biodiversity Act Threatened or Protected Species (No. 10 of 2004) (NEMBA), nine of which were confirmed during fieldwork (Appendix 4).

²³ Child *et al.*, 2016

²⁴ Child *et al.*, 2016

5.2.2 Birds

5.2.2.1 Regional Overview

The savanna biome supports the highest diversity of bird species within the Southern African sub-region. The GKNP supports the largest birdlist of all conservation areas in South Africa with an estimated 57% of the birds found within the entire southern African sub-region²⁵. The study area, situated within the QDGS 2431 AC, is especially diverse with a total of 348 species recorded during the second Southern African Bird Atlas Project (SABAP2)²⁶, which is currently in progress. At a finer scale, data from SABAP2 indicate that 332 bird species from 156 full protocol lists²⁷ have already been recorded from the four pentads (mapping units) in which the study area is situated (2420_3100, 2420_3105, 2425_3100 & 2425_3105)²⁸. A pentad covers an area of approximately 77 km², which is considerably smaller than a QDGS and thus a better indication of which species occur in the study area.

The study area falls within the Kruger National Park and Adjacent Areas Important Bird and Biodiversity Area (IBA) and qualifies as a Global IBA under criteria A1, A2, A3 and A4i. Eleven globally threatened species are resident within the GKNP, in addition to fourteen resident regionally threatened birds. A number of migratory and vagrant threatened species also occur²⁹.

5.2.2.2 Local Avifaunal Assemblages

A total of 157 bird species were confirmed to occur in the study area during fieldwork, and are listed in Appendix 4. Sufficient sampling was undertaken for assessing habitat suitability for potentially occurring threatened species, the primary objective of the ornithological component of this study, and to describe broad bird assemblages. Further fieldwork around each of the Application Sites is likely to increase the species richness of each assemblage slightly but is unlikely to identify additional assemblages. Three assemblages were present and are dealt with below.

Woodland Assemblage

²⁵ Taylor *et. al.*, 2015

²⁶ Data accessed from <http://sabap2.adu.org.za/coverage/qdgc/2431ac> on 24/04/2019

²⁷ Full protocol lists require at least two hours of coverage per list

²⁸ Data accessed from <http://sabap2.adu.org.za/coverage/project/sabap2on> 24/04/2019

²⁹ Taylor *et. al.*, 2015

This is by far the largest and most diverse bird assemblage in the general KGR area. A number of common and conspicuous savanna species are present in this community, including Grey Go-away-bird *Corythaixoides concolor*, Crested Francolin *Dendroperdix sephaena*, Marico Sunbird *Cinnyris mariquensis*, Burchell's Starling *Lamprotornis australis*, Southern Yellow-billed Hornbill *Tockus leucomelas* White-browed Scrub Robin *Erythropygia leucophrys*, Blue Waxbill *Uraeginthus angolensis* and Arrow-marked Babbler *Turdoides jardineii*. Rarer species encountered include African Hawk-Eagle *Aquila spilogaster*, Great Spotted Cuckoo *Clamator glandarius*, Quail-Finch *Ortygospiza fuscocrissa* and Common House Martin *Delichon urbicum*. One-hundred and eleven species (71% of the total list) were recorded from this assemblage, by far the highest of the three assemblages (Appendix 4).

Riparian Forest / Thicket Assemblage

Forest and thicket vegetation occurs along the ephemeral drainage lines within the River Lodge and Buffalo Camp Application Sites as well as along the perennial Klaserie River around Karula Lodge and River Crossings. It provides refuge for a number of bird species that favour dense vegetation, such as White-throated Robin-Chat *Cossypha humeralis*, Purple-crested Turaco *Tauraco porphyreolophus*, Yellow-bellied Greenbul *Chlorocichla flaviventris*, Green-backed Camaroptera *Camaroptera brachyura* and Spectacled Weaver *Ploceus ocularis*. Rarer species found include Crowned Hornbill *Lophoceros alboterminatus*, Lesser Honeyguide *Indicator minor* and Marsh Warbler *Acrocephalus palustris*. Forty-six species (29% of the total list) were recorded from this assemblage, the second highest of the three assemblages (Appendix 4).

Aquatic Assemblage

The aquatic habitats within KGR are fairly diverse, and include various dams, ephemeral streams, the perennial Klaserie River and the various waste water treatment works associated with the lodges. Common species recorded include Egyptian Goose *Alopochen aegyptiaca*, Striated Heron *Butorides striata*, African Jacana *Actophilornis africanus*, Water Thick-knee *Burhinus vermiculatus*, African Fish Eagle *Haliaeetus vocifer*, Blacksmith Lapwing *Vanellus armatus* and African Pied Wagtail *Motacilla aguimp*. Rarer species found include Black-winged Stilt *Himantopus himantopus* and Little Grebe *Tachybaptus ruficollis*. Twenty-six species were recorded from the Aquatic Assemblage, or 17% of the entire list, the lowest of the three assemblages (Appendix 4).

5.2.2.3 Conservation-Important Species

An estimated 32 conservation-important birds potentially occur within the study area (Appendix 5). Twenty-four of these are considered threatened, three of which were confirmed to occur during fieldwork and are discussed below:

Bateleur *Terathopius ecaudatus*

The Bateleur is listed as Endangered in South Africa primarily due to habitat loss and is now mostly restricted to larger conservation areas, at least as a breeding species³⁰. An estimated 550 – 650 breeding pairs are found within the GKNP³¹. A single bird was observed foraging north of River Lodge and suitable nesting sites (tall trees such as *Acacia nigrescens*) are present, although no nests were located during fieldwork. It is unlikely to nest near any of the Application Sites due to human disturbance.

White-backed Vulture *Gyps africanus*

This vulture is assessed as Critically Endangered due to anthropogenic impacts such as habitat loss, poisoning, electrocution and collision with powerlines, drowning in concrete farm reservoirs and collection for the medicinal trade³². A number of birds were observed throughout KGR and suitable foraging and breeding habitat is present. However, it is unlikely to breed near any of the Application Sites due to human disturbance.

Hooded Vulture *Necrosyrtes monachus*

Hooded Vulture is also listed as Critically Endangered due to anthropogenic impacts such as habitat loss, poisoning, electrocution and collision with powerlines, drowning in concrete farm reservoirs and collection for the medicinal trade³³. Two birds were observed in the southern portion of KGR, near Southern Camp, and suitable foraging and breeding habitat is present within the reserve. However, it is unlikely to breed near any of the Application Sites due to human disturbance.

Four additional threatened species have a moderate or high likelihood of occurring within KGR and are discussed below:

Tawny Eagle *Aquila rapax*

This large eagle is listed as Endangered (EN) due to continuing decline in the local population through habitat transformation, direct persecution, indirect poisoning and

³⁰ Taylor *et. al.*, 2015

³¹ Barnes, 1998

³² Taylor *et. al.*, 2015

³³ Taylor *et. al.*, 2015

drowning in concrete reservoirs³⁴. It is largely restricted to conservation areas in South Africa and the GKNP area supports an estimated 500 – 700 pairs (Barnes, 1998). Birds will probably regularly utilise the study area to forage in and suitable breeding habitat is present. Like most of the larger threatened bird species, it is unlikely to nest within close proximity to any of the Application Sites due to high disturbance levels.

Southern Ground-Hornbill *Bucorvus leadbeateri*

This large, mostly terrestrial bird is listed as EN due to habitat loss, direct persecution, bush encroachment and collisions with windows³⁵. They are mostly restricted to large conservation areas in South Africa and their slow reproduction rate of one chick / 9.3 years per family group means they have a very slow recovery rate if bird mortalities occur³⁶. Birds are likely to be resident in KGR in low numbers and suitable breeding habitat (cavities in large trees) is present.

Lappet-faced Vulture *Torgos tracheliotos*, Cape Vulture *Gyps coprotheres* and White-headed Vulture *Trionoceps occipitalis*

These three vultures are all threatened due to similar anthropogenic impacts as the above-mentioned vultures such as habitat loss, poisoning, electrocution and collision with powerlines, drowning in concrete farm reservoirs and collection for the medicinal trade³⁷. As a result, White-headed Vulture is assessed as Critically Endangered and Lappet-faced and Cape Vultures are assessed as Endangered. All could potentially forage within the study area and suitable breeding trees are present for all but the Cape Vulture which breeds on nearby Manoutsa cliffs west of Hoedspruit.

Martial Eagle *Polemaetus bellicosus*

Africa's largest eagle is listed as EN due to many factors including habitat loss, direct persecution from small-stock farmers and indirect persecution from electrocution and reservoir drownings³⁸. This species occupies very large territories (up to 150 km² in the Lowveld³⁹) and probably regularly forages over the study area. An estimated 250 birds occur within the GKNP (Hockey *et al.*, 2005), and suitable large trees are present in KGR for breeding.

³⁴ Taylor *et al.*, 2015

³⁵ Taylor *et al.*, 2015

³⁶ Hockey *et al.*, 2005

³⁷ Taylor *et al.*, 2015

³⁸ Taylor *et al.*, 2015

³⁹ Hockey *et al.*, 2005

African Finfoot *Podica senegalensis*

The African Finfoot is an unobtrusive resident of relatively undisturbed rivers and streams across eastern South Africa. It is listed as VU due to a decrease in water quality and destruction of riparian habitats⁴⁰ and is also a species that naturally occurs in low densities in specialised habitats. Although this species is unrecorded from KGR during SABAP2 so far, it is apparently resident along the Klaserie River⁴¹, an area that is likely to be under-sampled.

Eight Near Threatened species potentially occur within the study area with only one confirmed during fieldwork and is discussed below.

Marabou Stork *Leptoptilos crumeniferus*

The largest of all Africa's storks, the Marabou favours a wide diversity of habitats and will readily scavenge around humans. A flock was recorded roosting at the waste water treatment works adjacent to River Lodge and it is likely to regularly forage within the study area. This species does not regularly breed in South Africa but a few pairs breed in central Swaziland⁴².

One additional Near Threatened species has a moderate likelihood of occurring within the study area (Appendix 5). This species is discussed below:

European Roller *Coracias garrulous*

This Palearctic migrant prefers open, grassy areas within savanna. It is listed as Near Threatened due to habitat loss over some of its breeding grounds, particularly in Europe⁴³. Suitable foraging habitat is present in KGR.

The remaining SCC all have a low likelihood of occurring within the study area (Appendix 5). This is primarily due to a lack of suitable habitat or regional scarcity. Ten potentially occurring species are protected under the NEMBA, three of which were confirmed (Appendix 3).

⁴⁰ Taylor *et. al.*, 2015

⁴¹ KGR staff *pers. comm.*

⁴² Taylor *et. al.*, 2015

⁴³ Taylor *et. al.*, 2015

5.2.3 Reptiles

5.2.3.1 Regional Overview

The Lowveld of eastern Limpopo province supports a high diversity of reptile species with 100 species already recorded from the degree grid 2431⁴⁴. Fifty species of reptiles have been recorded from the QDGS 2431 AC, in which Kapama is situated, as listed on the Reptile Atlas of Southern Africa website (<http://vmus.adu.org.za/>) and in Bates *et al.* (2014), indicating that reptile diversity in the area is high. However, reptile endemism is low which is to be expected as the area lies in close proximity to Mozambique within the widespread savanna biome (Bates *et al.*, 2014).

5.2.3.2 Confirmed Species

Nine reptiles were recorded during fieldwork (Appendix 4), all of which are common and widespread in the Lowveld (Bates *et al.*, 2014). Species recorded in the Woodland assemblage include Speke's Hinged Tortoise *Kinixys spekii*, Bushveld Lizard *Heliobolus lugubris* and Eastern Black-lined Plated Lizard *Gerrhosaurus intermedius*. Serrated Hinged Terrapin *Pelusios sinuatus* and Water Monitor *Varanus niloticus* were recorded from aquatic habitats. No reptiles were recorded from Forest / Thicket environments. Dedicated reptile surveys, including trapping, would no doubt have produced many additional species but are unlikely to have produced data that would change the recommendations in this report.

5.2.3.3 Conservation-Important Species

Of the potentially occurring species, only two conservation-important reptiles potentially occur (Appendix 5). Only one of these is considered a SCC, namely Nile Crocodile *Crocodylus niloticus*, which is also protected under NEMBA ToPS. Although not recorded during fieldwork, this species is confirmed from Kapama⁴⁵ and is discussed below.

Nile Crocodile

Africa's largest reptile is listed as VU due to degradation of aquatic environments, persecution and water pollution⁴⁶. The population in the adjacent GKNP is considered the

⁴⁴ http://vmus.adu.org.za/vm_sp_list.php accessed 26/05/2018

⁴⁵ KGR staff *pers.comm.*

⁴⁶ Bates *et al.*, 2014

largest in South Africa (Bates *et al.*, 2014). Nile Crocodile could occur in any of the dams, streams and rivers in KGR and breeding habitat is present along the Klaserie River.

Southern African Python *Python natalensis* is protected under the National Environmental Management: Biodiversity Act (No.10 of 2004) and is probably a breeding resident in KGR.

5.2.4 Frogs

5.2.4.1 Regional Overview

The Lowveld of Limpopo and Mpumalanga provinces supports one of the richest areas in South Africa for frog diversity (Minter *et al.* 2004). Twenty-six species of frogs have been recorded in the QDGS 2431 AC, and 41 in the degree grid 2431, as listed on the Frogs of Southern Africa website (<http://vmus.adu.org.za/>) as well as in the frog atlas project (Minter *et al.*, 2004). However, frog endemism is very low with no potentially occurring endemic species present in the Kapama area (Minter *et al.*, 2004).

5.2.4.2 Confirmed Species

Only two species of frogs were recorded during fieldwork (Appendix 5), one from the Forest / Thicket community, namely Southern Foam Nest Frog *Chiromantis xerampelina*, and one from Aquatic Habitat, namely Common Platanna *Xenopus laevis*. Both frogs are common and widespread in the Lowveld (Minter *et al.*, 2004). Dedicated frog searches, including nocturnal surveys in spring at the onset of the rains, would have produced additional species but are unlikely to have produced data that would change the recommendations in this report

5.2.4.3 Conservation-Important Species

None of the 41 species of frogs recorded in 2431 have been assessed as threatened, with only one regarded as NT, namely Giant Bullfrog *Pyxicephalus adspersus*. However, it is doubtful that this species ever occurred in the Lowveld and the record is possibly an error, as this species and the African Bullfrog *Pyxicephalus edulis*, which is common in the Lowveld, were formerly conspecific and are very difficult to separate when young⁴⁷.

⁴⁷ Poynton, 1964

5.3 Ecological Sensitivity

5.3.1 Limpopo Province Biodiversity Conservation Assessment

The Limpopo Province Biodiversity Conservation Assessment (LPBCA) classifies most of the study area and general surroundings as a **Critical Biodiversity Area 1 & 2** (CBA1, CBA2) (Desmet *et al.*, 2013). CBA's are described as **Irreplaceable** Sites that are required to meet biodiversity pattern and/or ecological processes targets. The primary land management objective for CBA's is to maintain them in a natural state with limited or no biodiversity loss and to rehabilitate degraded areas to a natural or near natural state. Compatible land uses for these areas include conservation activities such as eco-tourism and extensive game farming (Desmet *et al.*, 2013). A few small, formerly degraded / cultivated areas such as around the Airstrip and Hongonyi Gate are classified as **Ecological Support Area 2** (ESA2) which allows for greater flexibility with land use options.

5.3.2 Site-specific Ecological Sensitivity Analysis

An Ecological Sensitivity analysis of each of the vegetation communities represented in the study area was undertaken using the methodology described in Section 4. Table 4 shows the calculation of the Receptor Sensitivity Index (RSI) for each community and Table 5 shows the calculation of Ecological Sensitivity of the Application Sites prior to construction, which is displayed in Figure 9 below.

The Riparian Forest community has **Low** Resilience, meaning that it cannot be easily restored ecologically with human intervention. It only has **Medium** Vulnerability as it occurs within a formerly protected area but experiences threats such as alien plant infestation, weir and lodge developments and associated impacts such as eutrophication from waste water treatment works and an increase in sedimentation from rainwater runoff. These two assessments combine to result in a **Medium** RSI rating (Table 4). Riparian Forest has a **Very High** Conservation Value due to being classified as a CBA1, providing important migration corridors for fauna and provides habitat for many specialised threatened aquatic species such as Hippopotamus, African Finfoot and Nile Crocodile. Six conservation-important plant species were confirmed during fieldwork. *Ansellia africana* is assessed as VU and *Dalbergia melanoxylon* as NT. *Sclerocarya birrea*, *Philenoptera violacea* and *Breonadia salicina* are protected under the NFA, while *Spirostachys africana* is protected under the LEMA. Two VU mammals were confirmed to occur, namely African Elephant and Hippopotamus, and one additional NT mammal potentially occurs, namely African Clawless

Otter. One VU-listed bird (African Finfoot) and one VU reptile (Nile Crocodile) have been recorded by KGR staff and are probably resident. When Conservation Value and RSI are combined it results in an ES of **Medium-High** (Table 5).

The Riparian Thicket vegetation community has **Low** Resilience, meaning that it cannot easily be restored ecologically. It only has **Medium** Vulnerability as it occurs within a formerly protected area but experiences threats such as alien plant infestation, dam construction, lodge developments and associated impacts such as eutrophication from waste water treatment works and an increase in sedimentation from rainwater runoff. These two assessments combine to result in a **Medium** RSI rating (Table 4). Riparian Thicket is classified as a CBA1 or CBA2, providing migration corridors for fauna and provides habitat for many threatened species such as African Elephant, Leopard and Lion. The ephemeral nature of the hydrology of this community eliminates the regular presence of species such as African Finfoot and Nile Crocodile, both listed as VU, as well as African Clawless Otter which is listed as NT. Therefore the Conservation Value is assessed as **High**. Five conservation-important plant species were confirmed during fieldwork. *Ansellia africana* is assessed as VU and *Dalbergia melanoxylon* and *Elaeodendron transvaalense* to be NT. *Sclerocarya birrea* and *Elaeodendron transvaalense* are protected under the NFA, while *Spirostachys africana* is protected under the LEMA. Two VU mammals were confirmed to occur, namely African Elephant and Hippopotamus from the small dam in front of River Lodge. One VU reptile (Nile Crocodile) has been recorded by KGR staff and is probably resident. When Conservation Value and RSI are combined it results in an ES of **Medium** (Table 5).

The Closed Woodland community has **Medium** Resilience, meaning that, with assistance, it can be restored ecologically. It only has **Medium** Vulnerability as it occurs within a formerly protected area but experiences threats such as alien plant infestation and road and lodge development. These two assessments combine to result in **Medium** RSI rating (Table 4). Six conservation-important plant species were recorded from Closed Woodland. One of these is listed by the IUCN as VU, namely *Ansellia africana*, and one as NT, namely *Dalbergia melanoxylon*. Four species are protected under the NFA, namely *Sclerocarya birrea*, *Philenoptera violacea*, *Combretum imberbe* and *Balanites maughamii*. Three VU mammals were confirmed, namely African Elephant, Lion and Leopard, and two NT species, namely White Rhinoceros and Spotted Hyaena. Two CR birds were confirmed, namely White-backed and Hooded Vultures, and one EN bird, namely Bateleur. A number of additional threatened species occur. It is also classified as a CBA1 or CBA2. Despite this, Closed

Woodland only attains **High** Conservation Value as this is the dominant vegetation community in the entire Lowveld and vast areas are protected in the adjacent GKNP. The High Conservation Value, when combined with the RSI rating of Medium, results in an ES rating of **Medium** (Table 5).

The Degraded Woodland community has **Medium** Resilience, meaning that it can only be moderately easily restored ecologically with some human intervention due to the large number of alien plant species present. It has **Medium** Vulnerability as potential impacts include alien plant infestation and lodge and road development. These two assessments combine to result in **Low** RSI rating (Table 3). Only two conservation-important plant species were recorded from this community, namely *Sclerocarya birrea* and *Combretum imberbe* which are both protected under the NFA. A number of threatened and NT mammals and birds potentially occur, such as Lion, Leopard and African Elephant (all VU) and White-backed and Hooded Vultures (CR), Martial (EN) and Tawny (VU) Eagles and more. Degraded Woodland is also classified as an ESA2. This leads to a **High** Conservation Value which, when combined with a Low RSI Value, results in an ES rating of **Medium** (Table 5).

Table 4. Vulnerability and Resilience of Vegetation Communities in the Study Area

Vegetation Community / Habitat	Vulnerability	Resilience	Receptor Sensitivity Index
Riparian Forest	Medium	Low	Medium
Riparian Thicket	Medium	Low	Medium
Closed Woodland	Medium	Medium	Medium
Degraded Woodland	Medium	Medium	Medium

Table 5. Ecological Sensitivity of Vegetation Communities in the Study Area

Vegetation Community / Habitat	Conservation Value	Receptor Sensitivity Index	Ecological Sensitivity
Riparian Forest	Very High	Medium	Med-High
Riparian Thicket	High	Medium	Medium
Closed Woodland	High	Medium	Medium
Degraded Woodland	High	Medium	Medium

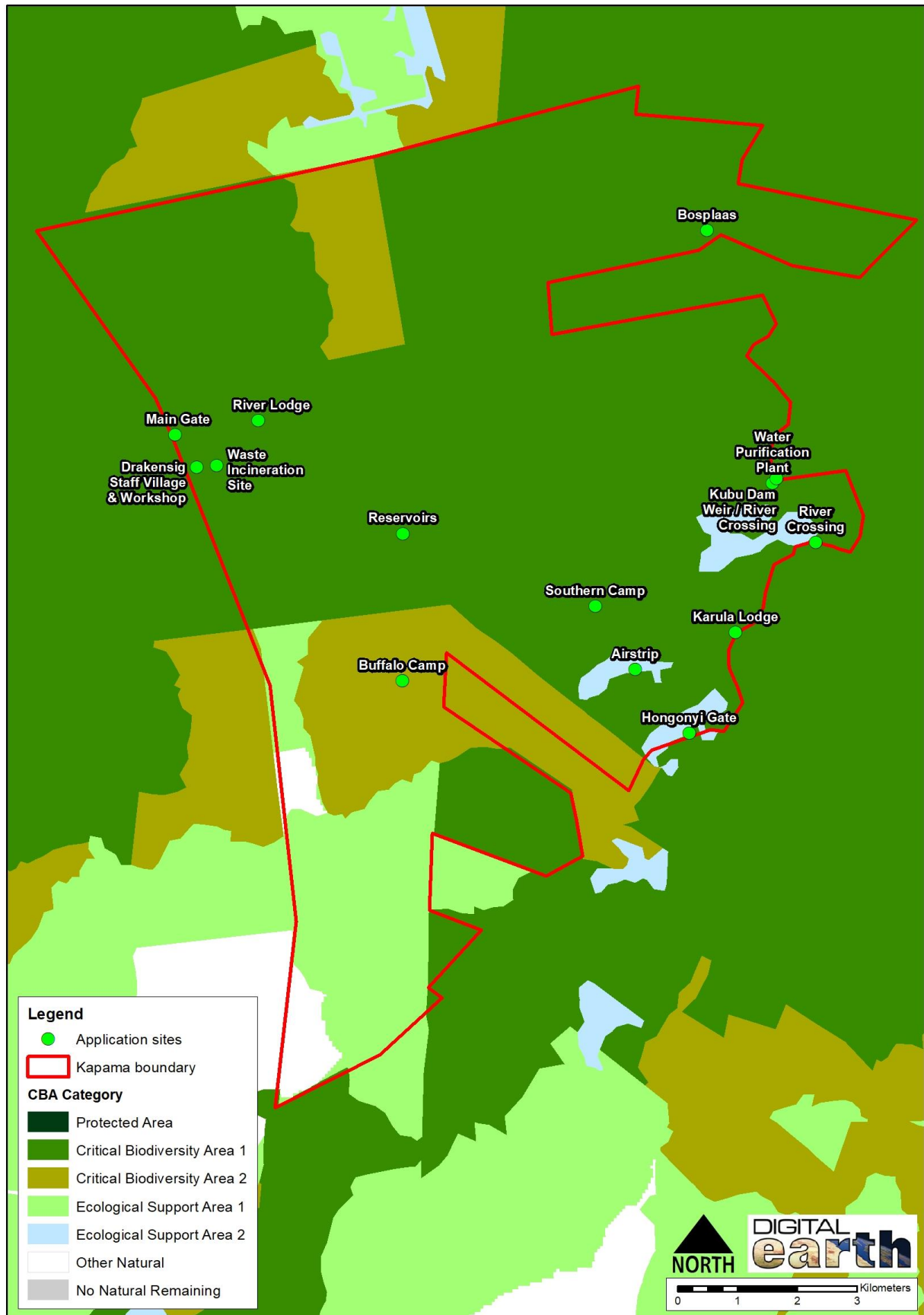


Figure 8. LPBCP Classification of Land Units within and adjacent to the Study Area

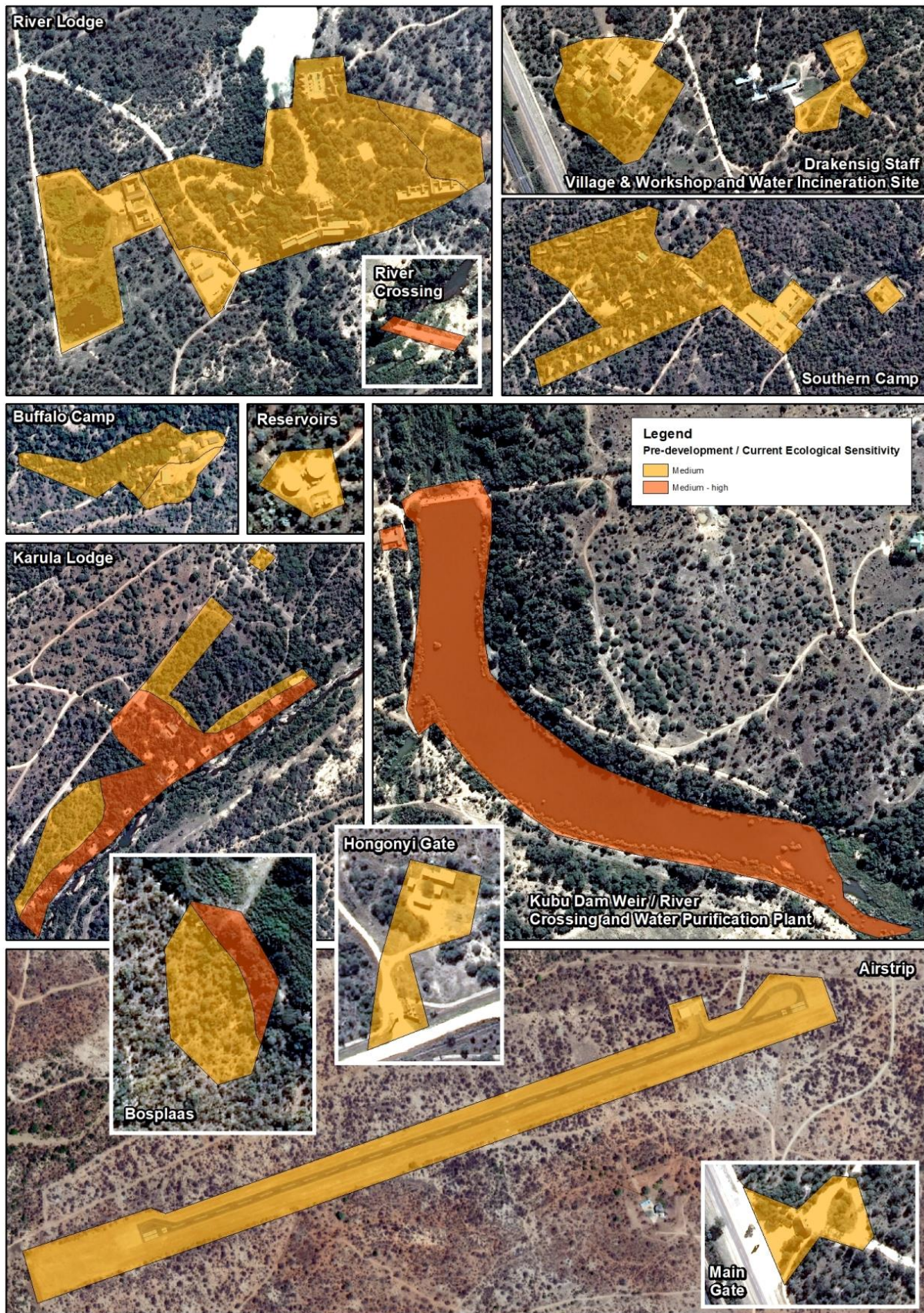


Figure 9. Ecological Sensitivity of Vegetation Communities in the Study Area Prior to Construction of the Application Sites

6. KEY CURRENT AND POTENTIAL IMPACTS

While a detailed impact assessment was not part of the terms of reference for this report, key general impacts associated with the existing developments on KGR on the ecology of the reserve are discussed below. The discussion of specific impacts per Application Site follows in Section 6.2 below. The assessments of these impacts are summarised in Table 6.

6.1 General Impacts on the Ecology of KGR

- **Losses of portions of Critical Biodiversity Area 1** – Eleven of the 14 Application Sites were constructed in areas that have been assessed as a Critical Biodiversity Area 1 by the LPBCA. The total area impacted is 57 ha in size and much of this area still contains natural vegetation (such as in the tourist lodges);
- **Degradation of vegetation communities with Medium-High Ecological Sensitivity** – The Riparian Forest vegetation community is assessed as having Medium-High Ecological Sensitivity. Four Application Sites are situated within this sensitive environment and a number of impacts have been identified, including loss of habitat, increased sedimentation and increased invasion by alien invasive plants;
- **Loss of plant species of conservation importance** – Five species could have been impacted during the construction. The epiphyte *Ansellia africana* is listed as VU by the IUCN and many appear to have been removed from natural vegetation and only partially successfully transplanted within the camps, the trees *Elaeodendron transvaalense* and *Dalbergia melanoxylon* are listed as NT and occur in fair numbers, especially in the Riparian Thicket and Closed Woodland communities. The trees *Elaeodendron transvaalense*, *Sclerocarya birrea*, *Philenoptera violacea*, *Breonadia salicina* and *Balanites maughamii* are protected under the NFA and the epiphyte *Ansellia africana* and tree *Spirostachys africana* are protected under the LEMA;
- **Degradation of watercourses** – A number of ephemeral streams (such as at River Lodge and Buffalo Camp) have been impacted through lodge and dam construction. Four developments are found along the Klaserie River. Current threats include habitat destruction, alien plant infestation, sedimentation and dumping of building rubble. Long-term changes in surface and subsurface runoff could negatively affect

the riparian structure and function, particularly with respect to channel erosion caused by increased stormwater runoff;

- **Invasion of natural habitat by alien plants** – A total of 22 alien plants were recorded during fieldwork, 11 of which are listed as invasive under the Conservation of Agricultural Resources Act, 1983 (CARA). These are mostly found in Degraded Woodland and the two Riparian communities. Invasion into other areas is likely as construction activities introduce seeds which may thrive in bare soil resulting from building activities;
- **Loss of habitat for conservation-important fauna** – KGR supports healthy populations of a number of VU-listed mammals such as Leopard, Lion, Hippopotamus and African Elephant, as well as CR-listed White-backed and Hooded Vulture, EN Bateleur and more. Although the total area taken up by the Application Sites is fairly small compared to the total size of KGR, they have high disturbance levels and would repel sensitive species such as the larger raptors;

6.2 Specific Impacts of Application Sites on the Ecology of KGR

Riparian Forest

Five Application Sites are situated partially or wholly within the Riparian Forest vegetation community, namely Karula Lodge, Klaserie River Crossing 1 & 2, Water Treatment Works and Bosplaas and are discussed below:

Approximately 3.2 ha of **Karula Lodge** is situated within Riparian Forest, with c. 13 guest chalets and the main lounge / deck area stretched out over a distance of 600m along the Klaserie River. While some of the infrastructure is built on raised slits, the chalets are more solid in construction and this has resulted in a slight loss of riparian habitat. Disturbance levels on fauna do not appear to be high, with sightings of the elusive African Finfoot from the camp bearing evidence of this. However, a number of alien invasive plants have established, such as **Lantana camara*. The overall impact on the Riparian Forest in Karula is assessed as **Medium**.

Klaserie River Crossing 1 is a low concrete drift upstream of Klaserie River Crossing 2. This structure appears to have altered the course of the river through a significant increase in sediment (sand) deposits on the upstream side, forcing the river down the concrete spillway. The increase in sediments has resulted in an ideal environment for the establishment of alien invasive plant species such as **Xanthium spinosum*, **Ricinus communis* and **Sesbania punicea*. No significant loss of Riparian Forest habitat has taken place and the site only covers 0.2 ha. Therefore the cumulative impacts are assessed as **Medium**.

Klaserie River Crossing 2, a large weir locally called Kubu Dam, is constructed over the Klaserie River downstream of the previous Application Site. Apart from the obvious, almost complete destruction of approximately 7.2 ha of Riparian habitat, this community is also providing disturbed habitat ideal for the establishment of alien invasive plant species such as **Salvinia adnata*, **Xanthium spinosum*, **Ricinus communis* and **Sesbania punicea*. Two positive impacts resulting from this development is the establishment of open water habitats which in turn benefit a wide variety of aquatic organisms and the sediment trapping the weir performs. However, the cumulative impact of this weir on Riparian Forest is assessed as **High**.

The **Water Purification Plant** is situated on the edge of the Riparian Forest community, adjacent to the previous Application Site. This new construction covers only 0.1 ha and, apart from a small loss of riparian habitat, did not appear to have any additional negative impacts. Therefore, the overall impact of this development is assessed as **Low**.

Bosplaas is a large, private residence situated in the far north-eastern portion of KGR and was under construction during the time of the survey. It straddles both Closed Woodland and Riparian Forest vegetation communities. The eastern portion of the building, covering just less than 0.2 ha in size, is situated within the Riparian Forest vegetation community, well within the 1/100 year flood line. This has resulted in a slight loss of riparian habitat. Current pollution levels are fairly high as much building rubble and litter is spread out around the construction site and it does not appear that an Environmental Control Officer (ECO) has been appointed. However, the significance of this impact is assessed as **Medium** due to the small size of the development.

Riparian Thicket

Two Application Sites are situated partially or wholly in Riparian Thicket, namely River Lodge and Buffalo Camp, and are discussed below:

River Lodge is situated in the north-western part of KGR and is the largest development site in within the reserve, containing over 160 beds, multiple entertainment / dining areas, a spa, large reception building, staff quarters and waste water treatment works. The overall footprint measures approximately 8.4 ha, with 5.2 ha containing Riparian Thicket. Much of this vegetation is still present within the footprint. Some portions of the lodge have been constructed over two converging streams, which are dammed below the confluence just downstream of the camp. The central portions are situated within Riparian Thicket while the peripheral infrastructure is situated in Closed Woodland (discussed below). Despite the relatively large footprint, the confirmed presence of VU mammals such as Hippopotamus and African Elephant and a VU plant (*Ansellia africana*) and NT plant (*Elaeodendron transvaalense*), the impact of the lodge on Riparian Thicket is assessed as **Medium** due to the relatively intact state of the vegetation along the two ephemeral streams.

Buffalo Camp, a small 10-bed camp, is situated in the southern portion of KGR. Almost the entire camp is situated within the Riparian Thicket vegetation community. The tourist accommodation is built on tall stilts over the drainage line while the dining / entertainment

and staff areas are solid constructions. Although a number of VU mammals were confirmed from the area, and a number of threatened birds potentially occur, the footprint is only 2 ha in size (1.4 ha in Riparian Thicket) and apart from some destruction of riparian habitat no additional negative impacts were observed. The overall impact of this camp on the Riparian Thicket is assessed as **Medium**.

Closed Woodland

Eight Application Sites are partially or wholly situated within Closed Woodland and these are described below:

The western portion of **River Lodge**, now transformed into waste water settling ponds and a staff village, as well as the far eastern portion where the reception building is now situated, would have contained 3.2 ha of Closed Woodland. Although this community is rated as having High Conservation Value due to it being located within a CBA: Irreplaceable area, and the confirmed and potential presence of a number of threatened mammal and bird species, the ES is assessed as Medium and the impacts of the developments are also assessed as **Medium** given the small sizes of the areas that have been transformed and the amount of relatively intact Closed Woodland left around the buildings.

Drakensig Staff Village and Workshop is situated on what appears to be an old farm homestead in the western portion of KGR as many mature trees are present on the Site. This area covers approximately 2.8 ha and is assessed as having had **Medium** impact on the ecology of the area for the same reasons as River Lodge.

The **Main Gate** footprint covers only 0.5 ha and experiences fairly high traffic volumes throughout the day. This disturbance would ordinarily discourage most large bird species from nesting in the immediate vicinity, but the adjacent R40 tarred road would probably have created sufficient deterrent without the impact of the gate. Therefore, the small size and existing disturbance levels result in a **Low** impact on the ecology of the area.

Two large concrete **Reservoirs** and a cellphone tower are situated within Closed Woodland in the central part of KGR. This site measures only 0.2 ha and, despite the CBA status of the area and potential occurrence of a number of threatened fauna species, is assessed as having **Low** impact on the ecology of the site.

Southern Camp is a large lodge development situated in the southern portion of KGR. It covers 5.9 ha, all of which would have been located in Closed Woodland which, as stated above, has high conservation value but only a Medium ES. The camp contains extensive tracts of undisturbed Closed Woodland, and the actual footprint of the lodge, staff quarters and waste water treatment plant is relatively low. However, the waste water treatment works are not operating optimally and considerable seepage is taking place into the surrounding vegetation. Therefore, the cumulative impacts on the ecology are assessed as **Medium**.

The western portions of **Karula Lodge**, including the Spa and Staff Quarters, are situated within the Closed Woodland vegetation community. This area measures 1.9 ha and transformation levels are moderate. As stated above, this community had Medium ES and the cumulative impacts result in a **Medium** assessment.

Closed Woodland formerly occurred in a small section of **Buffalo Camp**, although much of this community has been transformed. Although Closed Woodland has a Medium ES, the small size of the footprint results in a **Low** impact on the surrounding ecology.

Similarly, the western portion of the **Bosplaas Site** contains 0.2 ha of Closed Woodland which is situated within a CBA: Irreplaceable area with Medium ES. A number of NFA-protected trees are scattered around and some may have been destroyed, but the impact on the ecology in this area is still assessed as **Low**.

Degraded Woodland

Four Application Sites are situated within Degraded Woodland, and are discussed below:

The **Airstrip** is situated in an area of land that appears to have been cultivated many years ago but is recovering and is now dominated by pioneer *Acacia* species. This area is 18 ha in size and is classified as an ESA by the LPBCA. This vegetation community was assessed as having Low RSI, but High Conservation Value due to the potential occurrence of most of the threatened fauna species present on KGR. The overall ES Value is Medium, and the cumulative impacts, including loss of habitat for threatened fauna species, long footprint shape which may hinder game movement and disturbance through the noise of aircraft leads to an overall impact of **Medium**.

The Hongonyi Gate, situated in the far southern portion of KGR, is also assessed as an ESA in the LPBCA and was assessed as having Medium ES due to the confirmed and potential

presence of SCC. However, the footprint is only 0.6 ha in size and situated adjacent to an existing district road and the overall impact on the ecology at the site is rated as **Low**.

The **Waste Incineration / Dump Site** is situated in close proximity to Drakensig Staff Quarters and Workshop, in the western portion of KGR. This site is used for the incineration of waste, presumably from River Lodge and associated staff housing sites, as well as for dumping of objects not suitable for the incinerator. The site also contains an old but seemingly renovated farm house and workshop area, and has experienced habitat degradation for many decades. Therefore, the Site is classified as Degraded Woodland which has Medium ES. The dump site is unfenced and access for humans and animals is uncontrolled, potentially leading to injury or even death from the contents of the sites. Soft waste appears to be thrown into pits and burnt, leading to local pollution of the area. The site is only 1 ha in size, which leads to an impact assessment on the site of **Medium**.

The **Karula Lodge Waste Water Settling Pond** is situated in Degraded Woodland just outside the camp boundary. This site is extremely small, covering 0.1 ha, but is unfenced and animals have direct access to the pond. The impact on the immediate area is assessed as **Low**.

Table 6. Summary of Areas and Impact Assessment of the 14 Application Sites within the Study Area

APPLICATION SITE	Vegetation Community	Veg Community Portion Size (ha)	Total Area (ha)	Ecological Sensitivity	Ecological Impact Rating
River Lodge	Riparian Thicket	5,2	8,4	Medium	Medium
	Closed Woodland	3,2		Medium	Medium
Karula Lodge	Riparian Forest	3,2	5,2	Medium	Medium
	Closed Woodland	1,9		Medium	Medium
	Degraded Woodland	0,1		Medium	Low
Buffalo Camp	Riparian Thicket	1,4	1,8	Medium	Medium
	Closed Woodland	0,4		Medium	Low
Southern Camp	Closed Woodland	5,9	5,9	Medium	Medium
Drakensig Staff Village & Workshop	Closed Woodland	2,8	2,8	Medium	Medium
Waste Incineration Site	Degraded Woodland	1	1	Medium	Medium
Main Gate	Closed Woodland	0,5	0,5	Medium	Low
Hongonyi Gate	Degraded Woodland	0,6	0,6	Medium	Low
Reservoirs	Closed Woodland	0,2	0,2	Medium	Low
Airstrip	Degraded Woodland	18,1	18,1	Medium	Medium
Water Purification Plant	Riparian Forest	0,1	0,1	Med-High	Low
Klaserie River Crossing 1	Riparian Forest	0,2	0,2	Med-High	Medium
Klaserie River Crossing 2 (Kubu Dam)	Riparian Forest	7,2	7,2	Med-High	High
Bosplaas	Riparian Forest	0,2	0,7	Med-High	Medium
	Closed Woodland	0,5		Medium	Low
TOTAL AREA OF APPLICATION SITES			52,7		

7. CONCLUSION AND RECOMMENDATIONS

A number of developments have impacted the habitats on KGR, including lodges, staff housing, workshops, waste incineration and dumping, weir construction, waste water treatment works and water purification plant. The construction and operation of this infrastructure has taken place over many years and has had a limited overall impact on the ecology of the area. Examples of this are the extensive tracts of natural vegetation left within the lodge grounds, the rehabilitation of formerly cultivated areas and the fencing off of most of the Application Sites to restrict access for humans and animals alike.

Four vegetation communities were identified as having been impacted on by the 14 Application Sites surveyed, with Riparian Forest being assessed as having Medium-High ES. The remaining three communities (Riparian Thicket, Closed Woodland and Degraded Woodland) have been assessed as having Medium ES. The primary drivers of these assessments include most of KGR is classified as a CBA: Irreplaceable area, confirmed presence of a number of CR, EN, VU and NT species and potential occurrence of a number of additional species. However, KGR is situated within Granite Lowveld adjacent to the c. 2 million ha GKNP which is all formally conserved and therefore does not have many ecological threats. Granite Lowveld is not listed as a Threatened Ecosystem and KGR is managed as a tourism enterprise, which is one of the permissible land uses for CBA: Irreplaceable areas in the LPBCA. Most of the impacts of the 14 Application Sites have been assessed as either Low or Medium, with only one site (Klaserie River Crossing 2) being assessed as having a High impact on the Riparian Forest community. The cumulative impact of the 57 ha of unauthorized developments on KGR should also be taken into context; the area was formerly a cattle and crop farm and now protects some of the most threatened species in South Africa such as Hooded and White-backed Vultures, Leopard and Ground Pangolin. Biodiversity has significantly increased since agriculture ceased and the tourism venture was initiated and it appears as if the reserve is being managed to maintain and even improve it.

While most of the construction work has already taken place, some preliminary recommendations and mitigation measures for KGR are listed below:

- It is recommended that no further development takes place on KGR without ecological studies taking place first to assess the impact of the developments on untransformed habitats.

- In order to comply with the Conservation of Agricultural Resources Act (Act 43 of 1983), all listed invasive exotic plants as indicated in Appendix 1 should be targeted and controlled. This is especially applicable to **Lantana camara*, **Datura stramonium*, **Ricinus communis*, **Xanthium spinosum*, **Salvinia adnata*, **Sesbania punicea* and **Opuntia stricta*.
- All existing roads should contain adequate stormwater drainage and erosion control measures.
- All litter and building rubble around the Bosplaas Application Site should be removed and disposed of in a suitable manner. Additionally, the contractors should be encouraged to maintain the site free of litter and rubble.
- The open dumps adjacent to the Waste Incinerator Site should be tidied up and adequately fenced off to prevent access, similar to what has been done around the Airstrip.
- All waste water treatment sites / settling ponds should be fenced off to prevent access by animals. The leak below the Southern Camp settling ponds should be repaired.

Provided the recommendations suggested in this report are followed, there is no objection to the application for authorization under Section 24 (g) (Applications for rectification of unlawful commencement or continuation of listed activities under NEMA). However, if the mitigation measures given in Section 7 above are not implemented then we would object to the development application.

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9. APPENDICES

Appendix 1. Checklist of Flora recorded during fieldwork

Taxa	Growth Form	Red Data	Protected	CARA Category	Vegetation Communities			
					Riparian Forest	Riparian Thicket	Closed Woodland	Degraded Woodland
					Karula Lodge Klaserie River Crossing 1 Klaserie River Crossing 2 Bosplaas Water Purification Plant	River Lodge Buffalo Camp	River Lodge Drakensig Main Gate Reservoirs & Cell Tower Southern Camp Karula Lodge Buffalo Camp Bosplaas	Airstrip Hongonyni Gate Waste Incineration Karula Waste Water Works
Family Acanthaceae <i>Barleria elegans</i> S.Moore ex C.B.Clarke <i>Barleria obtusa</i> Nees <i>Hypoestes forskalii</i> (Vahl) R.Br. <i>Justicia flava</i> (Vahl) Vahl <i>Ruellia patula</i> Jacq.	herb climber herb herb herb				r	u r f	u r	u r
Family Amaranthaceae * <i>Achyranthes aspera</i> L. var. <i>aspera</i> * <i>Alternanthera pungens</i> Kunth * <i>Gomphrena celosioides</i> Mart. * <i>Guilleminea densa</i> (Willd. ex Roem. & Schult.) Moq. <i>Kyphocarpa angustifolia</i> (Moq.) Lopr.	herb herb herb herb herb						r r r f	r f u u
Family Amaryllidaceae <i>Crinum macowanii</i> Baker	geophyte						r	
Family Anacardiaceae <i>Lannea discolor</i> (Sond.) Engl. <i>Lannea schweinfurthii</i> (Engl.) Engl. var. <i>stuhlmannii</i> (Engl.) Kokwaro	tree tree					r	r	r

<i>Ozoroa engleri</i> R.Fern. & A.Fern.	tree						r	
<i>Sclerocarya birrea</i> (A.Rich.) Hochst. subsp. <i>caffra</i> (Sond.) Kokwaro	tree		NFA		r	r	d	r
<i>Searsia gueinzii</i> (Sond.) F.A.Barkley	tree				u	f		r
Family Apocynaceae								
<i>Carissa bispinosa</i> (L.) Desf. ex Brenan	shrub				r	u		
<i>Carissa spinarum</i> L.	climber					r		
<i>Cynanchum gerrardii</i> (Harv.) Liede	succulent					r		
<i>Cynanchum viminale</i> (L.) L.	succulent					r		
* <i>Nerium oleander</i> L.	tree			1b		r		r
Family Araceae								
<i>Stylochaeton natalensis</i> Schott	herb						r	
Family Asparagaceae								
<i>Asparagus falcatus</i> L.	climber					u	r	
<i>Asparagus setaceus</i> (Kunth) Jessop	climber				r	r		
Family Asphodelaceae								
<i>Aloe marlothii</i> A.Berger subsp. <i>marlothii</i>	succulent						r	
Family Asteraceae								
* <i>Acanthospermum australe</i> (Loefl.) Kuntze	herb							u
* <i>Ageratum conyzoides</i> L.	herb			1b		r		
* <i>Bidens pilosa</i> L.	herb						r	u
<i>Dicoma tomentosa</i> Cass.	herb						r	r
<i>Emilia transvaalensis</i> (Bolos) C.Jeffrey	herb							r
<i>Geigeria burkei</i> Harv. subsp. <i>burkei</i>	herb						r	
	dwarf							
<i>Gymnanthemum crataegifolium</i> (Hutch.) H.Rob.	shrub					r		
<i>Litogyne gariepina</i> (DC.) Anderb.	herb				r	r		
<i>Polydora steetziana</i> (Oliv. & Hiern) H.Rob.	herb					r	u	r
* <i>Schkuhria pinnata</i> (Lam.) Kuntze ex Thell.	herb						r	r
* <i>Tagetes minuta</i> L.	herb				r	r	r	u
* <i>Tridax procumbens</i> (L.) L.	herb				r			r
* <i>Xanthium spinosum</i> L.	herb			1b	r			r
* <i>Zinnia peruviana</i> (L.) L.	herb					r	r	u
Family Balanitaceae								
<i>Balanites maughamii</i> Sprague subsp. <i>maughamii</i>	tree		NFA				r	

Family Bignoniaceae * <i>Jacaranda mimosifolia</i> D.Don	tree			1b	r			
Family Boraginaceae <i>Ehretia amoena</i> Klotzsch <i>Ehretia obtusifolia</i> Hochst. ex A.DC. <i>Heliotropium strigosum</i> Willd.	tree tree herb					r r r	u	r
Family Burseraceae <i>Commiphora neglecta</i> I.Verd. <i>Commiphora schimperi</i> (O.Berg) Engl.	tree tree					f u	r r	
Family Cactaceae <i>Opuntia stricta</i> (Haw.) Haw.	succulent			1b			r	r
Family Capparaceae <i>Capparis tomentosa</i> Lam.	climber				r	r		
Family Celastraceae <i>Elaeodendron transvaalense</i> (Burt Davy) R.H.Archer	tree	NT	NFA			r		
<i>Gymnosporia glaucophylla</i> Jordaan <i>Gymnosporia maranguensis</i> (Loes.) Loes. <i>Gymnosporia senegalensis</i> (Lam.) Loes. <i>Mystroxyton aethiopicum</i> (Thunb.) Loes. subsp. <i>schlechteri</i> (Loes.) R.H.Archer	tree shrub shrub tree					r r u f	r r	r
Family Combretaceae <i>Combretum apiculatum</i> Sond. subsp. <i>apiculatum</i> <i>Combretum collinum</i> Fresen. subsp. <i>suluense</i> (Engl. & Diels) Okafor <i>Combretum erythrophyllum</i> (Burch.) Sond. <i>Combretum hereroense</i> Schinz <i>Combretum imberbe</i> Wawra <i>Combretum zeyheri</i> Sond. <i>Terminalia prunioides</i> M.A.Lawson <i>Terminalia sericea</i> Burch. ex DC.	tree tree tree tree tree tree tree tree		NFA		d	r f r u	d r f u	u u
Family Commelinaceae <i>Commelina benghalensis</i> L. <i>Commelina erecta</i> L.	herb herb				r		r	
Family Convolvulaceae <i>Evolvulus alsinoides</i> (L.) L.	herb						r	

<i>Ipomoea magnusiana</i> Schinz	climber						r	
<i>Ipomoea</i> sp. (no flowers)	climber					r		
Family Crassulaceae								
<i>Cotyledon barbeyi</i> Schweinf. ex Baker	succulent					r		
<i>Kalanchoe paniculata</i> Harv.	succulent						r	
<i>Kalanchoe rotundifolia</i> (Haw.) Haw.	succulent					r		
Family Cucurbitaceae								
<i>Cucumis zeyheri</i> Sond.	climber					r		
Family Cyperaceae								
<i>Cyperus dives</i> Delile	sedge				u			
<i>Cyperus sexangularis</i> Nees	sedge				u			
<i>Cyperus</i> sp.	sedge				r	r		
<i>Pycreus macranthus</i> (Boeckeler) C.B. Clarke	sedge				r			
Family Dioscoreaceae								
<i>Dioscorea cotinifolia</i> Kunth	climber					r		
Family Dracaenaceae								
<i>Sansevieria hyacinthoides</i> (L.) Druce	succulent					r	r	
Family Ebenaceae								
<i>Diospyros mespiliformis</i> Hochst. ex A. DC.	tree				d	r		
<i>Euclea divinorum</i> Hiern	tree				r	d	u	u
<i>Euclea natalensis</i> A. DC. subsp. <i>angustifolia</i> F. White	tree				r	r	r	r
Family Euphorbiaceae								
<i>Croton menyharthii</i> Pax	shrub					u		
<i>Euphorbia ingens</i> E. Mey. ex Boiss.	tree					r	r	
* <i>Ricinus communis</i> L. var. <i>communis</i>	dwarf							
<i>Spirostachys africana</i> Sond.	shrub				r			
	tree		LEMA	2	r		u	
Family Fabaceae								
<i>Acacia burkei</i> Benth.	tree					r	u	r
<i>Acacia exuvialis</i> I. Verd.	shrub				r	u	r	
<i>Acacia gerrardii</i> Benth. subsp. <i>gerrardii</i> var. <i>gerrardii</i>	tree						u	
<i>Acacia nigrescens</i> Oliv.	tree					r	f	r
<i>Acacia nilotica</i> (L.) Willd. ex Delile subsp. <i>kraussiana</i> (Benth.) Brenan	tree					r	r	d
<i>Acacia robusta</i> Burch. subsp. <i>clavigera</i> (E. Mey.) Brenan	tree				u	u		

<i>Acacia sieberiana</i> DC. var. <i>woodii</i> (Burt Davy) Keay & Brenan	tree				r				
<i>Acacia tortilis</i> (Forssk.) Hayne subsp. <i>heteracantha</i> (Burch.) Brenan	tree						r	d	
<i>Acacia xanthophloea</i> Benth.	tree				u	r			
	dwarf								
<i>Aeschynomene indica</i> L.	shrub				r	r			
<i>Albizia harveyi</i> E.Fourn.	tree						r		
<i>Bolusanthus speciosus</i> (Bolus) Harms	tree						u	r	
<i>Chamaecrista absus</i> (L.) H.S.Irwin & Barneby	herb						u		
<i>Crotalaria</i> sp. (no flowers)	herb					r			
<i>Dalbergia melanoxylon</i> Guill. & Perr.	tree	NT‡			r	u	r		
<i>Dichrostachys cinerea</i> (L.) Wight & Arn. subsp. <i>africana</i> Brenan & Brummitt	tree				r		f	f	
<i>Indigofera</i> sp. (no flowers)	herb							r	
<i>Mundulea sericea</i> (Willd.) A.Chev. subsp. <i>sericea</i>	tree					r	u		
<i>Ormocarpum trichocarpum</i> (Taub.) Engl.	tree					r	r		
<i>Peltophorum africanum</i> Sond.	tree					r	u	r	
<i>Pterocarpus rotundifolius</i> (Sond.) Druce subsp. <i>rotundifolius</i>	tree						r		
<i>Philenoptera violacea</i> (Klotzsch) Schrire	tree		NFA		r		r		
<i>Rhynchosia caribaea</i> (Jacq.) DC.	climber					r	r		
<i>Schotia brachypetala</i> Sond.	tree				f	d			
* <i>Sesbania bispinosa</i> (Jacq.) W.Wight var. <i>bispinosa</i>	shrub				r			r	
<i>Senna petersiana</i> (Bolle) Lock	tree						r		
* <i>Sesbania punicea</i> (Cav.) Benth.	shrub			1b	r				
	dwarf								
<i>Tephrosia rhodesica</i> Baker f. var. <i>rhodesica</i>	shrub							r	
Family Geraniaceae									
<i>Monsonia angustifolia</i> E.Mey. ex A.Rich.	herb							r	
Family Hyacinthaceae									
<i>Drimia altissima</i> (L.f.) Ker Gawl.	bulb						r		
<i>Drimiopsis crenata</i> van der Merwe	bulb					r			
Family Lamiaceae									
<i>Leucas glabrata</i> (Vahl) Sm. var. <i>glabrata</i>	herb						r	r	
<i>Ocimum americanum</i> L. var. <i>americanum</i>	herb						u	u	
Family Loranthaceae									
<i>Oncocalyx bolusii</i> (Sprague) Wiens & Polhill	epiphyte						r		

<i>Plicosepalus kalachariensis</i> (Schinz) Danser	epiphyte				r	r		
Family Malphigiaceae								
<i>Sphedamnocarpus pruriens</i> (A.Juss.) Szyszyl. subsp. <i>pruriens</i>	climber						r	
Family Malvaceae								
<i>Abutilon austro-africanum</i> Hochr.	dwarf shrub					r	f	u
<i>Dombeya rotundifolia</i> (Hochst.) Planch. var. <i>rotundifolia</i>	tree						r	
<i>Grewia bicolor</i> Juss. var. <i>bicolor</i>	shrub					u	f	r
<i>Grewia flavescens</i> Juss.	shrub				r	f	u	
<i>Grewia hexamita</i> Burret	tree					u		
<i>Grewia villosa</i> Willd. var. <i>villosa</i>	shrub						r	
	dwarf shrub							
<i>Hibiscus calyphyllus</i> Cav.	shrub					r		
	dwarf shrub							
<i>Hibiscus micranthus</i> L.f. var. <i>micranthus</i>	shrub						r	
<i>Hibiscus praeteritus</i> R.A.Dyer	herb					r		
	dwarf shrub							
<i>Pavonia burchellii</i> (DC.) R.A.Dyer	shrub							r
	dwarf shrub							
<i>Sida dregei</i> Burtt Davy	shrub							u
<i>Waltheria indica</i> L.	herb					r	f	r
Family Meliaceae								
<i>Turrea obtusifolia</i> Hochst.	shrub					r		
Family Menispermaceae								
<i>Cocculus hirsutus</i> (L.) Diels	climber					r		
<i>Tinospora fragosa</i> Verdoorn & Troupin	climber					r		
Family Moraceae								
<i>Ficus sycomorus</i> L. subsp. <i>sycomorus</i>	tree				f			
Family Oleaceae								
<i>Jasminum fluminense</i> Vell. subsp. <i>fluminense</i>	climber				r	r		r
<i>Olea europaea</i> L. subsp. <i>africana</i> (Mill.) P.S.Green	tree					r		
Family Onagraceae								
<i>Ludwigia adscendens</i> subsp. <i>diffusa</i> (Forssk.) P.H.Raven	herb				u			
Family Orchidaceae								
<i>Ansellia africana</i> Lindl.	epiphyte	VU‡			r	r	r	
Family Pedaliaceae								

<i>Ceratothera triloba</i> (Bernh.) Hook.f.	herb						r	r	
<i>Dicerocaryum senecioides</i> (Klotzsch) Abels	creeper						r	r	
Family Phyllanthaceae									
<i>Flueggea virosa</i> (Roxb. ex Wild.)	shrub					r	r		
<i>Phyllanthus reticulatus</i> Poir. var. <i>reticulatus</i>	shrub				u	u			
Family Poaceae									
<i>Aristida adscensionis</i> L.	grass					r	u	r	
<i>Aristida congesta</i> Roem. & Schult. subsp. <i>barbicollis</i> (Trin. & Rupr.) De Winter	grass					r	u		
<i>Brachiaria serrata</i> (Thunb.) Stapf	grass						u	u	
<i>Cymbopogon nardus</i> (L.) Rendle	grass					r			
<i>Cynodon dactylon</i> (L.) Pers.	grass							u	
<i>Dactyloctenium giganteum</i> Fisher & Schweick.	grass							r	
<i>Digitaria eriantha</i> Steud.	grass					r		r	
<i>Echinochloa colona</i> (L.) Link	grass				r		r		
<i>Eragrostis curvula</i> (Schrad.) Nees	grass						r	r	
<i>Eragrostis gummiflua</i> Nees	grass						r		
<i>Eragrostis lehmanniana</i> Nees var. <i>lehmanniana</i>	grass					r	d		
<i>Eragrostis nindensis</i> Ficalho & Hiern	grass							r	
<i>Eragrostis rigidior</i> Pilg.	grass						r	r	
<i>Eragrostis superba</i> Peyr.	grass						f	u	
<i>Eragrostis trichophora</i> Coss. & Durieu	grass						r		
<i>Heteropogon contortus</i> (L.) Roem. & Schult.	grass						r	f	
<i>Hyperthelia dissoluta</i> (Nees ex Steud.) Clayton	grass						r		
<i>Leersia hexandra</i> Sw.	grass				u				
<i>Melinis repens</i> (Willd.) Zizka subsp. <i>repens</i>	grass					r	u		
<i>Panicum deustum</i> Thunb.	grass				r	r			
<i>Panicum maximum</i> Jacq.	grass				u	u	u	u	
<i>Perotis patens</i> Gand.	grass						r		
<i>Phragmites australis</i> (Cav.) Steud.	reed				d				
<i>Phragmites mauritianus</i> Kunth	reed				u				
<i>Pogonarthria squarrosa</i> (Roem. & Schult.) Pilg.	grass						u		
<i>Setaria sphacelata</i> (Schumach.) Stapf & C.E.Hubb. ex M.B.Moss var. <i>sphacelata</i>	grass						r		
<i>Sporobolus pyramidalis</i> P.Beauv.	grass				r		u		
<i>Themeda triandra</i> Forssk.	grass						u		

<i>Urochloa mosambicensis</i> (Hack.) Dandy	grass						u	
Family Polygonaceae <i>Persicaria decipiens</i> (R.Br.) K.L.Wilson	herb				r			
Family Portulacaceae <i>Talinum cafrum</i> (Thunb.) Eckl. & Zeyh.	herb						r	
Family Rhamnaceae <i>Berchemia zeyheri</i> (Sond.) Grubov <i>Ziziphus mucronata</i> Willd. subsp. <i>mucronata</i>	tree tree				r r	r r	u	u
Family Rubiaceae <i>Agathisanthemum bojeri</i> Klotzsch subsp. <i>bojeri</i> <i>Breonadia salicina</i> (Vahl) Hepper & J.R.I.Wood <i>Coddia rudis</i> (E.Mey. ex Harv.) Verdc. <i>Plectroniella armata</i> (K.Schum.) Robyns <i>Pyrostria hystrix</i> (Bremek.) Bridson * <i>Richardia brasiliensis</i> Gomes	herb tree shrub tree shrub herb		NFA		r	u	r r r	r f
Family Salvadoraceae <i>Azima tetraacantha</i> Lam.	shrub						u	
Family Salviniaceae * <i>Salvinia adnata</i> Desv.	herb			1b			u	
Family Sapindaceae <i>Pappea capensis</i> Eckl. & Zeyh.	tree						u	
Family Selaginellaceae <i>Selaginella dregei</i> (C. Presl) Hieron.	fern							r
Family Sinopteridaceae <i>Cheilanthes viridis</i> (Forssk.) Sw. var. <i>viridis</i>	fern							r
Family Solanaceae * <i>Datura stramonium</i> L. <i>Solanum campylacanthum</i> A. Rich. subsp. <i>panduriforme</i> * <i>Solanum seaforthianum</i> Andrews var. <i>disjunctum</i> O.E.Schulz	dwarf shrub dwarf shrub climber			1b 1b			r r	r u
Family Strychnaceae <i>Strychnos madagascariensis</i> Poir.	tree							u
Family Typhaceae <i>Typha capensis</i> (Rohrb.) N.E.Br.	rush							r

Family Verbenaceae								
* <i>Lantana camara</i> L.	dwarf shrub			1b	r			r
Family Vitaceae								
<i>Cissus cactiformis</i> Gilg	succulent					r		
<i>Cissus cornifolia</i> (Baker) Planch.	climber					r	u	
<i>Cissus rotundifolia</i> Vahl	succulent					r		
<i>Rhoicissus tridentata</i> (L.f.) Wild & R.B.Drumm. subsp. <i>tridentata</i>	climber				r	r	r	
TOTAL	197	3	7	11	61	96	107	65

NFA = National Forests Act	d = dominant
LEMA = Limpopo Environmental Management Act	f = frequent
VU = Vulnerable	u = uncommon
NT = Near Threatened	r = rare
‡ = IUCN assessment	
* = exotic species	

Appendix 2. Potentially occurring plant species of conservation concern

Species	Family	Red Data Status	Habitat Preference	Optimal Survey Time	Likelihood of Occurrence	Justification
<i>Adenium swazicum</i>	Apocynaceae	CR	Lowveld savanna, often on sodic soils	Dec-May (Flowering period)	Low	No suitable habitat present, very rare in Limpopo Lowveld
<i>Elaeodendron transvaalense</i>	Celastraceae	NT	Savanna or bushveld, from open woodland to thickets, often on termite mounds.	Throughout the year (even when sterile)	Confirmed	
<i>Dalbergia melanoxylon</i>	Fabaceae	NT‡	Savanna	Throughout the year (even when sterile)	Confirmed	
<i>Bowiea volubilis</i> subsp. <i>volubilis</i>	Hyacinthaceae	VU	Thickly vegetated river valleys and in boulder screes	Oct-April, deciduous species	Very Low	No suitable habitat present
<i>Drimia sanguinea</i>	Hyacinthaceae	NT	Open veld and scrubby woodland in a variety of soil types.	Oct-April, deciduous species	Moderate	Suitable habitat present
<i>Ansellia africana</i>	Orchidaceae	VU‡	Savanna	Throughout the year (even when sterile)	Confirmed	

NT = Near Threatened
 VU = Vulnerable
 CR = Critically Endangered
 ‡ = IUCN assessment

Appendix 3. Co-ordinates of flora and fauna taxa of conservation-importance recorded during fieldwork

Species	Protected Status	Red Data	No. of Plants	GPS Co-ordinates	
				Lat	Long
<i>Ansellia africana</i>	LEMA	VU	1	-24.427399	31.027267
<i>Ansellia africana</i>	LEMA	VU	1	-24.427194	31.026847
<i>Ansellia africana</i>	LEMA	VU	1	-24.466513	31.051240
<i>Ansellia africana</i>	LEMA	VU	1	-24.457820	31.108092
<i>Ansellia africana</i>	LEMA	VU	1	-24.459021	31.106116
<i>Balanites maughamii</i>	NFA		1	-24.426479	31.027659
<i>Balanites maughamii</i>	NFA		1	-24.444098	31.051096
<i>Balanites maughamii</i>	NFA		1	-24.443938	31.051461
<i>Balanites maughamii</i>	NFA		1	-24.434242	31.019296
<i>Balanites maughamii</i>	NFA		1	-24.440716	31.100890
<i>Breonadia salicina</i>	NFA		1	-24.459128	31.106359
<i>Combretum imberbe</i>	NFA		1	-24.434512	31.017256
<i>Combretum imberbe</i>	NFA		1	-24.455982	31.082042
<i>Combretum imberbe</i>	NFA		1	-24.395763	31.097760
<i>Combretum imberbe</i>	NFA		1	-24.396921	31.097438
<i>Combretum imberbe</i>	NFA		1	-24.398176	31.101938
<i>Combretum imberbe</i>	NFA		1	-24.397862	31.101478
<i>Combretum imberbe</i>	NFA		1	-24.397670	31.101008
<i>Combretum imberbe</i>	NFA		1	-24.398163	31.100811
<i>Combretum imberbe</i>	NFA		1	-24.447016	31.109857
<i>Combretum imberbe</i>	NFA		1	-24.436306	31.113555
<i>Combretum imberbe</i>	NFA		1	-24.485530	31.074836
<i>Combretum imberbe</i>	NFA		1	-24.484174	31.074853
<i>Combretum imberbe</i>	NFA		1	-24.485574	31.075622
<i>Combretum imberbe</i>	NFA		2	-24.485501	31.075155
<i>Combretum imberbe</i>	NFA		1	-24.461009	31.103938
<i>Combretum imberbe</i>	NFA		1	-24.458598	31.106787
<i>Combretum imberbe</i>	NFA		1	-24.474170	31.098451
<i>Dalbergia melanoxylon</i>		NT	1	-24.426816	31.027783

<i>Dalbergia melanoxylon</i>		NT	1	-24.427424	31.026934
<i>Dalbergia melanoxylon</i>		NT	2	-24.428093	31.024423
<i>Dalbergia melanoxylon</i>		NT	1	-24.426873	31.024262
<i>Dalbergia melanoxylon</i>		NT	1	-24.434423	31.017294
<i>Dalbergia melanoxylon</i>		NT	1	-24.435347	31.017277
<i>Dalbergia melanoxylon</i>		NT	1	-24.429168	31.014326
<i>Dalbergia melanoxylon</i>		NT	1	-24.466615	31.050227
<i>Dalbergia melanoxylon</i>		NT	1	-24.466477	31.051374
<i>Dalbergia melanoxylon</i>		NT	1	-24.434057	31.018684
<i>Dalbergia melanoxylon</i>		NT	1	-24.456121	31.081214
<i>Dalbergia melanoxylon</i>		NT	1	-24.455843	31.081452
<i>Dalbergia melanoxylon</i>		NT	1	-24.460276	31.104993
<i>Dalbergia melanoxylon</i>		NT	1	-24.459205	31.106096
<i>Dalbergia melanoxylon</i>		NT	1	-24.458226	31.107273
<i>Dalbergia melanoxylon</i>		NT	1	-24.458914	31.106427
<i>Elaeodendron transvaalense</i>	NFA	NT	1	-24.426849	31.027788
<i>Elaeodendron transvaalense</i>	NFA	NT	1	-24.426943	31.023820
<i>Elaeodendron transvaalense</i>	NFA	NT	1	-24.426924	31.026116
<i>Philenoptera violacea</i>	NFA		1	-24.429869	31.014380
<i>Philenoptera violacea</i>	NFA		1	-24.429170	31.014144
<i>Philenoptera violacea</i>	NFA		1	-24.398027	31.101567
<i>Philenoptera violacea</i>	NFA		1	-24.398249	31.101112
<i>Philenoptera violacea</i>	NFA		1	-24.436282	31.113027
<i>Philenoptera violacea</i>	NFA		1	-24.441010	31.101704
<i>Philenoptera violacea</i>	NFA		1	-24.459579	31.104491
<i>Philenoptera violacea</i>	NFA		1	-24.459224	31.104856
<i>Philenoptera violacea</i>	NFA		1	-24.458869	31.106475
<i>Philenoptera violacea</i>	NFA		1	-24.473630	31.099144
<i>Philenoptera violacea</i>	NFA		1	-24.473845	31.098945
<i>Sclerocarya birrea</i>	NFA		1	-24.426422	31.027569
<i>Sclerocarya birrea</i>	NFA		1	-24.427113	31.028240
<i>Sclerocarya birrea</i>	NFA		1	-24.426917	31.024193

<i>Sclerocarya birrea</i>	NFA		1	-24.426618	31.023962
<i>Sclerocarya birrea</i>	NFA		2	-24.434399	31.017137
<i>Sclerocarya birrea</i>	NFA		1	-24.434765	31.017579
<i>Sclerocarya birrea</i>	NFA		1	-24.434098	31.016899
<i>Sclerocarya birrea</i>	NFA		1	-24.433369	31.016872
<i>Sclerocarya birrea</i>	NFA		3	-24.429645	31.014108
<i>Sclerocarya birrea</i>	NFA		1	-24.429379	31.013860
<i>Sclerocarya birrea</i>	NFA		1	-24.433813	31.018949
<i>Sclerocarya birrea</i>	NFA		1	-24.429237	31.013615
<i>Sclerocarya birrea</i>	NFA		1	-24.429263	31.014127
<i>Sclerocarya birrea</i>	NFA		1	-24.455252	31.084466
<i>Sclerocarya birrea</i>	NFA		1	-24.455035	31.083644
<i>Sclerocarya birrea</i>	NFA		1	-24.466472	31.051088
<i>Sclerocarya birrea</i>	NFA		1	-24.466266	31.050990
<i>Sclerocarya birrea</i>	NFA		1	-24.444193	31.051034
<i>Sclerocarya birrea</i>	NFA		1	-24.433935	31.020294
<i>Sclerocarya birrea</i>	NFA		2	-24.434126	31.020366
<i>Sclerocarya birrea</i>	NFA		1	-24.434356	31.019661
<i>Sclerocarya birrea</i>	NFA		1	-24.434540	31.019031
<i>Sclerocarya birrea</i>	NFA		1	-24.433823	31.019217
<i>Sclerocarya birrea</i>	NFA		1	-24.454525	31.082255
<i>Sclerocarya birrea</i>	NFA		1	-24.454522	31.082906
<i>Sclerocarya birrea</i>	NFA		1	-24.454789	31.083348
<i>Sclerocarya birrea</i>	NFA		1	-24.455081	31.083807
<i>Sclerocarya birrea</i>	NFA		1	-24.456097	31.081827
<i>Sclerocarya birrea</i>	NFA		1	-24.388492	31.080198
<i>Sclerocarya birrea</i>	NFA		1	-24.388796	31.080496
<i>Sclerocarya birrea</i>	NFA		1	-24.396051	31.098053
<i>Sclerocarya birrea</i>	NFA		1	-24.395624	31.097675
<i>Sclerocarya birrea</i>	NFA		1	-24.396627	31.098477
<i>Sclerocarya birrea</i>	NFA		1	-24.398639	31.101610
<i>Sclerocarya birrea</i>	NFA		1	-24.397999	31.101756

<i>Sclerocarya birrea</i>	NFA		1	-24.397868	31.100958
<i>Sclerocarya birrea</i>	NFA		1	-24.398341	31.101242
<i>Sclerocarya birrea</i>	NFA		1	-24.398523	31.101162
<i>Sclerocarya birrea</i>	NFA		1	-24.398336	31.100781
<i>Sclerocarya birrea</i>	NFA		1	-24.398058	31.100617
<i>Sclerocarya birrea</i>	NFA		1	-24.440774	31.100687
<i>Sclerocarya birrea</i>	NFA		1	-24.440216	31.101129
<i>Sclerocarya birrea</i>	NFA		1	-24.460286	31.104350
<i>Sclerocarya birrea</i>	NFA		1	-24.459742	31.104778
<i>Sclerocarya birrea</i>	NFA		1	-24.474539	31.098520
<i>Spirostachys africana</i>	LEMA		2	-24.426662	31.027581
<i>Spirostachys africana</i>	LEMA		1	-24.466074	31.051326
<i>Spirostachys africana</i>	LEMA		1	-24.458472	31.107275
<i>Spirostachys africana</i>	LEMA		1	-24.459763	31.105391

Appendix 4. Checklist of fauna recorded during fieldwork

Common Name	Scientific Name	Red Data	Endemic	Protected	Assemblage		
					Woodland	Riparian Forest / Thicket	Aquatic Habitats
Mammals							
ORDER: PRIMATES							
Family Cercopithecidae (Old World monkeys)							
Vervet Monkey	<i>Chlorocebus pygerythrus</i>				x	x	
Chacma Baboon	<i>Papio ursinus</i>				x		
ORDER: LAGOMORPHA							
Family Leporidae (rabbits and hares)							
African Savanna Hare	<i>Lepus victoriae</i>				x		
ORDER: RODENTIA							
Family Sciuridae (squirrels)							
Tree Squirrel	<i>Paraxerus cepapi</i>				x		
Family Hystricidae (Old World porcupines)							
Cape Porcupine	<i>Hystrix africaeaustralis</i>				x		
ORDER: CARNIVORA							
Family Herpestidae (mongooses)							
Dwarf Mongoose	<i>Helogale parvula</i>				x		
Slender Mongoose	<i>Herpestes sanguineus</i>				x		
Banded Mongoose	<i>Mungos mungo</i>				x		
Family Hyaenidae (hyaenas)							
Spotted Hyaena	<i>Crocuta crocuta</i>	NT		NEMBA (PR)	x		
Family Felidae (cats)							
Leopard	<i>Panthera pardus</i>	VU		NEMBA (PR)	x		

Lion	<i>Panthera leo</i>	VU‡		LEMA	x		
ORDER: PROBOSCIDEA							
Family Elephantidae (elephants)							
African Elephant	<i>Loxodonta africana</i>	VU		NEMBA (PR)	x	x	x
ORDER: PERRISODACTYLA							
Family Equidae (horses)							
Plains (Burchell's) Zebra	<i>Equus quagga burchellii</i>			NEMBA (PR)	x		
Family Rhinocerotidae (rhinoceros's)							
Southern White Rhinoceros	<i>Ceratotherium simum simum</i>	NT		NEMBA (PR)	x		
ORDER: CETARTIODACTYLA							
Family Hippopotamidae (hippopotamus)							
Hippopotamus	<i>Hippopotamus amphibius</i>	VU‡		LEMA		x	x
Family Suidae (pigs)							
Common Warthog	<i>Phacochoerus africanus</i>				x		
Family Giraffidae (giraffes)							
South African Giraffe	<i>Giraffa camelopardalis giraffa</i>			LEMA	x		
Family Bovidae (antelope, cattle)							
African Buffalo	<i>Syncerus caffer</i>			LEMA	x		
Greater Kudu	<i>Tragelaphus strepsiceros</i>				x		
Nyala	<i>Tragelaphus angasii</i>					x	
Southern Bushbuck	<i>Tragelaphus sylvaticus</i>					x	
Blue Wildebeest	<i>Connochaetes taurinus taurinus</i>				x		
Common Waterbuck	<i>Kobus ellipsiprymnus ellipsiprymnus</i>				x		
Steenbok	<i>Raphicerus campestris</i>				x		
Common Duiker	<i>Sylvicapra grimmia</i>				x	x	
Impala	<i>Aepyceros melampus</i>				x	x	
Subtotal	26	15	8	14	23	7	2
Birds							
ORDER: ANSERIFORMES							
Family Anatidae (ducks, geese and swans)							
White-faced Whistling Duck	<i>Dendrocygna viduata</i>						x

Knob-billed Duck	<i>Sarkidiornis melanotos</i>						x
Egyptian Goose	<i>Alopochen aegyptiaca</i>						x
ORDER: GALLIFORMES							
Family Numididae (guineafowl)							
Helmeted Guineafowl	<i>Numida meleagris</i>					x	
Family Phasianidae (pheasants, fowl and allies)							
Crested Francolion	<i>Dendroperdix sephaena</i>					x	
Natal Spurfowl	<i>Pternistis natalensis</i>					x	x
ORDER: PODICIPEDIFORMES							
Family Podicipedidae (grebes)							
Little Grebe	<i>Tachybaptus ruficollis</i>						x
ORDER: CICONIIFORMES							
Family Ciconiidae (storks)							
Marabou Stork	<i>Leptoptilos crumenifer</i>	NT					x
ORDER: PELECANIFORMES							
Family Threskiornithidae (ibises and spoonbills)							
Hadedda Ibis	<i>Bostrychia hagedash</i>						x
Family Ardeidae (herons and bitterns)							
Western Cattle Egret	<i>Bubulcus ibis</i>						x
Grey Heron	<i>Ardea cinerea</i>						x
Striated Heron	<i>Butorides striata</i>						x
Family Scopidae (Hamerkop)							
Hamerkop	<i>Scopus umbretta</i>						x
ORDER: ACCIPITRIFORMES							
Family Accipitridae (kites, hawks and eagles)							
African Harrier-Hawk	<i>Polyboroides typus</i>						x
Hooded Vulture	<i>Necrosyrtes monachus</i>	CR		EN (NEMBA)	x		
White-backed Vulture	<i>Gyps africanus</i>	CR		EN (NEMBA)	x		
African Fish Eagle	<i>Haliaeetus vocifer</i>					x	x
Black-chested Snake Eagle	<i>Circaetus pectoralis</i>				x		
Bateleur	<i>Terathopius ecaudatus</i>	EN		EN (NEMBA)	x		
African Hawk-Eagle	<i>Aquila spilogaster</i>				x		
Wahlberg's Eagle	<i>Hieraaetus wahlbergi</i>				x	x	

Gabar Goshawk	<i>Micronisus gabar</i>				x		
ORDER: OTIDIFORMES							
Family Otididae (bustards)							
Red-crested Korhaan	<i>Lophotis ruficrista</i>				x		
ORDER: CHARADRIIFORMES							
Family Burhinidae (thick-knees)							
Water Thick-knee	<i>Burhinus vermiculatus</i>						x
Family Recurvirostridae (stilts and avocets)							
Black-winged Stilt	<i>Himantopus himantopus</i>						x
Family Charadriidae (plovers)							
Crowned Lapwing	<i>Vanellus coronatus</i>				x		
African Wattled Lapwing	<i>Vanellus senegallus</i>						x
Blacksmith Lapwing	<i>Vanellus armatus</i>						x
Three-banded Plover	<i>Charadrius tricollaris</i>						x
Family Jacanidae (jacanas)							
African Jacana	<i>Actophilornis africanus</i>						x
Family Scolopacidae (sandpipers and snipes)							
Wood Sandpiper	<i>Tringa glareola</i>						x
ORDER: COLUMBIFORMES							
Family Columbidae (pigeons and doves)							
African Green Pigeon	<i>Treron calvus</i>						x
Cape Turtle Dove	<i>Streptopelia capicola</i>				x		
Red-eyed Dove	<i>Streptopelia semitorquata</i>						x
Laughing Dove	<i>Spilopelia senegalensis</i>				x		
Namaqua Dove	<i>Oena capensis</i>				x		
Emerald-spotted Wood Dove	<i>Turtur chalcospilos</i>				x		
ORDER: MUSOPHAGIFORMES							
Family Musophagidae (turacos)							
Purple-crested Turaco	<i>Tauraco porphyreolophus</i>						x
Grey Go-away-bird	<i>Corythaixoides concolor</i>				x		
ORDER: CUCULIFORMES							
Family Cuculidae (cuckoos)							
Burchell's Coucal	<i>Centropus burchellii</i>				x		
Great Spotted Cuckoo	<i>Clamator glandarius</i>				x		
Jacobin Cuckoo	<i>Clamator jacobinus</i>				x		

Levaillant's Cuckoo Klaas's Cuckoo	<i>Clamator levaillantii</i> <i>Chrysococcyx klaas</i>				x	x	
ORDER: STRIGIFORMES Family Strigidae (owls) Pearl-spotted Owllet	<i>Glaucidium perlatum</i>				x		
ORDER: CAPRIMULGIFORMES Family Caprimulgidae (nightjars) Fiery-necked Nightjar	<i>Caprimulgus pectoralis</i>				x		
ORDER: APODIFORMES Family Apodidae (swifts) African Palm Swift Alpine Swift African Black Swift Little Swift	<i>Cypsiurus parvus</i> <i>Tachymartus melba</i> <i>Apus barbatus</i> <i>Apus affinis</i>				over over over over	over over over over	over over over over
ORDER: CORACIIFORMES Family Coraciidae (rollers) Lilac-breasted Roller Family Alcedinidae (kingfishers) Woodland Kingfisher Brown-hooded Kingfisher	<i>Coracias caudatus</i> <i>Halcyon senegalensis</i> <i>Halcyon albiventris</i>				x x x		
Family Meropidae (bee-eaters) Little Bee-eater White-fronted Bee-eater European Bee-eater	<i>Merops pusillus</i> <i>Merops bullockoides</i> <i>Merops apiaster</i>				x x	x	
ORDER: BUCEROTIFORMES Family Upupidae (hoopoes) African Hoopoe Family Phoeniculidae (wood-hoopoes) Green Wood-hoopoe Common Scimitarbill Family Bucerotidae (hornbills) Crowned Hornbill African Grey Hornbill Southern Red-billed Hornbill	<i>Upupa africana</i> <i>Phoeniculus purpureus</i> <i>Rhinopomastus cyanomelas</i> <i>Lophoceros alboterminatus</i> <i>Tockus nasutus</i> <i>Tockus rufirostris</i>				x x x x x x	x	

Southern Yellow-billed Hornbill	<i>Tockus leucomelas</i>				x		
ORDER: COLIIFORMES							
Family Coliidae (mousebirds)							
Speckled Mousebird	<i>Colius striatus</i>					x	
Red-faced Mousebird	<i>Urocolius indicus</i>				x		
ORDER: PICIFORMES							
Family Lybiidae (African barbets)							
Black-collared Barbet	<i>Lybius torquatus</i>						x
Crested Barbet	<i>Trachyphonus vaillantii</i>				x		
Yellow-fronted Tinkerbird	<i>Pogoniulus chrysoconus</i>				x		
Acacia Pied Barbet	<i>Tricholaema leucomelas</i>				x		
Family Indicatoridae (honeyguides)							
Lesser Honeyguide	<i>Indicator minor</i>						x
Family Picidae (woodpeckers)							
Bearded Woodpecker	<i>Chloropicus namaquus</i>				x		
Cardinal Woodpecker	<i>Dendropicos fuscescens</i>				x		
Golden-tailed Woodpecker	<i>Campethera abingoni</i>				x	x	
ORDER: PSITTACIFORMES							
Family Psittacidae (parrots)							
Brown-headed Parrot	<i>Poicephalus cryptoxanthus</i>				x		
ORDER: PASSERIFORMES							
Family Platysteiridae (wattle-eyes and batises)							
Chin-spot Batis	<i>Batis molitor</i>				x		
Family Prionopidae (helmetshrikes)							
White-crested Helmetshrike	<i>Prionops plumatus</i>				x		
Family Malaconotidae (bushshrikes)							
Orange-breasted Bushshrike	<i>Chlorophoneus sulfureopectus</i>				x		
Grey-headed Bushshrike	<i>Malaconotus blanchoti</i>				x	x	
Black-backed Puffback	<i>Dryoscopus cubla</i>				x	x	
Black-crowned Tchagra	<i>Tchagra senegalus</i>				x		
Brown-crowned Tchagra	<i>Tchagra australis</i>				x		
Brubru	<i>Nilaus afer</i>				x		
Southern Boubou	<i>Laniarius ferrugineus</i>						x
Family Laniidae (shrikes)							
Southern White-crowned Shrike	<i>Eurocephalus anguimans</i>				x		

Lesser Grey Shrike	<i>Lanius minor</i>					x		
Red-backed Shrike	<i>Lanius collurio</i>					x		
Magpie Shrike	<i>Urolestes melanoleucus</i>					x		
Family Oriolidae (figbirds and orioles)								
Black-headed Oriole	<i>Oriolus larvatus</i>					x	x	
Family Dicruridae (drongos)								
Fork-tailed Drongo	<i>Dicrurus adsimilis</i>					x		
Family Monarchidae (monarchs)								
African Paradise Flycatcher	<i>Terpsiphone viridis</i>						x	
Family Corvidae (crows and jays)								
Pied Crow	<i>Corvus albus</i>					x		
Family Paridae (tits and chickadees)								
Southern Black Tit	<i>Parus niger</i>					x		
Family Remizidae (penduline tits)								
Grey Penduline Tit	<i>Anthoscopus caroli</i>					x		
Family Pycnonotidae (bulbuls)								
Dark-capped Bulbul	<i>Pycnonotus tricolor</i>					x	x	
Sombre Greenbul	<i>Andropadus importunus</i>						x	
Yellow-bellied Greenbul	<i>Chlorocichla flaviventris</i>						x	
Terrestrial Brownbul	<i>Phyllastrephus terrestris</i>						x	
Family Hirundinidae (swallows and martins)								
Lesser Striped Swallow	<i>Cecropis abyssinica</i>					x	x	x
Red-breasted Swallow	<i>Cecropis semirufa</i>					x		
Wire-tailed Swallow	<i>Hirundo smithii</i>							x
Barn Swallow	<i>Hirundo rustica</i>					x	x	x
Common House Martin	<i>Delichon urbicum</i>					x		
Family Macrosphenidae (crombecs and African warblers)								
Long-billed Crombec	<i>Sylvietta rufescens</i>					x		
Family Phylloscopidae (leaf warblers and allies)								
Willow Warbler	<i>Phylloscopus trochilus</i>					x		
Family Acrocephalidae (reed warblers and allies)								
Marsh Warbler	<i>Acrocephalus palustris</i>						x	
Family Cisticolidae (cisticolas and allies)								
Rattling Cisticola	<i>Cisticola chiniana</i>					x		
Red-faced Cisticola	<i>Cisticola erythrops</i>						x	

Neddicky	<i>Cisticola fulvicapilla</i>							x
Tawny-flanked Prinia	<i>Prinia subflava</i>							x
Yellow-breasted Apalis	<i>Apalis flavida</i>							x
Green-backed Camaroptera	<i>Camaroptera brachyura</i>							x
Burnt-necked Eremomela	<i>Eremomela usticollis</i>							x
Stierling's Wren-Warbler	<i>Calamonastes stierlingi</i>							x
Family Leiiothrichidae (laughingthrushes)								
Arrow-marked Babbler	<i>Turdoides jardineii</i>							x
Family Sturnidae (starlings)								
Cape Glossy Starling	<i>Lamprotornis nitens</i>							x
Burchell's Starling	<i>Lamprotornis australis</i>							x
Violet-backed Starling	<i>Cinnyricinclus leucogaster</i>							x
Family Buphagidae (oxpeckers)								
Red-billed Oxpecker	<i>Buphagus erythrorhynchus</i>							x
Family Turdidae (thrushes)								
Kurrichane Thrush	<i>Turdus libonyanus</i>							x
Family Muscicapidae (chats and Old World flycatchers)								
Spotted Flycatcher	<i>Muscicapa striata</i>							x
Ashy Flycatcher	<i>Muscicapa caerulescens</i>							x
Grey Tit-Flycatcher	<i>Myioparus plumbeus</i>							x
Southern Black Flycatcher	<i>Melaenornis pammelaina</i>							x
White-browed Scrub Robin	<i>Erythropygia leucophrys</i>							x
White-throated Robin-Chat	<i>Cossypha humeralis</i>							x
White-browed Robin-Chat	<i>Cossypha heuglini</i>							x
Family Nectariniidae (sunbirds)								
Marico Sunbird	<i>Cinnyris mariquensis</i>							x
White-bellied Sunbird	<i>Cinnyris talatala</i>							x
Scarlet-chested Sunbird	<i>Chalcomitra senegalensis</i>							x
Collared Sunbird	<i>Hedydipna collaris</i>							x
Family Passeridae (Old World sparrows)								
Southern Grey-headed Sparrow	<i>Passer diffusus</i>							x
House Sparrow	<i>Passer domesticus</i>							x
Yellow-throated Petronia	<i>Gymnoris superciliaris</i>							x
Family Ploceidae (weavers and widowbirds)								

Spectacled Weaver	<i>Ploceus ocularis</i>						x	
Village Weaver	<i>Ploceus cucullatus</i>					x		
Lesser Masked Weaver	<i>Ploceus intermedius</i>					x	x	
Southern Masked Weaver	<i>Ploceus velatus</i>					x		
Red-billed Buffalo Weaver	<i>Bubalornis niger</i>					x		
Red-headed Weaver	<i>Anaplectes rubriceps</i>					x		
Red-billed Quelea	<i>Quelea quelea</i>					x		
White-winged Widowbird	<i>Euplectes albonotatus</i>					x		
Family Estrildidae (waxbills, munias and allies)								
Common Waxbill	<i>Estrilda astrild</i>						x	
Blue Waxbill	<i>Uraeginthus angolensis</i>					x		
Red-billed Firefinch	<i>Lagonosticta senegala</i>					x		
Jameson's Firefinch	<i>Lagonosticta rhodopareia</i>					x		
Green-winged Pytilia	<i>Pytilia melba</i>					x		
Quail-Finch	<i>Ortygospiza fuscocrissa</i>					x		
Bronze Mannikin	<i>Lonchura cucullata</i>						x	
Cut-throat Finch	<i>Amadina fasciata</i>					x		
Family Viduidae (indigobirds and whydahs)								
Long-tailed Paradise Whydah	<i>Vidua paradisaea</i>					x		
Pin-tailed Whydah	<i>Vidua macroura</i>					x		
Purple Indigobird	<i>Vidua purpurascens</i>					x		
Village Indigobird	<i>Vidua chalybeata</i>					x		
Family Motacillidae (wagtails and pipits)								
African Pipit	<i>Anthus cinnamomeus</i>					x		
African Pied Wagtail	<i>Motacilla aguimp</i>							x
Family Fringillidae (finches and canaries)								
Yellow-fronted Canary	<i>Crithagra mozambica</i>					x	x	
Family Emberizidae (buntings and New World sparrows)								
Cinnamon-breasted Bunting	<i>Emberiza tahapisi</i>					x		
Subtotal	157	4	0	3	111	46	26	
Reptiles								
ORDER: TESTUDINES								
Family Testudinidae (tortoises)								
Speke's Hinged Tortoise	<i>Kinixys spekii</i>					x		

Leopard Tortoise	<i>Stigmochelys pardalis</i>				x		
Family Pelomedusidae (freshwater turtles)							
Serrated Hinged Terrapin	<i>Pelusios sinuatus</i>						x
ORDER: SQUAMATA							
Family Lacertidae (true lizards)							
Bushveld Lizard	<i>Heliobolus lugubris</i>				x		
Family Scincidae (skinks)							
Striped Skink	<i>Trachylepis striata</i>				x		
Variable Skink	<i>Trachylepis varia</i>				x		
Family Gerrhosauridae (plated lizards)							
Eastern Black-lined Plated Lizard	<i>Gerrhosaurus intermedius</i>				x		
Common Giant Plated Lizard	<i>Matobosaurus validus</i>				x		
Family Varanidae (monitor lizards)							
Water Monitor	<i>Varanus niloticus</i>						x
Subtotal	9	0	0	0	7	0	2
Frogs							
ORDER: ANURA							
Family Rhacophoridae (moss or bush frogs)							
Southern Foam Nest Frog	<i>Chiromantis xerampelina</i>					x	
Subtotal	1	0	0	0	5	1	1
TOTAL	193	19	8	17	146	54	31

PR - Protected
 NT - Near Threatened
 VU - Vulnerable
 EN - Endangered
 CR - Critically Endangered
 NEMBA - National Environmental Management: Biodiversity Act
 LEMA = Limpopo Environmental Management Act
 ‡ - IUCN assessment

Appendix 5. Potentially occurring fauna of conservation concern

Common Name	Scientific Name	Red Data	Protected	Habitat	SABAP2 Pentad Reporting Rate (%)				Likelihood	Reason
					2420_3100	2420_3105	2425_3100	2425_3105		
Mammals										
Cheetah	<i>Acinonyx jubatus</i>	VU	NEMBA (VU)	Savanna, semi desert					Low	Not resident on Kapama, only occasionally passes through
African Clawless Otter	<i>Aonyx capensis</i>	NT	LEMA	Rivers and streams					High	Suitable breeding and foraging habitat present along the Klaserie River
Side-striped Jackal	<i>Canis adustus</i>		LEMA	Savanna, grassland					High	Suitable habitat present
White Rhinoceros	<i>Ceratotherium simum</i>	NT	NEMBA (PR)	Savanna, semi desert					Confirmed	
African Civet	<i>Civettictis civetta</i>		LEMA	Savanna					High	Suitable habitat present
Blue Wildebeest	<i>Connochaetes taurinus</i>		NEMBA (PR)	Savanna, grassland					Confirmed	
Swamp Musk Shrew	<i>Crocidura mariquensis</i>	NT		Wetlands in savanna					Low	Unsuitable habitat present
Spotted Hyaena	<i>Crocuta crocuta</i>	NT	NEMBA (PR)	Wide variety of habitats					Confirmed	
African Marsh Rat	<i>Dasymys incommutus</i>	NT		Wetlands					Low	Unsuitable habitat present
Burchell's Zebra	<i>Equus quagga burchelli</i>		NEMBA (PR)	Savanna, grassland					Confirmed	
African Wildcat	<i>Felis silvestris</i>		LEMA	Wide variety of habitats					High	Suitable habitat present
Southern Lesser Galago	<i>Galago moholi</i>		LEMA	Savanna					High	Suitable habitat present
Giraffe	<i>Giraffa camelopardalis</i>		LEMA	Savanna					Confirmed	
Hippopotamus	<i>Hippopotamus amphibius</i>	VU‡	LEMA	Wetlands					Confirmed	

Sable	<i>Hippotragus niger</i>	VU	NEMBA (VU)	Savanna					Low	Very rare in Kapama
Serval	<i>Leptailurus serval</i>	NT	NEMBA (PR)	Grassland, wetlands					Low	Very rare in the area, limited suitable habitat present
African Elephant	<i>Loxodonta africana</i>	VU	NEMBA (PR)	Wide variety of habitats					Confirmed	
African Wild Dog	<i>Lycaon pictus</i>	EN	NEMBA (EN)	Wide variety of habitats					Low	Not resident on Kapama, only occasionally passes through
Honey Badger	<i>Mellivora capensis</i>		LEMA	Wide variety of habitats					High	Suitable habitat present
Aardvark	<i>Orycteropus afer</i>		NEMBA (PR)	Wide variety of habitats					Low	Rare in the Lowveld, may occasionally pass through
Thick-tailed Greater Galago	<i>Otolemur crassicaudatus</i>		LEMA	Moist woodland and forest					High	Suitable habitat present
Lion	<i>Panthera leo</i>	VU‡	NEMBA (VU)	Wide variety of habitats					Confirmed	
Leopard	<i>Panthera pardus</i>	VU	NEMBA (VU)	Wide variety of habitats					Confirmed	
African Weasel	<i>Poecilogale albinucha</i>	NT		Wide variety of habitats					Low	Very rare in the Lowveld
Aardwolf	<i>Proteles cristatus</i>		LEMA	Wide variety of habitats					Low	Rare in the Lowveld, may occasionally pass through
Steenbok	<i>Raphicerus campestris</i>		LEMA	Wide variety of habitats					Confirmed	
Ground Pangolin	<i>Smutsia temminckii</i>	VU	NEMBA (VU)	Wide variety of habitats					Moderate	Resident on Kapama although in low numbers
African Buffalo	<i>Syncerus caffer</i>		LEMA	Wide variety of habitats					Confirmed	
<i>Subtotal</i>	28	16	25							
Birds										
Half-collared Kingfisher	<i>Alcedo semitorquata</i>	NT		Streams with overhanging vegetation	-	-	-	-	Low	Rare in the Lowveld, no recent records
Tawny Eagle	<i>Aquila rapax</i>	EN	NEMBA (EN)	Savanna	21,9	17,5	14,3	12,9	High	May be resident in low numbers in Kapama, suitable breeding and foraging habitat present within study area
Kori Bustard	<i>Ardeotis kori</i>	NT	NEMBA (PR)	Savanna	-	-	-	-	Low	Unsuitable habitat present

Southern Ground-Hornbill	<i>Bucorvus leadbeateri</i>	EN	NEMBA (EN)	Savanna	-	2,5	9,5	3,2	Moderate	Suitable breeding and foraging habitat present
Abdim's Stork	<i>Ciconia abdimii</i>	NT		Wide variety of habitats	3,1	-	-	-	Low	Limited suitable habitat present, occasional influxes possible
Black Stork	<i>Ciconia nigra</i>	VU		Forages in wetlands and breeds on cliffs	-	-	-	1,6	Low	Suitable habitat present but very rare in the area
Pallid Harrier	<i>Circus macrourus</i>	NT		Open grassland and semi-desert	-	-	-	-	Low	No suitable habitat present
African Marsh Harrier	<i>Circus ranivorus</i>	EN		Moist grassland and wetland	-	-	-	-	Low	No suitable habitat present, very rare in the Lowveld
European Roller	<i>Coracias garrulus</i>	NT		Savanna	18,8	22,5	23,8	11,3	High	Suitable foraging habitat present
Saddle-billed Stork	<i>Ephippiorhynchus senegalensis</i>	EN		Large rivers, dams and pans	-	-	-	8,1	Low	Suitable habitat present but very rare in the area
Lanner Falcon	<i>Falco biarmicus</i>	VU		Wide variety of habitats	-	-	4,8	3,2	Low	Suitable habitat present but very rare in the area
White-backed Night-Heron	<i>Gorsachius leuconotus</i>	VU		Streams with overhanging vegetation	-	-	-	-	Low	Suitable habitat present but no recent records
White-backed Vulture	<i>Gyps africanus</i>	CR	NEMBA (EN)	Savanna	87,5	55,0	81,0	75,8	Confirmed	
Cape Vulture	<i>Gyps coprotheres</i>	EN	NEMBA (EN)	Wide variety of habitats	9,4	20,0	28,6	4,8	High	Suitable foraging habitat present
Marabou Stork	<i>Leptoptilos crumeniferus</i>	NT		Wide variety of habitats		10,0	47,6	24,2	Confirmed	
Bat Hawk	<i>Macheiramphus alcinus</i>	EN		Tall woodland along rivers	-	-	-	-	Low	Very rare in the Lowveld, no recent records
Lesser Jacana	<i>Microparra capensis</i>	VU		Floating vegetation on tropical wetlands	-	-	-	-	Low	Limited suitable habitat present but very rare in the Lowveld and no recent records from the Kapama area
Yellow-billed Stork	<i>Mycteria ibis</i>	EN		Wide variety of wetlands	3,1	-	-	3,2	Low	Suitable habitat present but very rare in the area

Hooded Vulture	<i>Necrosyrtes monachus</i>	CR	NEMBA (EN)	Wide variety of wetlands	9,4	22,5	38,1	29,0	Confirmed	
African Pygmy Goose	<i>Nettapus auritus</i>	VU		Tropical wetlands with floating vegetation	-	-	-	-	Low	Limited suitable habitat present but very rare in the Lowveld and no recent records from the Kapama area
Great White Pelican	<i>Pelecanus onocrotalus</i>	VU		Large pools, rivers and lakes	-	-	-	-	Low	Limited suitable habitat present but very rare in the Lowveld and no recent records from the Kapama area
Pink-backed Pelican	<i>Pelecanus rufescens</i>	VU		Large pools, rivers and lakes	-	-	-	-	Low	Limited suitable habitat present but very rare in the Lowveld and no recent records from the Kapama area
Greater Flamingo	<i>Phoenicopterus roseus</i>	NT		Saline wetlands	-	-	-	-	Low	No suitable habitat present
African Finfoot	<i>Podica senegalensis</i>	VU		Rivers and streams with overhanging vegetation	-	2,5	-	-	High	Reported from the Klaserie River at Karula Lodge
Martial Eagle	<i>Polemaetus bellicosus</i>	EN	NEMBA (EN)	Wide variety of habitats	18,8	5,0	19,0	4,8	High	May be resident in low numbers in Kapama, suitable breeding and foraging habitat present within study area
Greater Painted-snipe	<i>Rostratula benghalensis</i>	NT		Wetlands	-	-	-	-	Low	Suitable breeding and foraging habitat present but rare in general area
Secretarybird	<i>Sagittarius serpentarius</i>	VU		Open savanna and grassland	-	-	-	-	Low	Limited suitable breeding and foraging habitat present
Pel's Fishing Owl	<i>Scotopelia peli</i>	EN		Rivers and streams with overhanging vegetation	-	-	-	-	Low	Limited suitable habitat present but very rare in the Lowveld and no recent records from the Kapama area

Crowned Eagle	<i>Stephanoaetus coronatus</i>	VU		Forest	-	-	-	-	Low	No suitable habitat present
Bateleur	<i>Terathopius ecaudatus</i>	EN	NEMBA (EN)	Savanna	62,5	50,0	33,3	27,4	Confirmed	
Lappet-faced Vulture	<i>Torgos tracheliotos</i>	EN	NEMBA (EN)	Savanna	6,3	7,5	4,8	6,5	Moderate	May be resident in low numbers in Kapama, suitable breeding and foraging habitat present within study area
White-headed Vulture	<i>Trigonoceps occipitalis</i>	CR	NEMBA (EN)	Savanna	6,3	5,0	4,8	-	Moderate	May be resident in low numbers in Kapama, suitable breeding and foraging habitat present within study area
<i>Subtotal</i>	32	32	10							
Reptiles										
Nile Crocodile	<i>Crocodylus niloticus</i>	VU	NEMBA (VU)	Wetlands					High	Suitable breeding and foraging habitat present
Southern African Python	<i>Python natalensis</i>		NEMBA (PR)	Wide variety of habitats, but usually near water or rocky outcrops					High	Suitable breeding and foraging habitat present
<i>Subtotal</i>	2	1	2							
TOTAL	62	49	37							

CR = Critically Endangered
 EN = Endangered
 VU = Vulnerable
 NT = Near Threatened
 NEMBA = National Environmental Management: Biodiversity Act
 LEMA = Limpopo Environmental Management Act
 ‡ = IUCN assessment

Appendix 6. Curriculum Vitae of Duncan McKenzie

Name: Duncan Robert McKenzie
Profession: Terrestrial Ecologist
Date of Birth: 9 Nov 1977
Name of Firm: ECOREX Consulting Ecologists cc
Position in Firm: Ecologist
Years with firm: 11
Nationality: South African
Qualifications :



- N.Dip. [Nature Conservation] UNISA, RSA 2007
- N.Cert. [Nature Guiding] Drumbeat Academy, RSA 2004

Membership in Professional Societies:

- BirdLife South Africa
- Animal Demography Unit, University of Cape Town
- Botanical Society of South Africa

Languages :

	<u>Speaking</u>	<u>Reading</u>	<u>Writing</u>
English (home):	Excellent	Excellent	Excellent
Afrikaans:	Good	Good	Good
isiZulu:	Good	Fair	Fair

Countries of Work Experience : Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zimbabwe (Guiding). South Africa, Mozambique, DRC, Mali, Lesotho, Tanzania, Guinea, Swaziland, Sierra Leone (Consulting Ecologist)

OVERVIEW OF EXPERIENCE

- 11 years' experience in specialist species identification, conducting baseline surveys, data analysis and report writing in various biomes in southern Africa, particularly savannah, forest and grassland biomes
- 2 years' experience game reserve management (KwaZulu-Natal)
- 5 years' experience (part time) of wetland delineation and management
- 2 years' experience of plant propagation and use for rehabilitation
- Specialist knowledge of identification of vascular plants
- Specialist knowledge of identification of mammals, birds, reptiles and amphibians
- SABAP2 Regional Co-ordinator: Mpumalanga
- Member of the Kwa-Zulu-Natal Bird Rarities Committee

Employment Record:

2007 - present	ECOREX	Ecologist
2005 - 2006	Iglu (London, UK)	Specialist Travel Agent
1997 - 2005	Duncan McKenzie Bird Tours	Owner, Specialist Guide
2001	KZN Wildlife	District Conservation Officer, Reserve Manager
1999 - 2001	Institute of Natural Resources	Part-time Horticulturalist and Rehabilitation Officer
1997-2001	Mondi Wetlands Project	Part-time Field Assistant and Regional Co-ordinator
1996-1997	Natal Parks Board	Ranger

Appendix 7. Specialists Declaration

10.4 The Specialist

Note: Duplicate this section where there is more than one specialist.

I ...Duncan McKenzie..., as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
---	---

	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
--	--

- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
- will take into account, to the extent possible, the matters listed in regulation 18 of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).



Signature of the specialist

ECOREX Consulting Ecologists CC

Name of company

30/04/2019

Date