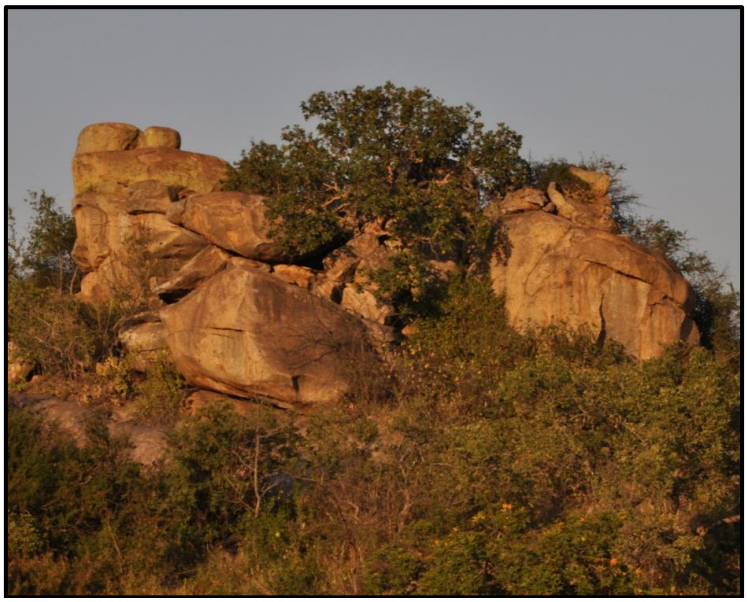
NKOSI CITY PROJECT

BASELINE STUDY: TERRESTRIAL FAUNA



JUNE 2017

Prepared for: Corné Niemandt
Bokamoso Landscape Architects & Environmental Consultants
PO Box 11375
Maroelana
0161

Prepared by: ECOREX Consulting Ecologists CC
Postnet Suite #192,
Private Bag X2
Raslouw 0109

Author: Warren McCleland

Fieldwork: Duncan McKenzie

Reviewer: Dr Rob Palmer (Nepid Consultants)

ECOREX

TABLE OF CONTENTS

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

List of Tables

List of Figures

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Abbreviations

IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
mamsl	Metres Above Mean Sea Level
MBSP	Mpumalanga Biodiversity Sector Plan
MNCA	Mpumalanga Nature Conservation Act (No. 10 of 1998)
MTPA	Mpumalanga Tourism and Parks Agency
NEMBA ToPS	National Environmental Management: Biodiversity Act Threatened or Protected Species (No. 10 of 2004)
NFA	National Forest Act (No. 30 of 1998)
PRECIS	National Herbarium Pretoria (PRE) Computerised Information System
QDS	Quarter Degree Square, for example 2531 AC

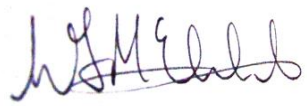
Terminology

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.
Hydrophyte	Plans growing in water
Transformed	Transformed ecosystems are no longer natural and contain little or no indigenous flora. Examples include agricultural lands, plantations, urban areas, etc.

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

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. McCleland *19 June 2017*

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

1. INTRODUCTION

ECOREX Consulting Ecologists CC was appointed by Corné Niemandt of Bokamoso Landscape Architects & Environmental Consultants to perform a biodiversity survey for faunal assemblages of terrestrial ecosystems on a portion of land north of Karino, Mpumalanga Province, South Africa (Figure 1). This study will provide a basis for assessing potential impacts of the proposed project on terrestrial ecology and guide the design and location of planned infrastructure. The study covered vertebrate fauna, specifically mammals, birds, reptiles and frogs. The primary deliverable for this study was a baseline report describing the faunal assemblages present in the study area.

The study team was as follows:

Duncan McKenzie (Terrestrial Ecologist)
Duncan has been involved in biodiversity assessments for ECOREX for nine years and countries of work experience include Lesotho, Swaziland, Mali, Mozambique, Sierra Leone, South Africa, Tanzania and Democratic Republic of the Congo. Duncan has previously worked as a Regional Coordinator for the Mondi Wetlands Project and lectures on many aspects of conservation in Nelspruit and the Kruger National Park. He is currently the Regional Co-ordinator for the South African Bird Atlas Project, sits on the KZN Bird Rarities Committee and is a co-author on the Wildflowers of the Kruger National Park project. A more detailed CV is presented in Appendix 7.

Warren McCleland (Terrestrial Ecologist)
Warren has been conducting biodiversity surveys since 2005 for Environmental Impact Assessments in 15 countries throughout sub-Saharan Africa. He is both botanist and zoologist and surveys have covered flora and vertebrate fauna (mammals, birds, reptiles and amphibians). Many of the projects undertaken in recent years have been in accordance with IFC Performance Standards, with prominent projects including Mkuju Uranium Mine (Selous Game Reserve, Tanzania), Kamoa Copper Mine (Kolwezi, DRC), Kalana Gold Mine (Yanfolila, Mali), the Pemba – Palma Coastal Road (Cabo Delgado Province, Mozambique) and SASOL's Pande and Temane Seismic Exploration Blocks (Inhassoro, Mozambique). Prior to becoming a full-time specialist Warren worked as a professional bird guide for four years, leading birding tours throughout southern and south-central Africa. He is co-author of the acclaimed "Field Guide to the Trees and Shrubs of Mpumalanga and Kruger National Park", published by Jacana in 2002, for which he received the Marloth Medal from the

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Botanical Society of South Africa in 2014. During the last five years he has been accredited with the discovery of several new plant species to science, two of which have been described (*Gladiolus diluvialis* Goldblatt & Manning, *Barleria lebomboensis* Darbyshire, McCleland & Froneman)

Linda McKenzie (GIS Specialist). Linda is a GIS Specialist/GIS Analyst with over 12 years' experience in the industry. For the last four 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 currently serves as treasurer for GISSA Mpumalanga and is a registered Professional GISc Practitioner (PGP0170).

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

2. TERMS OF REFERENCE

A. Conduct an assessment of the faunal assemblages within the study area, which will include the following:

- Description of faunal habitats;
- Habitat Map;
- Detailed description of bird assemblages;
- Overview of potentially occurring fauna species of conservation concern (mammals, birds, reptiles and frogs).

B. Assessment of the Biodiversity Value of the faunal assemblages represented, which will comprise:

- Assessment of conservation importance and functional importance of each assemblage;
- Biodiversity Value Map – including no-go and buffer areas.

Emphasis will be placed on locating species of conservation importance (Red Data, endemic, and / or protected).

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

3. STUDY AREA

The proposed development is situated on the eastern boundary of Daantjie township and 2 km west of Lupisi township, Ehlanzeni District, Mpumalanga (Figure 1). The study area covers 960 ha, of which about 650 ha are untransformed. The western boundary fence of the Kruger National Park is 4.5 km east of the study area and the north-western boundary of Mthethomusha Game Reserve is situated 2.5 km south-east of the study area. A near-perennial stream forms the southern and eastern boundary of the study area, which is situated in the quarter-degree grid 2531 AC at an altitude of between 660 and 700 mamsl.

Project details were not provided so no project description can be given.

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

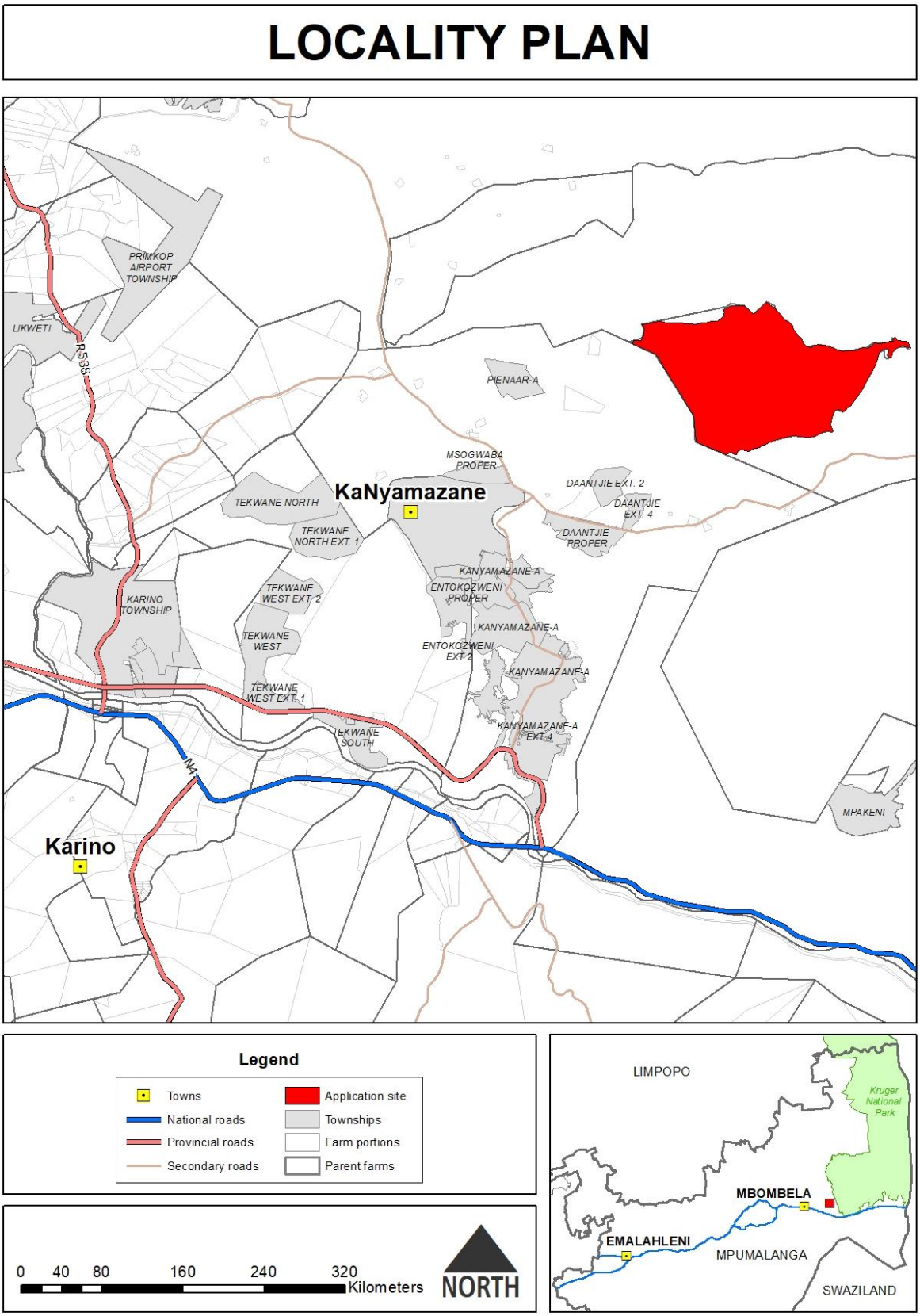


Figure 1. Location of Study Area

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

4. METHODS

4.1 Baseline Assessment

Desktop

Lists of conservation-important mammals, birds, reptiles and frogs potentially occurring within the general vicinity of the study area were prepared using data from the MTPA's threatened species database, Swanepoel *et al*. (2016), the Southern African Bird Atlas Project 2 http://sabap2.adu.org.za/, 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.

Fieldwork

The MacKinnon list method as recommended by O'Dea *et al.* (2004) was used. This is a rapid assessment technique in which all species seen or heard are grouped into consecutive lists of equal length and a species accumulation curve is generated by plotting cumulative species totals against number of lists. Ten-species lists were used, which Herzog *et al*. (2002) considered to be the best compromise between stable richness estimation curves and robust sample size. Birds were searched for by walking slowly through vegetation and recording all species seen or heard. Care was taken to remain at any point of bird activity and record all the species present, particularly mixed species flocks. Birds were identified audially and visually using Bushnell 10x42 binoculars. Mammals, reptiles and frogs were recorded incidentally as they were encountered during the survey through direct evidence (sightings) and indirect evidence (spoor, dung).

4.2 Biodiversity Value Assessment

The biodiversity value of each faunal assemblage was based on a combination of Conservation Importance and Functional Importance, each of which were rated on a five-point scale, from Very Low to Very High, as indicated in Table 1. This method was based on Biodiversity Action Plan guidelines developed by Anglo American (Coombes, 2004).

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Conservation Importance

The method of calculating conservation importance was based on six key parameters, which were each allocated a score that ranged between zero (Not Important) and twenty (Very Important) (Table 2). The overall conservation importance was based on the median value of the six parameters, namely:

1. *Protection Status*. The extent to which the faunal habitat is currently formally protected (e.g. World Heritage Site; RAMSAR, National Park; Provincial Game Reserve; Private Conservancy etc.);

2. *Size*. The extent to which the larger vegetation type of which the defined faunal habitat is a representative sample, still exists; this incorporates the conservation status of threatened vegetation types in that vegetation types with the highest threat status are assumed to have the lowest extent of habitat remaining;

3. *Species Diversity*. The extent to which the faunal habitat supports a high diversity of species;

4. *Species of Conservation Concern*. The extent to which the faunal habitat supports threatened species and other species of conservation concern;

5. *Unique Habitat or Taxa*. Presence of unique faunal assemblages or range-restricted fauna;

6. *Present Ecological State*. The extent to which the faunal habitat is modified from natural conditions.

Functional Importance

The method of calculating functional importance was based on four ecosystem service categories, which were each allocated a score that ranged between zero (Not Important) and twenty (Very Important) (Table 3). The overall functional importance was based on the median value of the four ecosystem service categories, namely:

1. *Provisioning Services*. The extent and frequency that the faunal habitat provides consumable goods (e.g. freshwater, timber, fibre, bushmeat, etc.);

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

2. *Regulating Services*. The extent to which the faunal habitat provides regulating services (e.g. flood attenuation, water purification, storage, climate regulation, carbon sequestration, etc.);

3. *Cultural Services*. The extent to which the faunal habitat provides cultural services (e.g. tourism attraction, spiritual attraction, aesthetic value, etc.), and;

4. *Supporting Services*. The extent to which the faunal habitat provides supporting ecological services, either positive (e.g. migration corridor, refuge area, primary production, pollination, pest control, nutrient cycling, soil formation), or negative (e.g. disease sources, pest outbreaks).

By integrating assessments of the conservation importance and functional importance of the different faunal habitats, an assessment of Biodiversity Value of each was made. This is indicated spatially in Figure 5.

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Table 1. Method of calculating Biodiversity Value of faunal habitats

Conservation Importance	Functional Importance				
	Very High	High	Moderate	Low	Very Low
Very High	Very High	Very High	High	High	Moderate
High	Very High	High	High	Moderate	Moderate
Moderate	High	High	Moderate	Moderate	Low
Low	High	Moderate	Moderate	Low	Low
Very Low	Moderate	Moderate	Low	Low	Very Low

Table 2. Method of calculating Conservation Importance of faunal habitats

Parameter	Very High	High	Moderate	Low	Very Low
Protection Status	International	National	Regional	Local	None
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length	Very small	Small	Moderate	Large	Very Large
	(<500km^2)	(500 to 1,000km^2)	(1,000 to 20,000km^2)	(20,000 to 50,000km^2)	(> 50,000km^2)
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity	Noticeably High		Moderate		Noticeably Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species of Conservation Concern	Noticeably High		Moderate		Noticeably Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa	Noticeably High		Moderate		Noticeably Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State	Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Table 3. Method of calculating Functional Importance of faunal habitats

Parameter	Very High	High	Moderate	Low	Very Low
Provisioning Services	Constant	Regular	Frequent	Occassional	Intermittent
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services	Very High	High	Moderate	Low	Very Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services	Very High	High	Moderate	Low	Very Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services	Very High	High	Moderate	Low	Very Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

4.3 Assumptions, Limitations and Knowledge Gaps

4.3.1 Seasonality

The assessment was based on a single field survey conducted during the dry season. As a result, no non-breeding Palearctic or intra-African migrants were present, resulting in a lower species richness tally than would be recorded from November – April when these migrants are present. However, Ecorex has conducted numerous faunal surveys in the Mbombela area over the past 10 years in similar habitats to those represented in the study area, and were able to assess the habitat suitability for any potentially migratory species, particularly species of conservation concern. This limitation should therefore not affect the Record of Decision.

4.3.2 Overlooked Species

Most bird assemblages comprise a core group of resident species, and a fluctuating mix of regular visitors and irregular vagrants. The turnover of these visiting and vagrant species can be fairly high in some assemblages, resulting in many of these species being absent during a single survey. 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. Certain faunal groups, particularly bats, rodents and fossorial reptiles are unlikely to be detected during a brief survey during which no trapping takes place. Such intensive sampling was outside of the scope of this study and these faunal groups should be considered undersampled. However, assessment of habitat suitability for these species should be sufficient to satisfy the terms of reference for this study.

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

5. BASELINE DESCRIPTION OF FAUNAL ASSEMBLAGES

5.1 Faunal Habitats

Faunal habitats were identified on the basis of distinctive vegetation structure (grassland, woodland, thicket, etc.) and the presence of diagnostic bird species. Five faunal habitats are present in the study area as follows:

5.1.1 Thicket

Thicket habitat is characterised by a dense, closed canopy, lack of discernible sub-canopy strata, and a sparse understory (Figure 2), and is mostly associated with edges of rocky outcrops and drainage lines within the study area (Figure 3). The habitat supports a relatively diverse faunal assemblage and 39 species were recorded in thickets during fieldwork (Appendix 1).

5.1.2 Rocky Outcrops

This habitat comprises bare sheetrock and boulders on exposed granite outcrops scattered throughout the study area (Figure 3). Vegetation is sparse (see photos in Figure 2), resulting in limited habitat for birds and mammals, but significant habitat for reptiles such as Rainbow Skink, Common Giant Plated Lizard and Wilhelm's Flat Lizard. Only 22 fauna species were recorded in this habitat during fieldwork (Appendix 1).

5.1.3 Closed Woodland

Closed Woodland is the most widespread habitat in the study area (Figure 3). Trees and woody shrubs are dominant in the canopy and mid-stratum and the understory is characterised by shade-loving grasses and soft herbaceous shrublets (Figure 2). This habitat supports the most diverse faunal assemblage in the study area, with 52 species being recorded during fieldwork (Appendix 1).

5.1.4 Old Lands / Open Woodland

This represents modified habitat that has resulted from the clearing of woodland for cultivated lands. Vegetation structure varies from grassland to open woodland, depending on the state of habitat regeneration (Figure 2). The habitat supports the second-most diverse

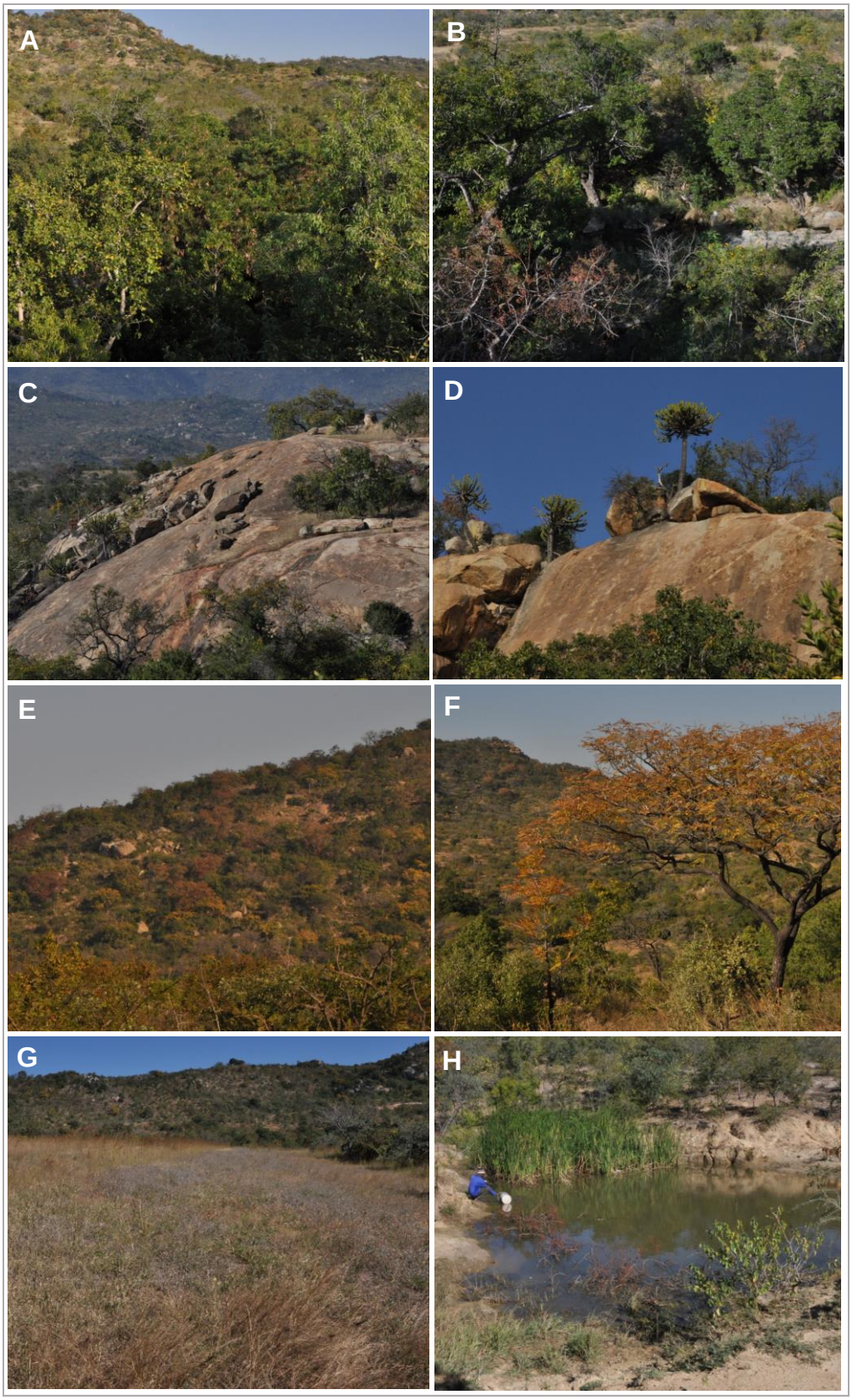
ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

faunal assemblage, with 39 species recorded during fieldwork, although many of these are habitat generalists (Appendix 1).

5.1.5 Wetlands

Wetland habitat is confined to two small dams in the study area, both of which represent modified habitat (Figure 3). Vegetation structure is low to tall hydrophytic grassland around the dam edges (Figure 2). The small size of these dams has resulted in limited open-water habitat and a species-poor faunal assemblage in which only 11 species were recorded during fieldwork (Appendix 1).

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za



A,B = Thicket; C,D = Rocky Outcrops; E,F = Closed Woodland; G = Old Lands / Open Woodland; H = Wetland

Figure 2. Photographs of Faunal Habitat within the Study Area

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

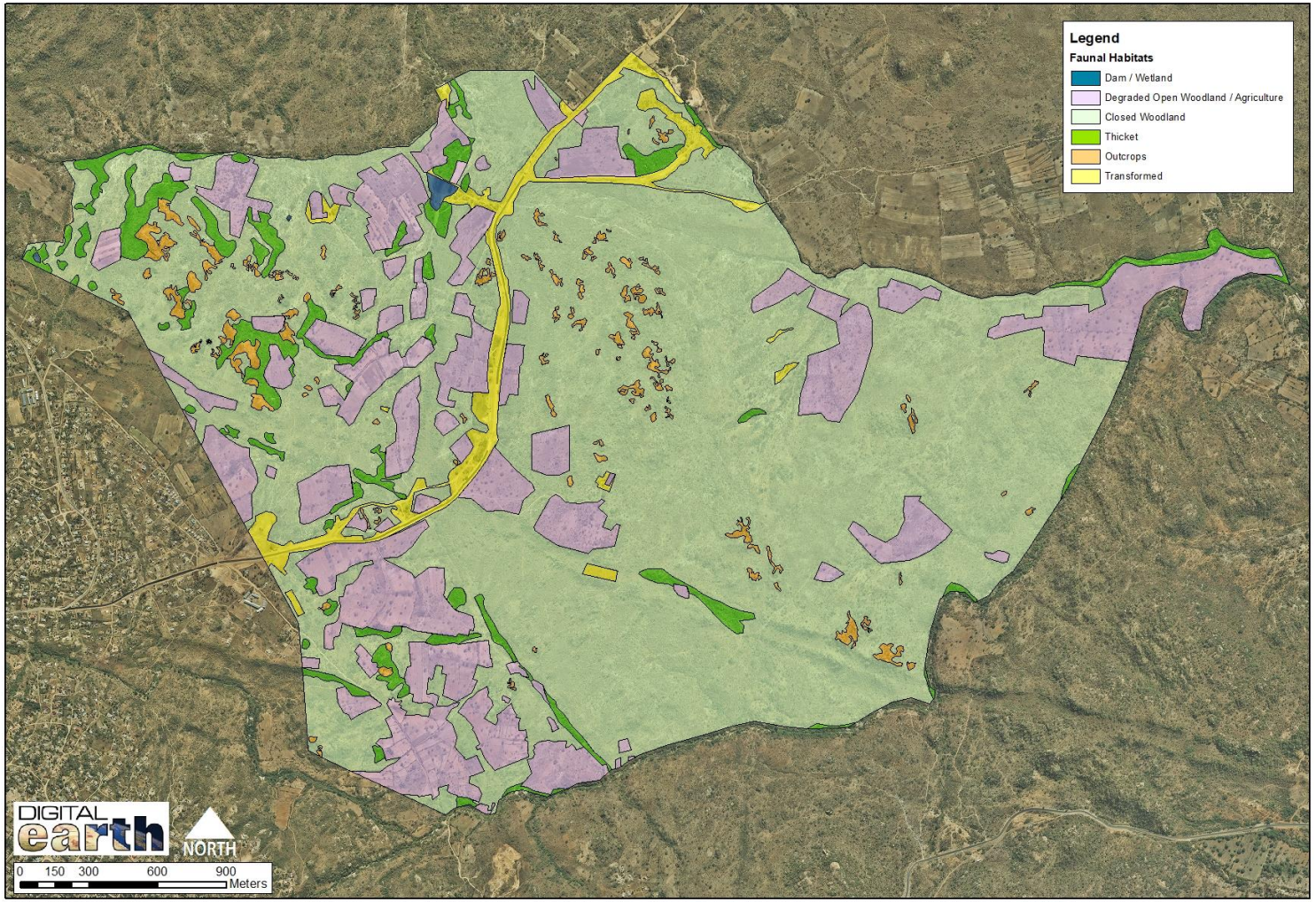


Figure 3. Faunal Habitats identified within the study area.

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

5.2 Faunal Assemblages

5.2.1 Mammals

The Nkosi City study area is situated in the savanna biome in the foothills between the Lowveld and the Escarpment. While the adjacent land comprises two large townships and much modified habitat, two significant protected areas are within a 5 km buffer of the study area, namely Kruger National Park (4.5 km to the east) and Mthethomusha Game Reserve (2.5 km south-east). However, the high human density outside of these two protected areas makes it unlikely that large mammals will leave these areas. Human movement through the area is quite frequent and a number of footpaths were located leading towards human dwellings. No snares were located but small-scale hunting possibly takes place. Although only 20 species have been recorded for the grid 2531 AC in the Animal Demography Unit's Virtual Museum's database[1], this is more a reflection of poor observer coverage than true diversity present. Mthethomusha Game Reserve, which lies within 2531 AC, has more than 20 mammal species, including threatened species such as Lion (*Panthera leo*), Elephant (*Loxodonta africana*) and White Rhinoceros (*Ceratotherium simum*)[2]. None of these larger mammals are likely to survive outside these protected areas and are not expected within the study area.

An estimated 18 mammal species of conservation concern occur within the general vicinity of the study area, although mostly in adjacent protected areas (Appendix 3). Seven of these have a low likelihood of occurring in the study area because of human disturbance and / or lack of suitable habitat, and will not be dealt with any further here. Only one of the potentially occurring species is classified as threatened, namely Leopard (*Panthera pardus*), which has a status of Vulnerable. This species is one of the few large carnivores known to occur in close proximity to people and is potentially an infrequent visitor to the study area, although is unlikely to be resident. Two of the potentially occurring species have been classified as Data Deficient, meaning that too few data were available in order to make an assessment of conservation status, one of which is a bat (Gambian Epauletted Fruit Bat *Epomophorus crypturus*) and one is a small carnivore (African Weasel *Poecilogale albinucha*). Eight Near Threatened species potentially occur in the study area, of which four are bats, three are carnivores and one is a small antelope (Appendix 3). The most likely of these species to occur in the study area is Natal Red Duiker (Cephalophus natalensis), which is is listed as Near Threatened due to ongoing habitat loss due to agriculture and bush-clearing as well as

[1] http://vmus.adu.org.za/vm_sp_list.php accessed 05/06/2017
[2] http://www.mtpa.co.za/index.php?parks+2002

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

losses through bushmeat hunting[1]. It is still fairly common in the Mbombela area (*pers. obs*.) and has a Moderate chance of still occurring within the thickets in the study area.

One of the potentially occurring species with a moderate likelihood of being present is protected under the National Environmental Management: Biodiversity Act, Threatened or Protected Species (No. 10 of 2004), while three are protected under the Mpumalanga Nature Conservation Act (No. 10 of 1998).

Nine mammal species were confirmed to occur during fieldwork (Appendix 1), with Closed Woodland supporting the highest species richness (6 species), followed by Rocky Outcrops (4 species) and Thicket (3 species).

[1] Swanepoel *et al*. (2016)

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

5.2.2 Birds

Regional Context

The quarter degree square (QDS) 2531 AC, within which the study area is situated, supports a diverse avifauna with a total of 343 species recorded during the second Southern African Bird Atlas Project (SABAP2)[1], which is currently in progress. At a finer scale, data from SABAP2 indicate that 193 bird species from 16 full protocol lists have already been recorded from the pentads (mapping units) in which the study area is situated (2525_3110 and 2520_3110)[2]. A pentad covers an area of approximately 77 km^2, which is considerably smaller than a quarter-degree grid (approximately 694 km^2) and thus a better indication of which species occur in the study area. These two pentads have received relatively low observer coverage and should be considered undersampled. As a comparison, an adjacent pentad (2525_3105) has been surveyed 44 times and has a confirmed list of 246 species.

The study area does not fall within or close to any Important Bird Areas (IBA's)[3].

Species Richness and Bird Assemblages

One hundred and three (103) bird species were recorded in the study area during two days fieldwork (Appendix 1). Thirty-nine 10-species lists were generated and are displayed in Appendix 2. While the true species richness of the site over the duration of a season is likely to be significantly higher, which the species accumulation curve from the 10-species list data indicates (Figure 3), sufficient sampling was undertaken for assessing habitat suitability for potentially occurring threatened species and to describe broad bird assemblages. Bird assemblages are distinct species groups associated with particular habitat types. Further fieldwork is likely to increase the species richness of each assemblage but is unlikely to identify additional assemblages. The most frequently recorded species during fieldwork, most of which are widespread habitat generalists, are indicated in

[1] http://sabap2.adu.org.za/pentad_info.php?group=&qdgc=&iba=&area=&pentad=2525_3105&section=observers#pent_info_tabs accessed 21/06/2017
[2] Data accessed from http://sabap2.adu.org.za/pentad_info.php?pentad=2525_3110 on 21/06/2017
[3] Taylor *et. al*., 2015

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Table 4.

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Table 4. Most frequently recorded bird species during June 2017 fieldwork

Species	Fieldwork Reporting Rate+
Blue Waxbill	0.44
Dark-capped Bulbul	0.41
Golden-breasted Bunting	0.33
White-browed Scrub Robin	0.31
Black-backed Puffback	0.31
Bronze Mannikin	0.31
Yellow-fronted Canary	0.23
White-bellied Sunbird	0.23
Sombre Greenbul	0.23
Scarlet-chested Sunbird	0.21
White-throated Robin-Chat	0.21
Red-faced Mousebird	0.21
Tawny-flanked Prinia	0.21
Neddicky	0.21

+ Reporting rate refers to the proportion of 10-species lists in which the species was reported

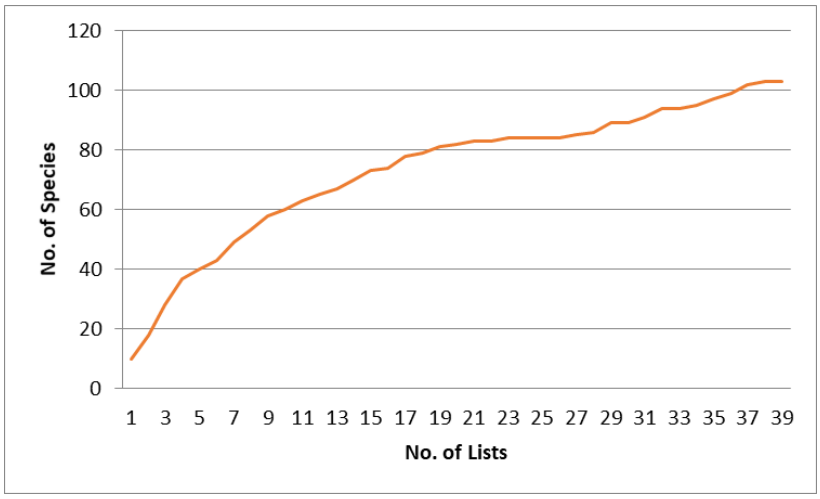


Figure 4. Species accumulation curve from 10-species lists

Five bird assemblages were identified during fieldwork and are briefly described below:

I. Thicket Assemblage

This species assemblage is closely associated with the riparian and outcrop thickets that are scattered throughout the study area. A number of habitat specialists that are confined to dense, closed habitats such as forest or thicket are diagnostic for this assemblage and include Little Sparrowhawk (*Accipiter minullus*), Tambourine Dove (*Turtur tympanistria*), Southern Boubou (*Laniarius ferrugineus*), Green-backed Camaroptera (*Camaroptera brachyura*), Sombre Greenbul (*Andropadus importunus*) and White-throated Robin-Chat

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

(*Cossypha humeralis*). Twenty-nine species were recorded from the Thicket assemblage, representing 28% of the fieldwork species list (Appendix 1). Species fidelity, which is an indication of assemblage uniqueness, is very high, with 20 species only being recorded in this assemblage. However, a number of these are woodland species, such as Crested Francolin (*Dendroperdix sephaena*), Speckled Mousebird (*Colius striatus*) and Green-winged Pytilia (*Pytilia melba*), and will no doubt be recorded in the woodland assemblage over time.

II. Rocky Outcrop Assemblage

This is a small species assemblage that is associated with exposed rocky habitat on granite outcrops in the study area. Few birds are adapted to such habitat, but four of these rocky habitat specialists were confirmed to occur and are diagnostic for this assemblage, namely Mocking Cliff Chat (*Thamnolaea cinnamomeiventris*), Familiar Chat (*Oenanthe familiaris*), Striped Pipit (*Anthus lineiventris*) and Cinnamon-breasted Bunting (*Emberiza tahapisi*). An additional species, Lazy Cisticola (*Cisticola aberrans*) is particular to open woodland on rocky hillslopes and was also found in rocky outcrop habitat during fieldwork. Only 13 species were recorded during fieldwork, representing only 13% of the study area species list (Appendix 1).

III. Closed Woodland Assemblage

This is the largest bird assemblage in the study area and is associated with the widespread closed woodland habitat. The species composition reflects a proportion of common generalist woodland species that also occur in disturbed habitat, such as Laughing Dove (*Streptopelia senegalensis*), Black-crowned Tchagra (*Tchagra senegalus*), Fork-tailed Drongo (*Dicrurus adsimilis*), Dark-capped Bulbul (*Pycnonotus tricolor*) and White-browed Scrub Robin (*Erythropygia leucophrys*), as well woodland habitat specialists that are unlikely to occur in disturbed woodland, such as Grey-headed Bushshrike (*Malaconotus blanchoti*), Brubru (*Nilaus afer*), Grey Penduline Tit (*Anthoscopus caroli*) and Red-headed Weaver (*Anaplectes rubriceps*). Forty-four species (43 % of the species list) were recorded from the Closed Woodland assemblage, the highest of the five assemblages (Appendix 1). Species fidelity, which is an indication of assemblage uniqueness, is high, with 28 species (64%) only recorded from this assemblage.

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

IV. Old Lands / Open Woodland Assemblage

This is the second-largest bird assemblage in the study area and is associated with cultivated lands that have been allowed to lie fallow and develop secondary, open woodland or grassland. The assemblage species list is dominated by generalist woodland species that are able to thrive in degraded habitats, including Lizard Buzzard (*Kaupifalco monogrammicus*), Cape Turtle-Dove (*Streptopelia capicola*), Dark-capped Bulbul (*Pycnonotus tricolor*) and Rattling Cisticola (*Cisticola chiniana*), as well open woodland or grassland species such as Black-shouldered Kite (*Elanus caeruleus*), Pied Crown (*Corvus albus*), Southern Fiscal (*Lanius collaris*), Yellow-throated Longclaw (*Macronyx croceus*) and Rufous-naped Lark (*Mirafra africana*). Thirty-six species (35 % of the species list) were recorded from this species assemblage (Appendix 1), of which 25 species (69%) were not recorded in other assemblages. However, this is an inflated indication of species fidelity since a number of woodland species, such as Crested Barbet (*Trachyphonus vaillantii*), African Hoopoe (*Upupa africana*), Arrow-marked Babbler (*Turdoides jardineii*) and Southern Grey-headed Sparrow (*Passer diffusus*) are very likely to be present in the Closed Woodland assemblage as well and should be located there over time.

V. Wetland Assemblage

This is the smallest bird assemblage in the study area, but does include a number of species that are unlikely to occur elsewhere in the study area, such as African Black Duck (*Anas sparsa*), Little Grebe (*Tachybaptus ruficollis*), Black Crake (*Amaurornis flavirostra*) and Three-banded Plover (*Charadrius tricollaris*). Only 11 species were recorded in the wetland assemblage, representing 11% of the study area species list (Appendix 1). Open-water habitats such as dams have a high species turnover as microhabitat changes occur, such as exposed muddy shorelines as dam water recedes, and it is likely that a number of other waterbird species do irregularly occur in this assemblage.

Species of Conservation Concern

An estimated 24 bird species of conservation concern[1] potentially occur within the general vicinity of the study area, although none of these could be confirmed during fieldwork (Appendix 3). Nineteen species are classified as threatened by Taylor *et al*. (2015), one of which as a moderate likelihood of occurring, namely Lanner Falcon (*Falco biarmicus*), which has a status of Vulnerable. Two Near Threatened species also have a moderate likelihood of occurring, namely Half-collared Kingfisher (*Alcedo semitorquata*) and European Roller

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

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

(*Coracias garrulus*), while the rest of the species in Appendix 3 have a low or very low likelihood of occurring because of a limited amount of suitable habitat or human disturbance as a result of the close proximity of townships. The three species with a moderate likelihood of occurring are dealt with in more detail below.

Lanner Falcon

Lanner Falcon is a widespread bird of prey in the Mpumalanga Lowveld, but usually in low numbers, which is reflected by the very low SABAP2 reporting rates for this species in the pentads surrounding the study area (mostly lower than 4%)[1]. If this species does occur in the study area, it is likely to be an infrequent visitor hunting over habitats within the study area, but it is highly unlikely to be a breeding resident.

Half-collared Kingfisher

This small kingfisher requires fairly undisturbed, tree-lined streams and dams and is listed as Near Threatened due to habitat quality degradation[2]. This species has not yet been recorded in the pentads represented in the study area during SABAP2, but it has been recorded along the nearby Crocodile River during previous ECOREX surveys and may occasionally utilise the riparian habitat along the southern boundary of the study area, possibly also nesting in the steep banks of the drainage line.

European Roller

This non-breeding Palearctic migrant visits the Mpumalanga Lowveld between November and April and is usually associated with open savannah or grassland. It is present in large numbers in the open habitats within Kruger National Park, but in much lower numbers in the more densely wooded habitats of the foothills around Nespruit, where reporting rates are under 7%[3]. The only habitat within the study area in which it is likely to occur is the old lands / open woodland habitat and even then, only as an infrequent visitor.

Eight of the species listed in Appendix 3 are protected under the National Environmental Management: Biodiversity Act (No.10 of 2004).

[1] http://sabap2.adu.org.za/species_info.php?spp=114#menu_left
[2] Taylor *et. al*., 2015
[3] http://sabap2.adu.org.za/species_info.php?spp=412

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

5.2.3 Reptiles & Frogs

The foothills of the Mbombela area support a relatively high diversity of reptile species with 102 species already recorded from the degree grid 2531[1]. Fifty-two species of reptiles have been recorded from the QDS 2531 AC, in which the study area is situated, as listed on the ReptileMap website (http://vmus.adu.org.za/) and in Bates *et al*. (2014). Of the potentially occurring species, four are threatened and one is protected under the NEMBA ToPS (Appendix 3). One of the threatened reptiles has a national threat status, namely Nile Crocodile (*Crocodylus niloticus*), which is classified as Vulnerable and is also protected under NEMBA ToPS. This species has a low likelihood of occurring within the small dam in the study area due to human disturbance and distance from the Crocodile River. Three reptiles have locally endemic subspecies that have been provincially assessed as either Endangered (Haacke's Flat Gecko *Afroedura multiporis haackei*), or Vulnerable (Barberton Girdled Lizard *Smaug warreni barbertonensis*; Wilhelm's Flat Lizard *Platysaurus intermedius wilhelmi*). Wilhelm's Flat Lizard was confirmed to occur during fieldwork on granite outcrops and is likely to be a fairly common resident in this restricted habitat. Both Haacke's Flat Gecko and Barberton Girdled Lizard potentially occur in the same habitat.

Southern African Python (*Python natalensis*) is protected under the National Environmental Management: Biodiversity Act (No.10 of 2004) ToPS and was reported to be present in the study area by a local community member. It is probably only present in low numbers due to the close proximity of high human density and the presence of dogs roaming the study area.

A dedicated reptile survey, including trapping, would no doubt have produced more species but is unlikely to have produced data that would change the recommendations in this report.

Twenty-one species of frogs have been recorded in 2531 AC, as listed on the FrogMap website (http://vmus.adu.org.za/) as well as in the frog atlas project (Minter *et al.*, 2004), none of which have Red Data or protected status. No frogs were recorded during the assessment although limited time was spent sampling the small dam. Dedicated trapping and nocturnal surveys would result in confirmation of at least a few species.

[1] http://vmus.adu.org.za/vm_sp_list.php accessed 21/06/2017

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

6. BIODIVERSITY VALUE ASSESSMENT

A qualitative integration of conservation importance and functional importance values for the faunal habitats represented in the study area provides an indication of the biodiversity values of these habitats and their assemblages. The data sheets for conservation importance and functional importance calculations for each habitat are presented in Appendix 4. The integrated biodiversity values are summarised in Table 5 and presented spatially in Figure 5.

The Rocky Outcrop habitat has the highest biodiversity value as a result of high scores in metrics such as Species of Conservation Concern (e.g. Wilhelm's Flat Lizard, Vulnerable endemic), Unique Habitat or Taxa and Present Ecological State. The rocky outcrops are embedded in the Closed Woodland habitat and many of the rocky outcrop fauna depend on the woodland fringe around the outcrops for shelter and food. Portions of Closed Woodland connecting rocky outcrops fragments are thus equally important in terms of biodiversity value and form important corridors allowing movement of fauna between outcrops.

The Closed Woodland and Thicket faunal habitats have Moderate Biodiversity Value because of high to moderately high scores in the metrics Species Diversity, Species of Conservation Concern, Unique Habitat or Taxa and Present Ecological State, as well as a high score in Provisioning Services. The Old Lands / Open Woodland and Wetland habitats represent modified habitat with low likelihood of supporting species of conservation concern and lower capacity to support ecosystem services, and are therefore classified as Low Biodiversity Value.

Table 5. Conservation Importance, Functional Importance and Biodiversity Values for faunal habitats in the Study Area

Faunal Habitat	Conservation Importance	Functional Importance	Biodiversity Value
Thickets	Moderate	Moderate	Moderate
Rocky Outcrops	High	Moderate	High
Closed Woodland	Moderate	Moderate	Moderate
Old Lands / Open Woodland	Low	Low	Low
Modified Wetland / Dam	Low	Low	Low

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

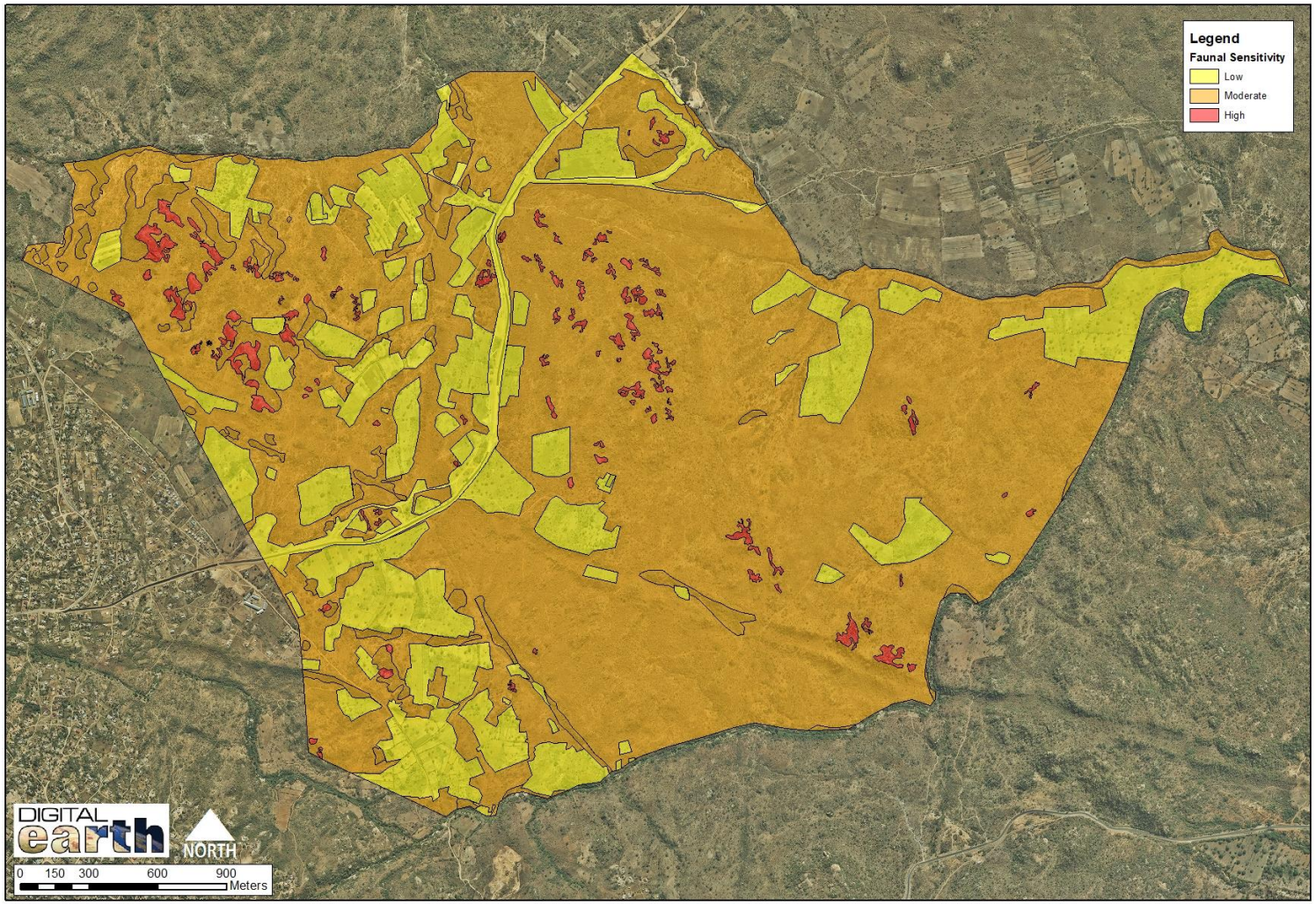


Figure 5. Biodiversity Values of Faunal Habitats in the Study Area

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

7. CONCLUSIONS

The study area for the proposed Nkosi City development covers five faunal habitats of which one has High Biodiversity Value (Rocky Outcrops) and two have Moderate BV (Thickets, Closed Woodland). No mammal or bird species of conservation concern were located during fieldwork, but 11 mammal and three bird species of conservation concern have a moderate likelihood of occurring.

Some preliminary recommendations and mitigation measures regarding the proposed development are listed below.

- The location of infrastructure should be within habitats with Low Biodiversity Value wherever possible, specifically within the Old Lands / Open Woodland habitat; where this is not feasible, then areas of closed woodland - rocky outcrop mosaic should be excluded from any development and the less diverse woodland between old lands be developed.
- A detailed botanical survey of the study area is recommended prior to any record of decision being made; this should ideally take place within the growing season when most plant species are identifiable; the botanical study also needs to identify the invasive alien plants present in the study area and make recommendations regarding the management of these species.
- High concentrations of Rocky Outcrops (High Biodiversity Value) within the study area should be protected as private open space within the development and a buffer of at least 100 metres be placed around these zones in which no habitat destruction takes place.

Provided the recommendations suggested in this report is followed, and the recommendations in the botanical specialist report are followed, we can find no fatal flaws from a terrestrial ecology perspective regarding the Nkosi City project.

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

8. REFERENCES

Animal Demography Unit. n.d. The Southern African Bird Atlas Project http://sabap2.adu.org.za/index.php accessed on 05/06/2017.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J. & de Villiers, M.S. (eds). 2014. *Atlas and Red Data List of the Reptiles of South Africa, Lesotho and Swaziland.* Suricata 1. South African National Biodiversity Institute, Pretoria.

Coombes, P. 2004. Anglo American Best Practice Environmental Guideline Series 01: Guideline for preparing Biodiversity Action Plans (BAP) Draft Document 03. Anglo American. Johannesburg.

DEA. 2014. National Environmental Management: Biodiversity Act 2004 (Act 10 of 2004) Alien and Invasive Species Lists. Government Gazette.

DEAT. 2011. *National List of Threatened Terrestrial Ecosystems in South Africa.* National Environmental Management: Biodiversity Act (Act 10 of 2004). Government Gazette.

Edwards, D. 1983. A broad-scale structural classification of vegetation for practical purposes. *Bothalia* 14:705-712.

Lötter, M.C., Cadman, M.J. and Lechmere-Oertel, R.G. 2014. *Mpumalanga Biodiversity Sector Plan*. Mpumalanga Tourism & Parks Agency, Nelspruit.

Minter, L.R., Burger, M., Harrison, J.A., Braack, H.H., Bishop, P.J. & Kloepfer, D.2004. *Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland*. SI/MAB Series No.9. Smithsonian Institution, Washington, DC.

Mucina, L. and Rutherford, M.C. (eds) 2006. *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Raimondo, D., Von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C., Kamundi, D.A. & Manyama, P.A. (eds) 2009. *Red List of South African Plants 2009*. Strelitzia 25. South African National Biodiversity Institute, Pretoria.

Swanepoel, L.H., Balme, G., Williams, S., Power, R.J., Snyman, A., Gaigher, I., Senekal, C., Martins, Q., Child, M.F. 2016. A conservation assessment of *Panthera pardus*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Taylor, M.R., Peacock, F., Wanless, R.W. (eds). 2015. *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland.* Birdlife South Africa, Johannesburg.

Van Wyk, A. E. & Smith, G. F. 2001. *Regions of floristic endemism in southern Africa: A review with emphasis on succulents*. Umdaus Press, Pretoria.

Williams, V.L., Raimondo, D., Crouch, N.R., Cunningham, A.B., Scott-Shaw, C.R., Lötter, M. & Ngwenya, A.M. 2008a. *Elaeodendron transvaalense* (Burtt Davy) R.H.Archer.

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

National Assessment: Red List of South African Plants version 2015.1. Accessed on 2017/06/05.

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

9. APPENDICES

Appendix 1. Checklist of Fauna recorded during fieldwork

Species	Family	Endemic	Protected	Red Data	Assemblages				
					Thicket	Outcrops	Closed Woodland	Old Lands / Open Woodland	Wetland
Mammals									
ORDER: PRIMATES									
Family Cercopithecidae (Old World monkeys)									
# Vervet Monkey	*Chlorocebus pygerythrus*				x		x		
# Chacma Baboon	*Papio ursinus*						x		
ORDER: LAGOMORPHA									
Family Leporidae (rabbits and hares)									
Scrub Hare	*Lepus saxatilis*	E (RSA)				x		x	
ORDER: RODENTIA									
Family Sciuridae (squirrels)									
Tree Squirrel	*Paraxerus cepapi*						x		
Family Hystricidae (Old World porcupines)									
Cape Porcupine	*Hystrix africaeaustralis*				x	x	x		
Family Bathyergidae (mole-rats)									
Common Mole-rat	*Cryptomys hottentotus*	E (RSA)						x	
ORDER: CARNIVORA									
Family Herpestidae (mongooses)									
Slender Mongoose	*Herpestes sanguineus*					x	x		
Family Viverridae (genets & civets)									

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

African Civet	*Civettictis civetta*					x			
ORDER: CETARTIODACTYLA									
Family Bovidae (cattle & antilopes)									
Grey Duiker	*Sylvicapra grimmea*						x		
Subtotal	9	3	0	1	3	4	6	2	0
Birds									
ORDER: ANSERIFORMES									
Family Anatidae (ducks, geese and swans)									
African Black Duck	*Anas sparsa*								x
ORDER: GALLIFORMES									
Family Phasianidae (pheasants, fowl and allies)									
Crested Francolin	*Dendroperdix sephaena*				x				
Natal Spurfowl	*Pternistis natalensis*				x				
ORDER: PODICIPEDIFORMES									
Family Podicipedidae (grebes)									
Little Grebe	*Tachybaptus ruficollis*								x
ORDER: ACCIPITRIFORMES									
Family Accipitridae (kites, hawks & eagles)									
Black-shouldered Kite	*Elanus caeruleus*							x	
Lizard Buzzard	*Kaupifalco monogrammicus*							x	
Little Sparrowhawk	*Accipiter minullus*				x				
ORDER: GRUIFORMES									
Family Rallidae (rails, crakes and coots)									
Black Crake	*Amaurornis flavirostra*								x
ORDER: CHARADRIIFORMES									
Family Charadriidae (plovers)									
Three-banded Plover	*Charadrius tricollaris*								x
ORDER: COLUMBIFORMES									
Family Columbidae (pigeons, doves)									
Rock Dove	*Columba livia*							x	
Cape Turtle-Dove	*Streptopelia capicola*							x	

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Red-eyed Dove	*Streptopelia semitorquata*				x		x		
Laughing Dove	*Streptopelia senegalensis*					x	x	x	
Emerald-spotted Wood Dove	*Turtur chalcospilos*						x		
Tambourine Dove	*Turtur tympanistria*				x				
African Green Pigeon	*Treron calvus*				x				
ORDER: MUSOPHAGIFORMES									
Family Musophagidae (turacos)									
Purple-crested Turaco	*Gallirex porphyreolophus*				x				
ORDER: CUCULIFORMES									
Family Cuculidae (cuckoos)									
Burchell's Coucal	*Centropus burchelli*								x
ORDER: CAPRIMULGIFORMES									
Family Caprimulgidae (nightjars)									
Fiery-necked Nightjar	*Caprimulgus pectoralis*						x		
ORDER: APODIFORMES									
Family Apodidae (swifts)									
African Palm Swift	*Cypsiurus parvus*							x	
Little Swift	*Apus affinis*							x	
ORDER: COLIIFORMES									
Family Coliidae (mousebirds)									
Speckled Mousebird	*Colius striatus*				x				
Red-faced Mousebird	*Urocolius indicus*						x		
ORDER: CORACIIFORMES									
Family Alcedinidae (kingfishers)									
Brown-hooded Kingfisher	*Halcyon albiventris*						x		
Striped Kingfisher	*Halcyon chelicuti*						x		
Family Meropidae (bee-eaters)									
Little Bee-eater	*Merops pusillus*							x	
ORDER: BUCEROTIFORMES									
Family Upupidae (hoopoes)									
African Hoopoe	*Upupa africana*							x	

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Family Bucerotidae (hornbills)									
Southern Yellow-billed Hornbill	*Tockus leucomelas*						x		
ORDER: PICIFORMES									
Family Lybiidae (African barbets)									
Yellow-fronted Tinkerbird	*Pogoniulus chrysoconus*						x		
Acacia Pied Barbet	*Tricholaema leucomelas*						x		
Black-collared Barbet	*Lybius torquatus*				x		x		
Crested Barbet	*Trachyphonus vaillantii*							x	
Family Indicatoridae (honeyguides)									
Lesser Honeyguide	*Indicator minor*				x				
Family Picidae (woodpeckers)									
Golden-tailed Woodpecker	*Campethera abingoni*				x				
ORDER: PASSERIFORMES									
Family Platysteiridae (wattle-eyes and batises)									
Chinspot Batis	*Batis molitor*						x		
Family Malaconotidae (bushshrikes)									
Grey-headed Bushshrike	*Malaconotus blanchoti*						x		
Orange-breasted Bushshrike	*Chlorophoneus sulfureopectus*						x		
Brown-crowned Tchagra	*Tchagra australis*						x		
Black-crowned Tchagra	*Tchagra senegalus*						x		
Black-backed Puffback	*Dryoscopus cubla*				x		x		
Southern Boubou	*Laniarius ferrugineus*				x				
Brubru	*Nilaus afer*						x		
Family Laniidae (shrikes)									
Southern Fiscal	*Lanius collaris*							x	
Family Oriolidae (figbirds and orioles)									
Black-headed Oriole	*Oriolus larvatus*						x		
Family Dicruridae (drongos)									
Fork-tailed Drongo	*Dicrurus adsimilis*					x	x	x	
Family Corvidae (crows and jays)									
Pied Crow	*Corvus albus*							x	

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Family Paridae (tits and chickadees)										
Southern Black Tit	*Melaniparus niger*						x			
Family Remizidae (penduline tits)										
Grey Penduline Tit	*Anthoscopus caroli*						x			
Family Alaudidae (larks)										
Rufous-naped Lark	*Mirafra africana*							x		
Flappet Lark	*Mirafra rufocinnamomea*							x		
Family Pycnonotidae (bulbuls)										
Dark-capped Bulbul	*Pycnonotus tricolor*				x	x	x	x		
Sombre Greenbul	*Andropadus importunus*				x					
Family Hirundinidae (swallows & martins)										
Wire-tailed Swallow	*Hirundo smithii*								x	
Family Macrosphenidae (crombecs & African warblers)										
Long-billed Crombec	*Sylvietta rufescens*						x			
Family Cisticolidae (cisticolas & allies)										
Red-faced Cisticola	*Cisticola erythrops*								x	
Lazy Cisticola	*Cisticola aberrans*					x				
Rattling Cisticola	*Cisticola chiniana*							x		
Neddicky	*Cisticola fulvicapilla*						x	x		
Yellow-breasted Apalis	*Apalis flavida*				x		x			
Green-backed Camaroptera	*Camaroptera brachyura*				x					
Tawny-flanked Prinia	*Prinia subflava*					x	x	x	x	
Family Leiothrichidae (laughingthrushes)										
Arrow-marked Babbler	*Turdoides jardineii*							x		
Family Zosteropidae (white-eyes)										
Cape White-eye	*Zosterops virens*				x					
Family Sturnidae (starlings)										
Common Myna	*Acridotheres tristis*							x		
Cape Glossy Starling	*Lamprotornis nitens*							x		
Family Buphagidae (oxpeckers)										
Red-billed Oxpecker	*Buphagus erythrorhynchus*						x			

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Family Turdidae (thrushes)										
Kurrichane Thrush	*Turdus libonyanus*				x		x			
Family Muscicapidae (chats & Old World flycatchers)										
White-browed Scrub Robin	*Erythropygia leucophrys*						x			
Southern Black Flycatcher	*Melaenornis pammelaina*						x			
Pale Flycatcher	*Bradornis pallidus*						x			
White-throated Robin-Chat	*Cossypha humeralis*				x					
Mocking Cliff Chat	*Thamnolaea cinnamomeiventris*					x				
Familiar Chat	*Oenanthe familiaris*					x				
Family Nectariniidae (sunbirds)										
Collared Sunbird	*Hedydipna collaris*				x					
Amethyst Sunbird	*Chalcomitra amethystina*						x			
Scarlet-chested Sunbird	*Chalcomitra senegalensis*						x	x		
Marico Sunbird	*Cinnyris mariquensis*				x					
White-bellied Sunbird	*Cinnyris talatala*				x	x	x	x		
Family Passeridae (Old World sparrows)										
House Sparrow	*Passer domesticus*							x		
Southern Grey-headed Sparrow	*Passer diffusus*							x		
Family Ploceidae (weavers & widowbirds)										
Spectacled Weaver	*Ploceus ocularis*				x					
Southern Masked Weaver	*Ploceus velatus*							x		
Village Weaver	*Ploceus cucullatus*							x		
Red-headed Weaver	*Anaplectes rubriceps*						x			
Southern Red Bishop	*Euplectes orix*								x	
Red-collared Widowbird	*Euplectes ardens*							x		
Family Estrildidae (waxbills, mannikins)										
Green-winged Pytilia	*Pytilia melba*				x					
Red-billed Firefinch	*Lagonosticta senegala*				x					
African Firefinch	*Lagonosticta rubricata*				x					
Jameson's Firefinch	*Lagonosticta rhodopareia*						x			
Blue Waxbill	*Uraeginthus angolensis*				x	x	x	x		

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Common Waxbill	*Estrilda astrild*						x	x	x
Bronze Mannikin	*Spermestes cucullatus*						x	x	x
Family Motacillidae (wagtails & pipits)									
Yellow-throated Longclaw	*Macronyx croceus*							x	
African Pipit	*Anthus cinnamomeus*							x	
Striped Pipit	*Anthus lineiventris*					x			
Bushveld Pipit	*Anthus caffer*						x		
Family Fringillidae (finches, canaries & allies)									
Yellow-fronted Canary	*Crithagra mozambica*				x	x	x	x	x
Brimstone Canary	*Crithagra sulphurata*						x		
Streaky-headed Seedeater	*Crithagra gularis*					x	x		
Cape Canary	*Serinus canicollis*							x	
Family Emberizidae (buntings and New World sparrows)									
Cinnamon-breasted Bunting	*Emberiza tahapisi*					x			
Golden-breasted Bunting	*Emberiza flaviventris*						x		
Subtotal	103	0	0	0	29	13	44	36	11
Reptiles									
ORDER: SQUAMATA									
Family Lacertidae (true lizards)									
Common Rough-scaled Lizard	*Meroles squamulosus*						x		
Family Cordylidae (girdled lizards)									
Wilhelm's Flat Lizard	*Platysaurus intermedius wilhelmi*	E (MPU)		VU*		x			
Family Gerrhosauridae (plated lizards)									
Common Giant Plated Lizard	*Matobosaurus validus*					x			
Family Scincidae (skinks)									
Striped Skink	*Trachylepis striata*					x			
Rainbow Skink	*Trachylepis margaritifer*					x			
Variable Skink	*Trachylepis varia*				x	x	x	x	
Family Pythonidae (pythons)									

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

# Southern African Python	*Python natalensis*			NEMBA (PR)	x				
Family Elapidae (cobras, mambas & allies)									
# Black Mamba	*Dendroaspis polylepis*				x				
Mozambique Spitting Cobra	*Naja mossambica*						x		
Subtotal	8	1	0	2	3	5	2	1	0
TOTAL	**120**	**4**	**0**	**3**	**35**	**22**	**52**	**39**	**11**

Confirmed by resident cattle herder
* Provincial assessment
VU = Vulnerable
E = Endemic

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Appendix 2. MacKinnon List Summary Data

Species	10-species Lists																																																TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39									
Rattling Cisticola	1	1																																															2
Dark-capped Bulbul	1	1		1			1	1		1		1					1			1			1	1		1			1			1			1				1									16
Blue Waxbill	1				1		1			1		1	1		1	1		1		1	1			1		1				1			1				1		1								17
African Green Pigeon	1																																															1
Cape Glossy Starling	1				1							1				1												1											1								6
Black-crowned Tchagra	1								1		1										1		1		1			1																			7
Yellow-fronted Canary	1					1						1	1								1			1						1			1							1							9
Black-headed Oriole	1							1								1									1								1								1						6
Red-eyed Dove	1								1			1							1							1					1							1									7
White-bellied Sunbird	1				1					1				1							1					1				1		1						1									9
White-browed Scrub Robin		1			1		1					1			1					1		1			1					1			1					1		1							12
Grey-headed Bushshrike		1			1													1																														3
Black-backed Puffback		1				1		1		1		1	1		1			1		1					1		1								1													12
Southern Fiscal		1																	1									1																				3
Black-shouldered Kite		1																																														1
Scarlet-chested Sunbird		1			1	1					1									1			1				1										1										8
Brimstone Canary		1																								1																						2
Laughing Dove		1												1											1																							4
House Sparrow			1				1																						1																			3

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

White-throated Robin-Chat			1							1				1						1				1		1		1					1					8
Yellow-breasted Apalis			1						1					1										1											1				5
Long-billed Crombec			1						1											1		1														1			5
Red-faced Mousebird			1		1						1							1				1			1								1			1			8
African Firefinch			1			1										1															1					1			5
Common Waxbill			1			1							1				1							1							1						1		7
Red-faced Cisticola			1			1																	1																4
Tawny-flanked Prinia			1			1		1														1				1					1				1	1			8
Sombre Greenbul			1					1						1									1			1					1	1			1			1		9
Amethyst Sunbird				1																		1																	2
Southern Boubou				1											1					1								1								1			5
Spectacled Weaver				1																							1								1			3
Golden-breasted Bunting				1						1		1			1			1			1						1		1	1		1			1			1 3
Little Grebe				1																											1							2
Fork-tailed Drongo				1				1			1					1															1								5
Lizard Buzzard				1																																		1
Black-collared Barbet				1																			1										1			1			4
Cape Turtle Dove				1							1						1													1		1					1		6
African Pipit					1																							1										1	3
Wire-tailed Swallow					1																																		1
Little Sparrowhawk					1																																		1
Green-backed Camaroptera						1																									1			1	1				4
Cape Canary						1																																	1
Southern Grey-headed Sparrow						1							1						1																		1		4

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Southern Masked Weaver							1																	1																	2
Bronze Mannikin							1			1			1					1			1			1			1			1			1			1			1		12
Village Weaver							1																													1				2
Streaky-headed Seedeater							1									1								1		1				1			1						1	7
Cinnamon-breasted Bunting							1																																	1
Jameson's Firefinch							1																				1													2
Pied Crow								1																		1														2
Lazy Cisticola								1	1	1							1						1																	5
Southern Black Tit								1			1				1		1																							4
Orange-breasted Bushshrike								1																																1
Emerald-spotted Wood Dove									1				1					1					1				1								1					6
Mocking Cliff Chat									1							1							1																	3
Red-collared Widowbird									1		1		1			1			1							1														6
Neddicky									1							1			1		1					1			1			1					1			8
Fiery-necked Nightjar									1																											1				2
Speckled Mousebird										1					1							1		1																4
Little Bee-eater										1				1						1							1							1						5
Little Swift											1																													1
Grey Penduline Tit											1														1											1				3
Brubru											1								1																	1				3
Green-winged Pytilia												1																										1		2
Kurrichane Thrush												1		1																					1					3
Cape White-eye													1											1																2

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Golden-tailed Woodpecker													1										1											1								3
Red-headed Weaver														1																						1						2
Bushveld Pipit														1				1													1										3
Pale Flycatcher														1																												1
Chinspot Batis															1			1			1	1			1											1						6
Striped Pipit															1																											1
Yellow-fronted Tinkerbird															1		1				1								1			1									5
African Hoopoe																1					1									1				1				1			5
Southern Black Flycatcher																	1																								1
Familiar Chat																	1																								1
Yellow-throated Longclaw																	1		1										1												3
Crested Barbet																	1												1												2
Brown-crowned Tchagra																		1			1																				2
Lesser Honeyguide																			1																						1
Rufous-naped Lark																			1																						1
Natal Spurfowl																				1		1																			2
Flappet Lark																					1																				1
African Black Duck																							1																		1
Brown-hooded Kingfisher																											1			1						1				3
Arrow-marked Babbler																												1												1
African Palm Swift																													1											1
Rock Dove																													1											1
Common Myna																													1											1
Three-banded Plover																															1										1

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Southern Red Bishop																															1										1
Southern Yellow-billed Hornbill																																1									1
Crested Francolin																																1									1
Red-billed Firefinch																																1									1
Black Crake																																		1							1
Marico Sunbird																																			1						1
Red-billed Oxpecker																																			1						1
Tambourine Dove																																				1					1
Collared Sunbird																																				1					1
Striped Kingfisher																																					1				1
Purple-crested Turaco																																					1				1
Burchell's Coucal																																					1				1
Acacia Pied Barbet																																						1			1
103	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Appendix 3. Potentially occurring fauna of conservation concern

Species	Scientific Name	Red Data	Protected	Habitat	SABAP2 Reporting Rate for 2531 AC	Likelihood	Reason
Mammals							
Cape Clawless Otter	*Aonyx capensis*	NT	MNCA	Rivers and streams		Moderate	Suitable habitat present but high disturbance levels
Side-striped Jackal	*Canis adustus*	NT		Woodland and grassland		Moderate	Suitable habitat present but high disturbance levels
Natal Red Duiker	*Cephalophus natalensis*	NT	MNCA	Forest and thicket		Moderate	Suitable habitat present but high disturbance levels
Short-eared Trident Bat	*Cloeotis percivali*	EN		Savanna, cave roosting		Moderate	Suitable habitat present but very rare
Swamp Musk Shrew	*Crocidura mariquensis*	NT		Wetland habitats		Low	Very limited suitable habitat present
African Marsh Rat	*Dasymys incomtus*	NT		Wetland habitats		Low	Very limited suitable habitat present
Gambian Epauletted Fruit Bat	*Epomophorus crypturus*	DD		Savanna		Moderate	Suitable habitat present
Southern Lesser Galago	*Galago moholi*		MNCA	Savanna		Moderate	Suitable habitat present
Hippopotamus	*Hippopotamus amphibius*	VU*	MNCA	Wetland		Low	Human disturbance, limited habitat present
Serval	*Leptailurus serval*	NT	NEMBA (PR)	Grassland, wetlands		Low	Human disturbance through hunting, feral dogs
Honey Badger	*Mellivora capensis*	NT	MNCA	Wide variety of habitats		Moderate	Suitable habitat present but high disturbance levels
Lesser Long-fingered Bat	*Miniopterus fraterculus*	NT		Wide variety of habitats, cave roosting		Moderate	Suitable habitat present
Schreiber's Long-fingered Bat	*Miniopterus schreibersii*	NT		Wide variety of habitats, cave roosting		Moderate	Suitable habitat present
Juliana's Golden Mole	*Neamblysomus julianae*	EN		Sour Bushveld		Moderate	Suitable habitat present but edge of range

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Klipspringer	*Oreotragus oreotragus*		MNCA	Rocky woodland and grassland		Moderate	Suitable habitat present but high disturbance levels
Aardvark	*Orycteropus afer*		MNCA	Wide variety of habitats		Low	Human disturbance through hunting, feral dogs
Greater Galago	*Otolemur crassicaudatus*		MNCA	Thicket, closed woodland		Moderate	Suitable habitat present
Leopard	*Panthera pardus*	VU	NEMBA (PR)	Wide variety of habitats		Low	May occasionally pass through
Anchieta's Pippistrelle	*Pipistrellus anchietai*	NT		Wide variety of habitats, cave roosting		Moderate	Suitable habitat present
African Weasel	*Poecilogale albinucha*	DD		Wide variety of habitats		Moderate	Suitable habitat present
Aardwolf	*Proteles cristatus*		MNCA	Wide variety of habitats		Low	Human disturbance through hunting, feral dogs
Peak-saddle Horseshoe Bat	*Rhinolophus blasii*	NT		Wide variety of habitats, cave roosting		Moderate	Suitable habitat present but edge of range
Temminck's Ground Pangolin	*Smutsia temminckii*	VU	NEMBA (VU)	Arid and moist savanna		Low	Human disturbance through hunting, feral dogs
Subtotal	23	19	12				
Birds							
Half-collared Kingfisher	*Alcedo semitorquata*	NT		Forested streams	0.8	Moderate	Suitable habitat present along the southern border
Tawny Eagle	*Aquila rapax*	EN	NEMBA (EN)	Savanna	0.5	Low	Human disturbance, lack of prey
Verreaux's Eagle	*Aquila verreauxii*	VU		Mountainous areas	-	Low	Human disturbance, lack of prey
Southern Ground Hornbill	*Bucorvus leadbeateri*	EN	NEMBA (EN)	Wide variety of habitats	-	Very Low	Human disturbance, lack of prey
Abdim's Stork	*Ciconia abdimii*	NT		Arid grasslands and savanna	0.8	Low	Limited suitable habitat available
Black Stork	*Ciconia nigra*	VU		Rivers, cliffs	0.5	Low	Human disturbance
European Roller	*Coracias garrulus*	NT		Open woodland	0.5	Moderate	Suitable habitat present
Saddle-billed Stork	*Ephippiorhynchus senegalensis*	EN		Lowveld rivers and dams	0.25	Very Low	Very limited suitable habitat present, human disturbance
Lanner Falcon	*Falco biarmicus*	VU		Wide variety of habitats	1.5	Moderate	Suitable breeding and foraging habitat present

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

White-backed Night Heron	*Gorsachius leuconotus*	VU		Forested rivers and streams	-	Low	Suitable habitat present along the southern border but prone to disturbance
White-backed Vulture	*Gyps africanus*	CR	NEMBA (EN)	Wide variety of habitats	2.5	Low	Human disturabance, lack of food
Marabou Stork	*Leptoptilos crumenifer*	NT		Wide variety of habitats	0.8	Low	Human disturabance, lack of food
Bat Hawk	*Macheiramphus alcinus*	EN		Tall riparian forest	14.6	Very Low	Only one pair known from this general area
Yellow-billed Stork	*Mycteria ibis*	EN		Wetlands	0.25	Very Low	Very limited suitable habitat present, human disturbance
Hooded Vulture	*Necrosyrtes monachus*	CR	NEMBA (EN)	Wide variety of habitats	-	Very Low	Human disturabance, lack of food
African Finfoot	*Podica senegalensis*	VU		Well wooded streams and rivers	0.5	Low	Suitable habitat present along the southern border but prone to disturbance
Martial Eagle	*Polemaetus bellicosus*	EN	NEMBA (EN)	Woodland, savannah	0.25	Low	May occasionally forage over the study area
Greater Painted Snipe	*Rostratula benghalensis*	NT		Wetlands	-	Low	Unrecorded from the area, limited suitable habitat present
Secretarybird	*Sagittarius serpentarius*	VU		Open woodland, grassland	0.8	Very Low	Very limited suitable habitat present, human disturbance
Crowned Eagle	*Stephanoaetus coronatus*	VU		Forest	6.6	Low	Very limited suitable habitat present, human disturbance
Bateleur	*Terathopius ecaudatus*	EN	NEMBA (EN)	Savanna	0.5	Low	May occasionally forage over the study area
Lappet-faced Vulture	*Torgos tracheliotos*	EN	NEMBA (EN)	Savanna	0.5	Very Low	Human disturabance, lack of food
White-headed Vulture	*Trigonoceps occipitalis*	CR	NEMBA (EN)	Wide variety of habitats	-	Very Low	Human disturabance, lack of food
African Grass Owl	*Tyto capensis*	VU		Extensive tracts of open grassland and wetland	-	Very Low	Very rare in the area, disturbance
Subtotal	24	24	8				
Reptiles and Frogs							

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Nile Crocodile	*Crocodylus niloticus*	VU	NEMBA (VU)	Wetlands		Low	Very limited suitable habitat present, human disturbance
Haacke's Flat Gecko	*Afroedura multiporis haackei*	EN #		Large rocky outcrops with adjacent woodland and thicket		Moderate	Suitable habitat present
Wilhelm's Flat Lizard	*Platysaurus intermedius wilhelmi*	VU #		Granite outcrops		Confirmed	
Southern African Python	*Python natalensis*		NEMBA (PR)	Wide variety of habitats, but usually near water or rocky outcrops		Confirmed	
Barberton Girdled Lizard	*Smaug warreni barbertonensis*	VU #		Large rocky outcrops with adjacent woodland and thicket		Moderate	Suitable habitat present
Subtotal	5	4	2				
TOTAL	**52**	**47**	**22**				

* = IUCN assessment
= provincial assessment
CR = Critically Endangered
EN = Endangered
VU = Vulnerable
NT = Near-threatened
DD = Data Deficient
MNCA = Mpumalanga Nature Conservation Act
NEMBA = National Environmental Management: Biodiversity Act

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Appendix 4. Biodiversity Value calculations of Faunal Habitats in the Study Area

Thickets

Conservation Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Protection Status		International	National	Regional	Local	None
	13	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length		Very small	Small	Moderate	Large	Very Large
		(<500km^2)	(500 to 1,000km^2)	(1,000 to 20,000km^2)	(20,000 to 50,000km^2)	(> 50,000km^2)
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity		Noticeably High		Moderate		Noticeably Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species of Conservation Concern		Noticeably High		Moderate		Noticeably Low
	8	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa		Noticeably High		Moderate		Noticeably Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State		Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	13	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**12.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

Functional Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Provisioning Services		Constant	Regular	Frequent	Occassional	Intermittent
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services		Very High	High	Moderate	Low	Very Low
	10	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services		Very High	High	Moderate	Low	Very Low
	6	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services		Very High	High	Moderate	Low	Very Low
	10	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**10.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Rocky Outcrops

Conservation Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Protection Status		International	National	Regional	Local	None
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length		Very small	Small	Moderate	Large	Very Large
		(<500km^2)	(500 to 1,000km^2)	(1,000 to 20,000km^2)	(20,000 to 50,000km^2)	(> 50,000km^2)
	16	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity		Noticeably High		Moderate		Noticeably Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species of Conservation Concern		Noticeably High		Moderate		Noticeably Low
	13	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa		Noticeably High		Moderate		Noticeably Low
	16	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State		Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	14	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**13.5**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

Functional Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Provisioning Services		Constant	Regular	Frequent	Occassional	Intermittent
	10	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services		Very High	High	Moderate	Low	Very Low
	10	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services		Very High	High	Moderate	Low	Very Low
	14	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services		Very High	High	Moderate	Low	Very Low
	14	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**12.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

Closed Woodland

Conservation Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Protection Status		International	National	Regional	Local	None
	10	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length		Very small	Small	Moderate	Large	Very Large
		(<500km^2)	(500 to 1,000km^2)	(1,000 to 20,000km^2)	(20,000 to 50,000km^2)	(> 50,000km^2)
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity		Noticeably High		Moderate		Noticeably Low
	14	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species of Conservation Concern		Noticeably High		Moderate		Noticeably Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa		Noticeably High		Moderate		Noticeably Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State		Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	13	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**12.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

Functional Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Provisioning Services		Constant	Regular	Frequent	Occassional	Intermittent
	15	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services		Very High	High	Moderate	Low	Very Low
	10	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services		Very High	High	Moderate	Low	Very Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services		Very High	High	Moderate	Low	Very Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**12.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Old Lands / Open Woodland

Conservation Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Protection Status		International	National	Regional	Local	None
	10	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length		Very small	Small	Moderate	Large	Very Large
		(<500km^2)	(500 to 1,000km^2)	(1,000 to 20,000km^2)	(20,000 to 50,000km^2)	(> 50,000km^2)
	10	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity		Noticeably High		Moderate		Noticeably Low
	8	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species of Conservation Concern		Noticeably High		Moderate		Noticeably Low
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa		Noticeably High		Moderate		Noticeably Low
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State		Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**6.5**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

Functional Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Provisioning Services		Constant	Regular	Frequent	Occassional	Intermittent
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services		Very High	High	Moderate	Low	Very Low
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services		Very High	High	Moderate	Low	Very Low
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services		Very High	High	Moderate	Low	Very Low
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**5.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

Wetlands (Dams)

Conservation Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Protection Status		International	National	Regional	Local	None
	8	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length		Very small	Small	Moderate	Large	Very Large
		(<500km^2)	(500 to 1,000km^2)	(1,000 to 20,000km^2)	(20,000 to 50,000km^2)	(> 50,000km^2)
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity		Noticeably High		Moderate		Noticeably Low
	8	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species of Conservation Concern		Noticeably High		Moderate		Noticeably Low
	6	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa		Noticeably High		Moderate		Noticeably Low
	6	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State		Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**7.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

Functional Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Provisioning Services		Constant	Regular	Frequent	Occassional	Intermittent
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services		Very High	High	Moderate	Low	Very Low
	7	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services		Very High	High	Moderate	Low	Very Low
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services		Very High	High	Moderate	Low	Very Low
	7	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**7.0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

Appendix 5. Curriculum Vitae

Name	**:**	**Warren Lee McCleland**
Profession	**:**	Terrestrial Ecologist
Date of Birth	**:**	7 Sep 1972
Name of Firm	**:**	ECOREX Consulting Ecologists cc
Position in Firm	**:**	Sole Member
Years with firm	**:**	11
Nationality	**:**	South African

Qualifications :

- N.Dip. [Nature Conservation] Cape Peninsula University of Technology 1993

Membership in Professional Societies:

- South African Association of Botanists
- International Association for Impact Assessment (SA)

Languages :

	Speaking	Reading	Writing
English (home):	Excellent	Excellent	Excellent
Afrikaans:	Good	Good	Good
isiZulu:	Good	Fair	Fair
siSwati:	Fair	Poor	Poor

Countries of Work Experience **:** Angola**,** Botswana**,** Democratic Republic of the Congo**,** Lesotho, Malawi, Mali, Mozambique, Namibia, Republic of Guinea, Sierra Leone, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe.

OVERVIEW OF EXPERIENCE

- 15 years experience in conducting baseline surveys, data analysis and report writing in various biomes in southern and tropical Africa, particularly savannah, forest and grassland biomes.
- 5 years experience game reserve management (KwaZulu-Natal, Mpumalanga)
- **Co-author of acclaimed Field Guide to Trees and Woody Shrubs of Mpumalanga & Kruger National Park, Jacana Publishers, 2002.**
- Specialist knowledge of identification of plants, mammals, birds, reptiles and frogs.
- Experience in reporting according to IFC Performance Standards for numerous international projects in Sierra Leone, Angola, Democratic Republic of the Congo, Republic of Guinea, Tanzania, Malawi, Mali, Mozambique and Zambia.
- Accredited with the discovery of a number of new plant species, most notably *Gladiolus diluvialis* Goldblatt & Manning (Fish River Canyon, Namibia), *Streptocarpus sekhukhuniensis* ms (Stoffberg, Mpumalanga – manuscript currently being edited) and *Barleria lebomboensis* Darbyshire, McCleland & Froneman (Lebombo Mts, Swaziland).
- **2014 Recipient of the Marloth Medal** from the Botanical Society of South Africa for co-authoring the Kruger tree field guide.
- Included as a major contributor in the forthcoming “Trees of Mozambique” (Burrows, Schmidt & Lotter).

Employment Record:

2005 - present	ECOREX Consulting Ecologists CC	Ecologist; Sole Member
2001 - 2005	Lawson’s Birding Tours	Specialist Guide
2000 - 2001	Escarpment Ecological Consultants cc	Founder Director
1996 – 2000	Crystal Springs Game Reserve	Reserve Manager
1995	Mutemwa Lodge, western Zambia	Lodge manager, guide
1993 - 1994	Natal Parks Board	Cadet field ranger

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

SELECTED RECENT PROJECTS & EXPERIENCE

West Africa			
Mali	**2014**	Biodiversity Baseline Study and Impact Assessment for Kalana Gold Mine, Yanfolila	Epoch Resources – Fanie Coetzee (fanie@epochresources.co.za)
	2013	Biodiversity Baseline Study and Impact Assessment for Fekola Gold Mine, Fedougou	Epoch Resources – Fanie Coetzee (fanie@epochresources.co.za)
Republic of Guinea	**2012**	Review of Specialist Studies conducted for an EIA for an aluminium mine near Bel-Air, in Bofa Prefecture.	Epoch Resources – Fanie Coetzee (fanie@epochresources.co.za)
Sierra Leone	**2011**	Biodiversity Baseline Study and Impact Assessment for Marampa Iron Ore Mine, Lunsar	SRK (U.K.) - Nicola Rump (nrump@srk.co.uk)
East Africa			
Tanzania	**2011**	Biodiversity Baseline Study and Impact Assessment for Mkuju River Uranium Project, Selous Game Reserve, Songea	Epoch Resources – Fanie Coetzee (fanie@epochresources.co.za)
Southern and South-central Africa			
Angola	**2013**	Biodiversity Management Plan for the raising of the Cambambe Dam wall, Kwanza River, Dondo	ERM – Jessica Hughes (jessica.hughes@erm.com)
Democratic Republic of the Congo	**2014**	Biodiversity Baseline Study and Impact Assessment for Pumpi Copper Mine, Kolwezi	Epoch Resources – Fanie Coetzee (fanie@epochresources.co.za)
	2013	Biodiversity Assessment of selected wetland habitats, Kamoa Copper Mine, Kolwezi	Wetland Consulting Services – Gary Marneweck (GaryM@wetcs.co.za)
	2009-2011	Biodiversity Baseline Study and Impact Assessment for Kinsevere Copper Mine, Lubumbashi	Knight Piesold - Amelia Briel (abriel@knightpiesold.com)
	2008	Biodiversity Baseline Study for Ulindi Hydropower Scheme, Itombwe Mts, Kivu South	Knight Piesold - Amelia Briel (abriel@knightpiesold.com)
Malawi	**2015**	Terrestrial Ecology Survey of sugar mill site, Ethco, Dwangwa	ERM - Rachel Conti (Rachel.Conti@erm.com)
	2010	Terrestrial Ecology Survey of Kanyika Uranium Mine, Kasungu	Synergistics - Bronwyn Williams (bronwyn@synergistics.co.za)
Mozambique	**2016**	Biodiversity Baseline Study and Impact Assessment for an onshore gas pipeline, Inhassoro, Inhambane province	ERM – Jessica Hughes (jessica.hughes@erm.com)
	2015	Critical Habitat Assessment for coastal dry forest in Palma District, Cabo Delgado province	Enviro-Insight - Luke Verburgt (luke@enviro-insight.co.za)
	2015	Biodiversity Baseline Study for a Regional ESIA of Seismic Exploration blocks, SASOL, Inhassoro	Golder - Warren Aken (waken@golder.co.za)
	2014	Biodiversity Baseline Study and Impact Assessment for a coastal road between Pemba and Palma, Cabo Delgado province	ERM – Jessica Hughes (jessica.hughes@erm.com)
	2013	Biodiversity Monitoring Plan for Benga Coal Mine, Moatize	Rio Tinto - Isaac Ndlovu (Isaac.ndlovu@riotinto.com)
	2012	Biodiversity Baseline Study and Action Plan for the Muanza Quarry, Gorongosa NP, Sofala province	Nepid Consultants – Dr Rob Palmer rob@nepid.co.za)
	2011	Terrestrial Ecology component of the Biodiversity Study for the Four Dams Project (Corumana Dam, Gorongosa Dam, Metuchira Weir, Ressano Weir), Maputo and Sofala provinces	Austral-Cowi - Jacob Ulrich (jacob.ulrich@australcowi.co.mz)
Namibia	**2009**	Biodiversity Baseline Study and Impact Assessment for Neckartal Dam, Keetmanshoop	Knight Piesold - Amelia Briel (abriel@knightpiesold.com)
South Africa	**2013**	Faunal Baseline Study and Impact Assessment for Riemvasmaak Hydro-electric Scheme, Augrabies Falls NP	Aurecon - Nelis Bezuidenhout (Nelis.Bezuidenhout@aurecongroup.com)
	2010	Biodiversity Baseline Study and Impact Assessment for Hoogland Chrome Mine, Steenkampsberg Mts, Mpumalanga	Metago Environmental Engineers - Hylton Allison (hallison@slrconsulting.com)
	2010	Assessment of the status of *Pelargonium sidoides* and harvesting potential in Lesotho and South Africa	South African National Biodiversity Institute - Domitilla Raimondo (Raimondo@sanbi.org)
Swaziland	**2014**	Biodiversity Baseline Study and Impact Assessment for Ethemba Dam, Hlatikulu	Knight Piesold - Neal Neervoort (nneervoort@knightpiesold.com)
		Biodiversity Value Assessment for the Mhlumeni Community Conservation land, Siteki	Rod de Vletter (devletter@gmail.com)
Zambia	**2015**	Botanical survey for ESIA for Ngonye Falls Hydropower Project, Zambezi River, Senanga	Ecotone - Michiel Jonker (michiel@ecotone-sa.co.za)
	2013	Biodiversity Baseline Study and Impact Assessment for Mulungushi Hydropower Project, Kabwe	ERM – Zoe Daniels (Zoe.Daniel@erm.com)
	2008	Biodiversity Baseline Study and Impact Assessment for Lumwana Copper Mine, Solwezi	Knight Piesold - Amelia Briel (abriel@knightpiesold.com)
Zimbabwe	**2011**	Biodiversity Baseline Study and Impact Assessment for Bokai Platinum Mine, Gweru	Epoch Resources - Fanie Coetzee (fanie.coetzee@epochresources.co.za)

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

PUBLICATIONS

Books

Schmidt, E., Lötter, M.C. & McCleland, W.L. 2002. *Field Guide to Trees and Woody Shrubs of Mpumalanga & Kruger National Park*. Jacana Publishers, Houghton.

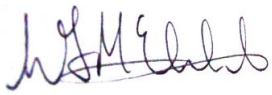
Peer-reviewed Journals

Darbyshire, I., McCleland, W.L. & Froneman, W. *in press*. *Barleria lebomboensis* (Acanthaceae), an endangered new species from the Lebombo Mountains of Swaziland. *Phytotaxa*.

McCleland, W.L. & Massingue, A. *in press*. New population and conservation assessment of *Ecbolium hastatum* (Acanthaceae). *Bothalia*.

DECLARATION

I declare that the particulars above are accurate and true to the best of my knowledge and belief.

SIGNATURE:  DATE: 24 March 2017

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za

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: 9
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 :

	Speaking	Reading	Writing
English (home):	Excellent	Excellent	Excellent
Afrikaans:	Good	Good	Good
isiZulu:	Good	Fair	Fair
Spanish:	Fair	Fair	Fair

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

OVERVIEW OF EXPERIENCE

- 9 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 6. Specialist Declaration

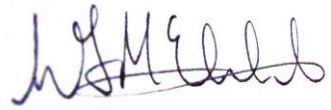
I …Warren McCleland…, as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- 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

21/06/2017

Date

ECOREX Consulting Ecologists CC
Postnet Suite #192, Private Bag X2 Raslouw 0109
(083) 231-5632 warren@ecorex.co.za