



ECOLOGICAL ASSESSMENT REPORT

Thunderflex 78 (Pty) Ltd

Wexford Diamond Prospecting Operation



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Thunderflex 78 (Pty) Ltd

The Farm Wexford 246;

Remaining Extent of the Farm Zoetgat 84

Districts of Herbert and Hopetown

Northern Cape Province

**Ecological Assessment Report in application for Environmental
Authorisation related to a Prospecting Right Application (NC
30/5/1/2/2/12451 PR) that was lodged with the Department of
Mineral Resources**

March 2020

EXECUTIVE SUMMARY

Thunderflex 78 (Pty) Ltd is proposing the prospecting of diamonds on the Farm Wexford 246 and the Remaining Extent of the Farm Zoetgat 84. The prospecting right area is located within the Herbert and Hopetown Districts of the Northern Cape Province. Thunderflex 78 has submitted a Prospecting Right application, which triggers the requirement to apply for Environmental Authorisation. An ecological assessment is required in order to consider the impacts that the proposed activities might have on the ecological integrity of the property. This terrestrial ecological assessment report describes the ecological characteristics and biodiversity of the proposed prospecting area, identifies the source of impacts from the operation, and assesses these impacts, as well as the residual impacts after closure.

A desktop study was performed to obtain ecological and biodiversity information for the proposed study area and identify the ecological characteristics and sensitivity of the site. Six potential plant communities were identified on site of which the Upper Gariiep Alluvial Vegetation (along with the banks and channels of the Orange River), ephemeral drainage lines and ephemeral pan are considered to be of very high sensitivity. The Vaalbos Rocky Shrubland on the ridges are considered to be of high sensitivity, while the Northern Upper Karoo and Kimberley Thornveld vegetation units are considered to be of medium sensitivity. The area transformed for agriculture is considered to be of low sensitivity. The most profound impacts are expected to be related to the loss of plant species of conservation concern as well as the disruption of ecological corridors and the hydrological regime if any of the tributaries to the Orange River are cut off, or if the ephemeral pans and ephemeral drainage lines are modified through road creation or drill pad establishment.

Disturbances to the natural habitat and associated fauna within the study area are inevitable. However, the significance of the impacts is low due to the low invasive nature of drilling activities. Nevertheless, any significance of the impacts will be affected by the success of the mitigation measures implemented and the rehabilitation programme for the prospecting area.

Authorisation for the proposed operation can be granted. However, the applicant should still commit to the adherence of effective avoidance, management, mitigation and rehabilitation measures.

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1. INTRODUCTION

1.1. Background information

Thunderflex 78 (Pty) Ltd is proposing the prospecting of diamonds on two separate properties in the Northern Cape Province that collectively form one application area (Figure 1). The Farm Wexford 246 (from hereon referred to as Wexford East) is situated in the Herbert District, while the Remaining Extent of the Farm Zoetgat 84 (from hereon referred to as Wexford West) is located within the Hopetown District. Wexford West lies 12 km north-west of Hopetown on the R3112, with its northern border lining the Orange River for 1.6 km. Wexford East lies 9 km North of Hopetown on the R385. The total extent of the prospecting right area is $\pm 2\,700$ ha.

Thunderflex 78 has submitted a Prospecting Right application, which triggers an application for Environmental Authorisation. An ecological assessment is required in order to consider the impacts that the proposed activities might have on the ecological integrity of the property and therefore Boscia Ecological Consulting has been appointed by the applicant to conduct a desktop assessment and provide an ecological assessment report.

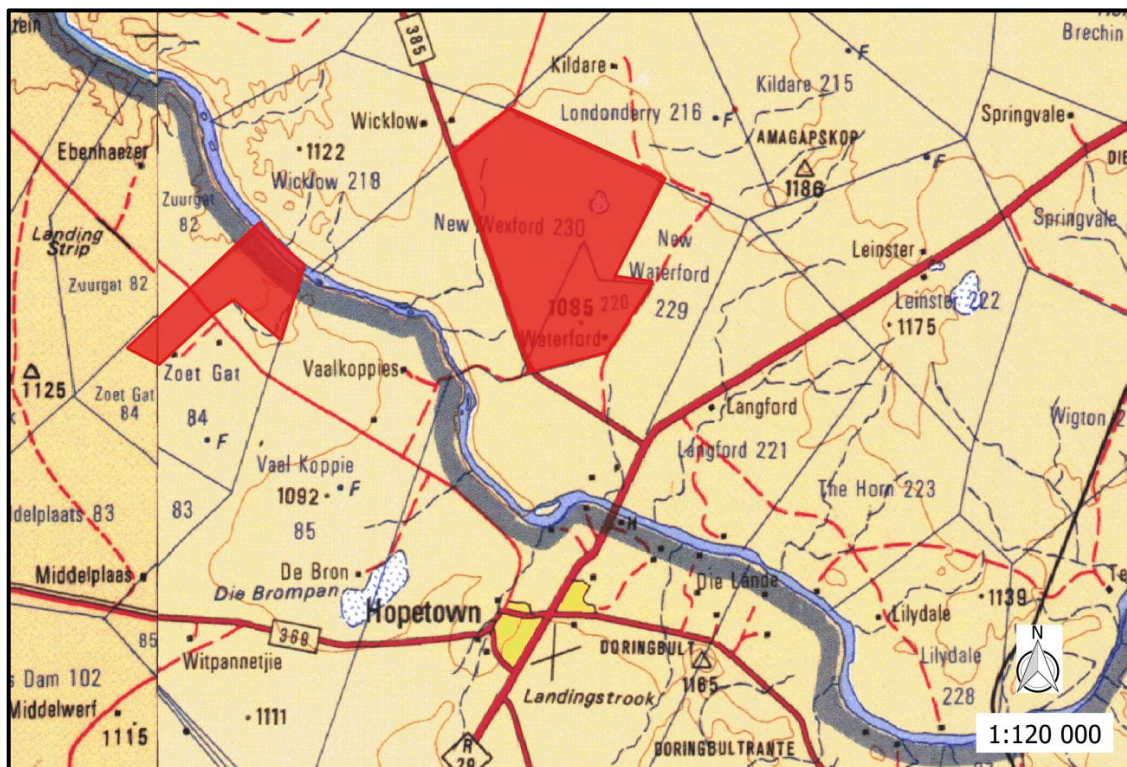


Figure 1. The location of the Wexford prospecting area is indicated in red.

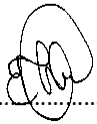
This assessment report describes the characteristics of habitats in the proposed prospecting area, identifies the biodiversity and species of conservation concern, identifies invasive and encroaching species and their distribution, indicates the source of impacts from the prospecting operation and assesses these impacts as well as the residual impacts after closure. A variety of avoidance and mitigation measures associated with each identified impact are recommended to reduce the likely impact of the operation. Ecological responsibilities pertaining to relevant conservation legislation are also indicated. These should all be included in the EMP.

1.2. Scope of study

The specific terms of reference for the study include the following:

- conduct a desktop study in order to identify and describe different ecological habitats and provide an inventory of biodiversity, i.e. communities/species/taxa and associated species of conservation concern within the environment that may be affected by the proposed activity;
- identify the relative ecological sensitivity of the project area;
- produce an assessment report that:
 - indicates identified habitats and fauna and flora species,
 - indicates the ecological sensitivity of habitats and conservation values of species,
 - determines the potential impacts of the project on the ecological integrity,
 - provides mitigation measures and recommendations to limit project impacts,
 - indicate ecological responsibilities pertaining to relevant conservation legislation.

1.3. Details of the specialist consultant

Company Name	Boscia Ecological Consulting cc	Registration no:	2011/048041/23
Address	PostNet Suite #194 Private Bag X2 Diamond 8305		
Contact Person	Dr Elizabeth (Betsie) Milne		
Contact Details	Cell: 082 992 1261	Email: BosciaEcology@gmail.com	
Qualifications	PhD Botany (Nelson Mandela Metropolitan University), Masters Environmental Management (University of the Free State), BTech Nature Conservation (Tshwane University of Technology)		
Declaration of independence	<p>I, Elizabeth (Betsie) Milne, owner of Boscia Ecological Consulting, declare that I:</p> <ul style="list-style-type: none"> • act as the independent specialist in this application; • regard the information contained in this report as it relates to my specialist input/study to be true and correct; • do not have, and will not have any financial interest in the undertaking of the activity; other than the remuneration of work performed in terms of the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act; • have and will not have any vested interest in the activity proceedings; • have no, and will not engage in conflicting interest in the undertaking of the activities; • undertake to disclose to the component authority any material information that have or may have the potential to influence the decision of the competent authority, or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act; • will provide the competent authority with access to all information at my disposal regarding the study. <p style="text-align: center;">  </p>		

1.4. Description of the proposed activity

The prospecting operation is primarily based on diamondiferous gravel deposits that are associated with the alluvial terraces of the Orange River. These gravels are confined to quaternary deposits, which covers the majority of the study area (Figure 2). The presence of diamondiferous gravels on Wexford will be evaluated by means of a standard phased approach. Initially, non-invasive desktop studies will be conducted to delineate and define areas underlain by alluvial gravels. Thereafter, a drilling programme will be performed over anomalous target areas using predefined grids. At least 700 boreholes of ± 5 m in depth are expected to be drilled over 5 years.

Prospecting activities will primarily make use of existing roads where possible, but reconnaissance tracks will be created in order to access the drilling grid. Minor bush clearing will also be done to establish the drill pads. A mobile container office with mobile toilets might be positioned in the vicinity of the drill grid, but no permanent infrastructure will be established on site.



Figure 2. The proposed core footprint of prospecting activities on Wexford is indicated in white.

2. METHODOLOGY

2.1. Data collection

The study comprised an extensive desktop survey for data collection on fauna and flora in order to obtain a relatively comprehensive data set for the assessment. Most data was obtained from the quarter degree squares that include the study area, i.e. 2923DB and 2924CA as well as other reports from the surrounding area.

2.1.1. Flora

For the floral component, the South African National Vegetation Map (Mucina and Rutherford 2006) was used to obtain data on broad-scale vegetation types, associated species and their conservation status. This information was then extrapolated to satellite images where homogenous vegetation units within the proposed prospecting area were identified to infer possible fine-scale communities on site. The South African National Biodiversity Institute's (SANBI) BGIS database was also consulted to obtain information on biodiversity information for the Thembelihle (NC076) Local Municipality, in which the study area falls.

Further searches were undertaken specifically for Red List plant species within the current study area. Historical occurrences of Red List plant species were obtained from the SANBI: POSA database for the in the broad geographical area that includes the study site. The IUCN conservation status of plants in the species list was also extracted from the SANBI database and is based on the Threatened Species Programme (SANBI 2017).

2.1.2. Fauna

For the faunal component, a lists of mammals, reptiles, amphibians, birds, fish and arthropods which are likely to occur in the study area were derived based on distribution records from the literature, including Friedmann and Daly (2004) and Stuart and Stuart (2015) for mammals, Alexander and Marais (2007) and Bates et al. (2014) for reptiles, Du Preez and Carruthers (2009) for amphibians, Gibbon (2006) for birds, Kleynhans (2007) for fish and Thirion (2007) for arthropods.

Additional information on faunal distribution was extracted from the various databases hosted by the ADU web portal, <http://adu.org.za>. A map of important bird areas (BirdLifeSA 2015) was also consulted. The faunal species lists provided are based on species which are known to occur in the broad geographical area.

The likelihood of Red Data species occurring on site has been determined using the distribution maps in the Red Data reference books (Friedmann and Daly 2004; Bates et al. 2014; Taylor et al. 2015; ADU 2016) and comparing their habitat preferences with the habitats identified from satellite images. The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria (IUCN 2019) and/or the various red data books for the respective taxa.

2.2. Assumptions and limitations

Due to the nature of a desktop survey and the lack of ground-truth information, the species list reflected in this report cannot be regarded as entirely accurate or comprehensive. Ideally, a site should be visited at least once to compare desktop information with information on site as well as to ensure actual habitats and associated species present on site are recorded.

However, an extensive desktop review was conducted to ensure a fairly accurate representation of the study area. This is assumed to be sufficient to support this environmental authorisation application, because the proposed operation is primarily non-invasive with a likelihood of minor disturbances produced by the drilling operation.

2.3. Sensitivity mapping and assessment

An ecological sensitivity map of the site was produced by integrating the available ecological and biodiversity information available in the literature and various spatial databases. The sensitivity mapping entails delineating different habitat units identified on the satellite images and assigning likely sensitivity values to the units based on their ecological properties, conservation value and the potential presence of species of conservation concern, as well as their probability of being affected by proposed activities.

The sensitivity of the different units identified in the mapping procedure increased with probability and was rated according to the following scale:

- Low:** Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and biodiversity. Most types of activities can proceed within these areas with little ecological impact.
- Medium:** Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. Activities within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- High:** Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas may contain or be important habitat for faunal species or provide important ecological services such as water flow regulation or forage provision. Activities within these areas are undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
- Very High:** Critical and unique habitats that serve as habitat for species of conservation concern, or perform critical ecological roles. These areas are essentially no-go areas for activities and should be avoided as much as possible.

2.4. Impact assessment and mitigation

The criteria used to assess the significance of the impacts are shown in Table 1. The different project activities and associated infrastructure were identified and considered in order to identify and analyse the various possible impacts. The limits were defined in relation to project characteristics. Those for severity, extent, duration and probability are subjective, based on rule-of-thumb and experience.

Natural and existing mitigation measures were considered. These natural mitigation measures were defined as natural conditions, conditions inherent in the project design and existing management measures, which alleviate impacts.

The Consequence value of the impacts was calculated by using the following formula:

$$\frac{\text{CONSEQUENCE}}{(\text{Severity} + \text{Spatial Scope} + \text{Duration})} \times \frac{\text{PROBABILITY}}{(\text{Frequency of activity} + \text{Frequency of impact})}$$

Consequence of impacts is defined as follows:

- Very Low:** Impact would be negligible. Almost no mitigation and/or remedial activity would be needed, and any minor steps which might be needed would be easy, cheap and simple.
- Low:** Impact would have little real effect. Mitigation and/or remedial activity would be either easily achieved or little would be required or both.
- Low – Medium:** Impact would be real but not substantial within the bounds of those which could occur. Mitigation and/or remedial activity would be both feasible and fairly easily possible.
- Medium – High:** Impact would be real and rather substantial within the bounds of those which could occur. Mitigation and/or remedial activity would be feasible, but not necessarily possible without difficulty.
- High:** Impacts of substantial order. Mitigation and/or remedial activity would be feasible but difficult, expensive, time consuming or some combination of these.
- Very High:** Of the highest order possible within the bounds of impacts which could occur. There would be no possible mitigation and/or remedial activity to offset the impact at the spatial or time scale for which was predicted.

Table 1. Criteria used to assess the significance of the impacts.

Weight	Severity	Spatial scope (Extent)		Duration											
5	Disastrous	Trans boundary effects		Permanent											
4	Catastrophic / major	National / Severe environmental damage		Residual											
3	High/ Critical / Serious	Regional effect		Decommissioning											
2	Medium / slightly harmful	Immediate surroundings / local / outside mine fence		Life of operation											
1	Minimal/potentially harmful	Slight permit deviation / on-site		Short term / construction (6 months – 1 yrs)											
0	Insignificant / non-harmful	Activity specific / No effect / Controlled		Immediate (0 – 6 months)											
Weight number		1	2	3	4	5									
Frequency															
Probability	Frequency of impact	Highly unlikely	Rare	Low likelihood	Probable / possible	Certain									
		Practically impossible	Conceivable but very unlikely	Only remotely possible	Unusual but possible	Definite									
	Frequency of activity	Annually or less	6 monthly / temporarily	Infrequent	Frequently	Life of operation									
CONSEQUENCE (Severity + Spatial Scope + Duration)															
PROBABILITY (Frequency of activity + Frequency of impact)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Colour code	Significance rating	Value	Negative impact Management strategy		Positive Impact Management strategy										
	VERY HIGH	126 – 150	Improve current management		Maintain current management										
	HIGH	101 – 125	Improve current management		Maintain current management										
	MEDIUM – HIGH	76 – 100	Improve current management		Maintain current management										
	LOW – MEDIUM	51 – 75	Improve current management		Maintain current management										
	LOW	26 – 50	Improve current management		Maintain current management										
	VERY LOW	1 – 25	Improve current management		Maintain current management										

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1. Current and historic land use

Currently, the major land uses in the area are mining and agriculture. According to AGIS, the land capability for the study site is non-arable with potential for grazing land and wildlife. The agricultural region is demarcated for sheep farming on Wexford West with a grazing capacity of 22 ha/LSU and cattle farming on Wexford East with a grazing capacity of 16 ha/LSU. The study area is categorised to have suitability for the crop production of beans, cereals, cotton, groundnut, maize, sorghum, soybean, tea and wheat.

Wexford is currently used for agriculture. A large portion of Wexford West is under pivot irrigation, with associated pipeline infrastructure, reservoir, landfill site, farmstead and staff quarters (Figure 3). Wexford East is used for grazing pastures, but an old cultivated land and staff quarters is located in the south of the property (Figure 3). Existing farm tracks are also present.

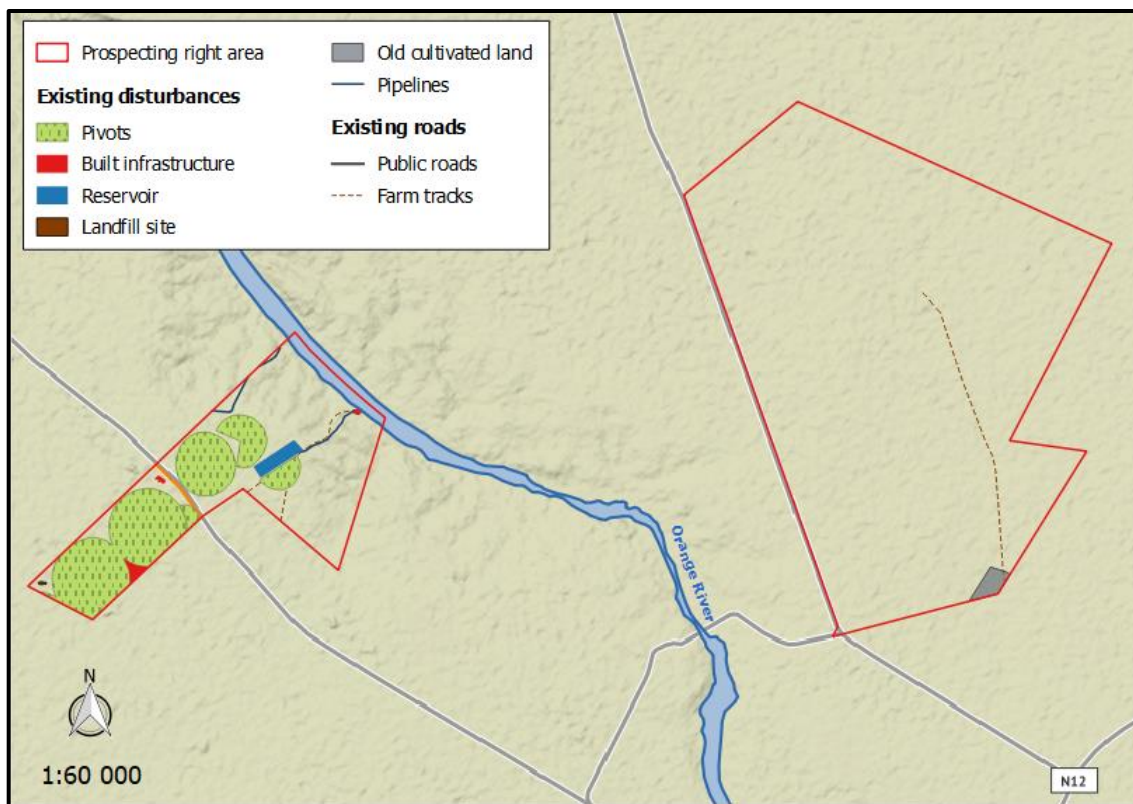


Figure 3. Evidence of existing infrastructure and land use disturbances in the study area.

3.2. Geology, soils and topography

According to Thomas (1992) the geological features on Wexford comprise Quaternary, Jurassic, Carboniferous and Randian deposits (Figure 4). The majority of Wexford East comprises calcrete, with alluvium found in the vicinity of the pans. Dwyka tillites from the Karoo Sequence and a section with Dolerite are also present. Wexford West primarily comprises wind-blown sand in the far west, with andesitic lava (Allanridge Formation) and quartzites (Bothaville) from the Ventersdorp Supergroup associated to the ridges towards the river. Diamondiferous gravels are mainly expected to be found within the quaternary deposits, which are confined to the calcrete and wind-blown sand (Figure 4).

The study area is primarily characterised by level plains with some relief, but along the river on Wexford West, the terrain transforms into open hills or ridges. Altitude ranges from 1 040 m above sea level along the river, 1 080 m on the ridges, and 1 100 m on the plains. The terrain is indicated by a very gentle slope of <2 % on the plains, but increases slightly from 3 - 12 % on the ridges towards the Orange River.

Landtypes found on the property include Ae276, Ae278, Ag135 and Fb389 (Figure 5). The majority of Wexford East is characterised by red and yellow, freely drained soils, with high base status and are less than 300 mm deep. These soils are typically associated with the Ag135 landtype and have a low potential for regeneration if badly eroded. The remainder of Wexford East and the majority of Wexford West is characterised by red and yellow, freely drained soils, with high base status, and which are deeper than 300 mm. These soils are typically associated with the Ae 276 and Ae278 landtypes and have a moderate potential for regeneration if badly eroded. The ridges towards the river is characterised by soils with minimal development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils (Glenrosa/Mispah forms). Lime is generally present in part or most of the landscape. These soils are associated with the Fb389 landtype and have a very low potential for regeneration if badly eroded.

The soils associated with the plains have low to moderate water erosion risks due to the level to gently sloping land. However, soils associated to the steep slopes of the ridges are of very high erodibility. The sandy soils of the study area are at high risk of wind erosion.

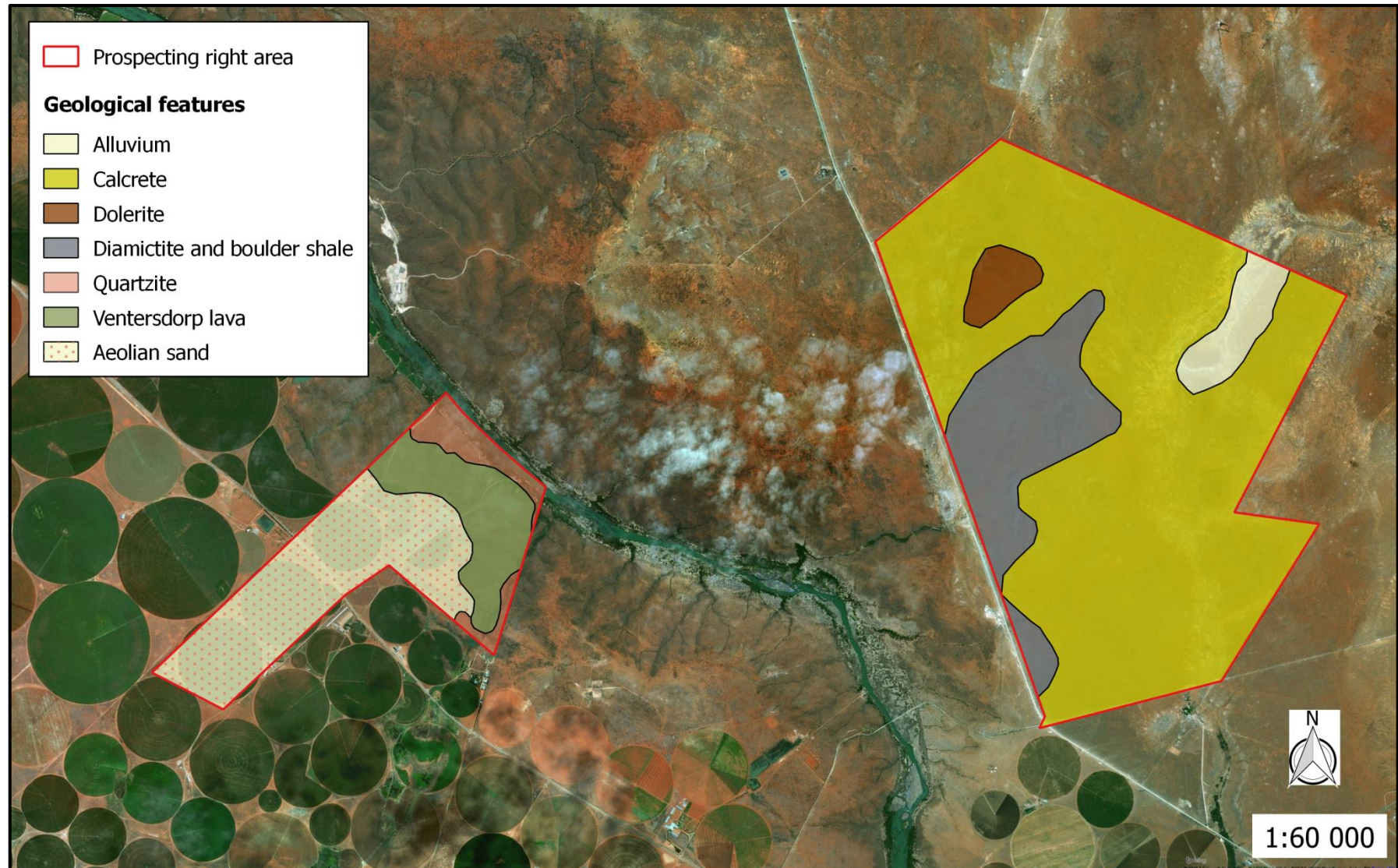


Figure 4. The distribution of geological features in the study area.

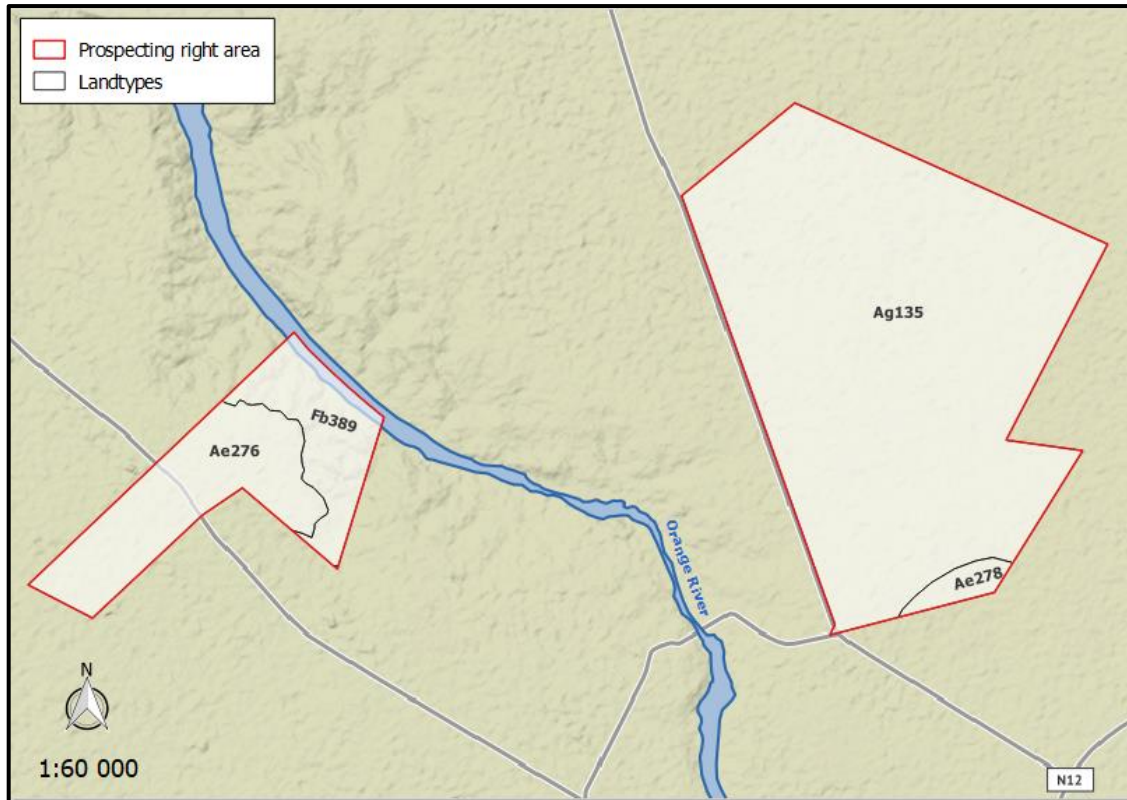


Figure 5. The distribution of landtypes in the study area.

3.3. Vegetation

3.3.1. Broad-scale vegetation patterns

According to the vegetation map of Mucina and Rutherford (2012), the site comprises three biomes with five broad-scale vegetation units; i.e. Northern Upper Karoo from the Nama Karoo Biome, Kimberley Thornveld and Vaalbos Rocky Shrubland from the Savanna Biome as well as Highveld Salt Pans and Upper Gariep Alluvial Vegetation from the Azonal Vegetation Biome (Figure 6).

Northern Upper Karoo is found in the Northern Cape and Free State at altitudes between 1 000 and 1 500 m. It is mostly restricted to the Northern regions of the Upper Karoo plateau from Prieska, Vosburg and Carnarvon in the west to Phillipstown, Petrusville and Petrusburg in the east. The topography is typically flat to gently sloping, but isolated hills of the Upper Karoo Hardeveld (in the south) and Vaalbos Rocky Shrubland (in the northeast) and numerous pans are interspersed in this unit. The vegetation occurs mainly as shrubland dominated by dwarf karoo shrubs, grasses and *Senegalia mellifera*.

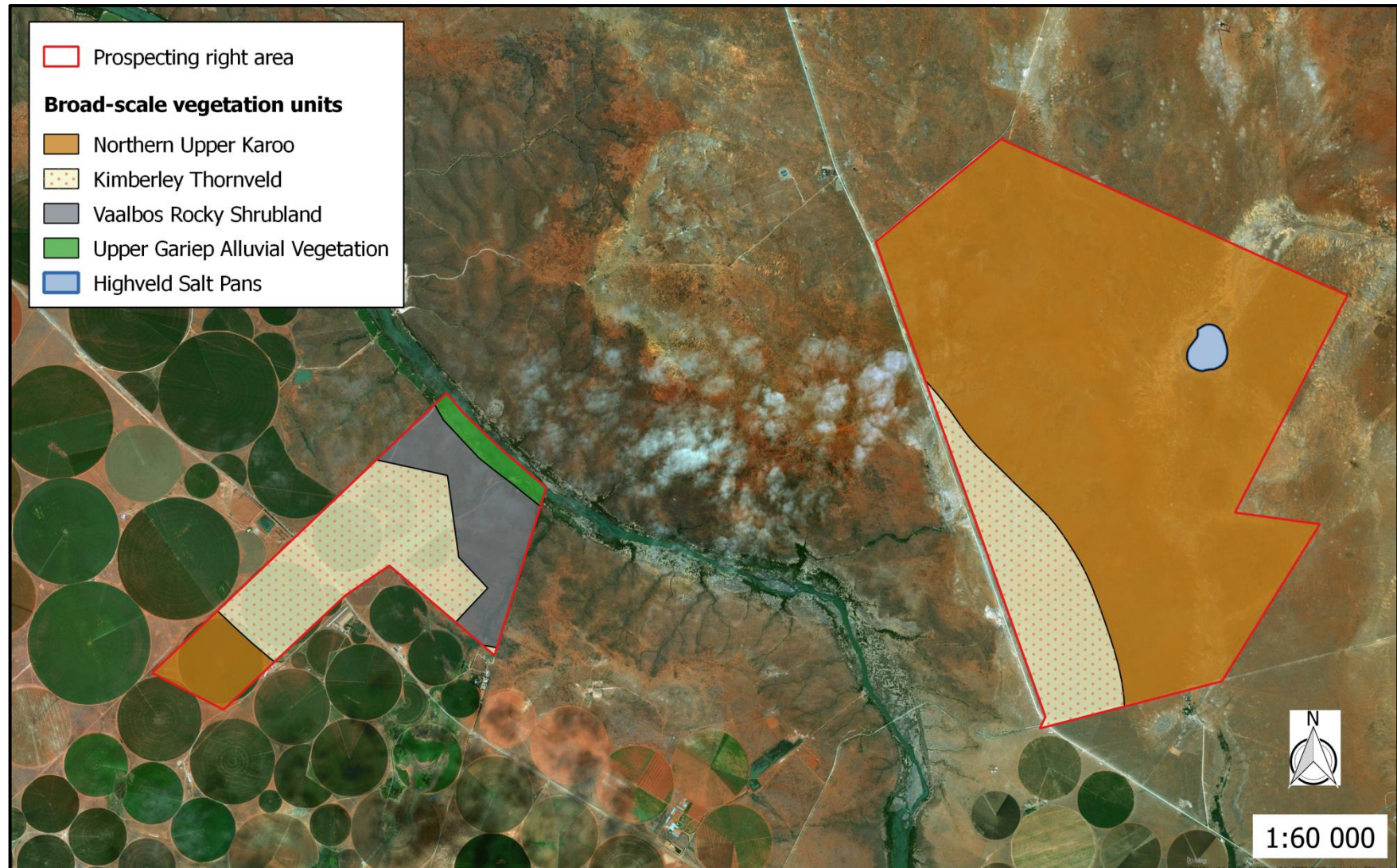


Figure 6. The broad-scale vegetation units (Mucina and Rutherford 2012) present in the study area.

The geology and soil of this unit varies greatly. Geology includes Shales of the Volksrust Formation, Dwyka Group Diamictite, Jurassic Karoo Dolerite sills and sheets, and calcretes of the Kalahari Group. Soils range from shallow to deep, red-yellow, apedal, freely drained soils to very shallow Glenrosa and Mispah forms. The most dominant landtypes are Ae, Ag and Fc. It is estimated that about 4 % of the unit has been cleared for cultivation or transformed by building of dams; and human settlements are increasing in the north-eastern parts. Erosion is moderate, very low and low, while *Prosopis glandulosa*, considered among the top 12 agriculturally significant invasive alien plants in South Africa, are widely distributed in this unit. The unit is classified as being least threatened and it is not currently conserved within any formal conservation areas. Endemic plant species known from this unit include *Lithops hookeri*, *Stomatium pluridens*, *Atriplex spongiosa*, *Galenia exigua* and *Manulea deserticola*.

Upper Gariep Alluvial Vegetation is found in the Northern Cape and Free State and includes the broad alluvia of the Orange River, lower Caledon as well as the lower stretches of the Vaal, Riet and Modder Rivers as far as Groblershoop. The topography is typically flat alluvial terraces that host riparian thicket vegetation (dominated by *Vachellia karroo* and *Diospyros lycioides*), flooded grasslands, reed beds and ephemeral herblands found mainly on sand banks within the river and on the river banks. The geology of this unit is presented as recent alluvial deposits underlain by Karoo Supergroup sediments and tillites. The soils are typically of the Ia group land types. This unit is subject to flooding during summer. It is estimated that more than 20 % of the unit has been transformed for cultivation and the building of dams. Exotic woody species like *Salix babylonica*, *Eucalyptus camaldulensis*, *E. Sideroxylon*, *Prosopis* and *Populus* spp., dominate heavily disturbed alluvial vegetation. The unit is classified as being vulnerable and only 3 % is conserved within formal conservation areas. These include Tussen Die Riviere, Gariep Dam and Oviston Nature Reserves. No endemic plant species are known from this unit.

Highveld Salt Pans are distributed in the Northern Cape, Eastern Cape, North-West, Free State and Gauteng Provinces. They are scattered on broad Grassland/Karoo and Grassland/Savanna interfaces between Mafikeng/Koster in the north and Britstown/Middelburg in the south. The highest concentration of pans is found around Dealesville, Bultfontein, Wesselsbron, Delareyville and Petrusburg. The average size of these pans in the western Free State is 0.2 km², with a number of the largest ones measuring several kilometres across. Altitude ranges between 1 000 and 1 600 m.

The pans occur as depressions in a plateau landscape containing temporary water bodies. The central parts of the pans are often seasonally inundated and sometimes with floating macrophyte vegetation or the vegetation cover develops zonation patterns. On the pan edge open to sparse grassy dwarf shrubland may develop, especially when the pan is under heavy grazing pressure. The bottom of the pans is usually formed by shales of the Ecca Group giving rise to saline systems as the dry season progresses and evaporation intensifies. Wind erosion is of particular significance during the dry season, when the pan basin is dry and marginal vegetation is short and sparse. Dense dust can reach several thousand meters into the air under windy conditions. The unit is classified as being least threatened, with only a small portion being statutorily conserved in the Bloemhof Dam, Soetdoring, Willem Pretorius, Baberspan and S.A Lombard Nature Reserves. It is estimated that only about 4% has been transformed so far, but threats by agriculture, road building, mining and urbanisation are still increasing. Alien plants such as *Atriplex semibaccata*, *Conyza albida*, *Flaveria bidentis*, *Salsola kali*, *Schkuhria pinnata*, *Sonchus oleraceus*, *Spergularia rubra*, *Tagetes minuta*, *Verbena brasiliensis* and *Xanthium* species have been recorded in these pans. *Gnaphalium simii* is the only endemic species known from this unit.

Kimberley Thornveld is distributed in the North-West, Free State and Northern Cape Provinces at altitudes between 1 050 and 1 400 m. It is found in the Kimberley, Hartswater, Bloemhof and Hoopstad Districts, but is also within the Warrenton, Christiana, Taung, Boshof and Barkly West Districts. The unit is typically presented as slightly undulating sandy plains with a well-developed tree and shrub layer and an open grass layer. Andesitic lavas of the Allanridge Formation occur in the north and west, while fine-grained sediments of the Karoo Supergroup are found in the south and east. Soils are deep, sandy to loamy, and of the Hutton form. The most common land types are Ae and Ah. The unit is classified as being least threatened, but 18 % has already been transformed, predominantly by cultivation. Only 2 % is currently conserved in statutory reserves and no endemic species are known from this unit. It is specifically prone to *Senegalia mellifera* encroachment following overgrazing, but the occurrence and risk of erosion is very low.

Vaalbos Rocky Shrubland is mainly distributed in the Northern Cape and Free State, where it extends along solitary hills and scattered ridges east of the confluence of the Orange and Vaal Rivers, mainly in the Kimberley and Herbert District and west of a line bounded by the western Free State towns of Luckhoff, Petrusburg, Dealesville, Bultfontein and Hertzogville.

Altitude ranges between 1 000 and 1 400 m. The unit is presented with slopes and elevated hills and ridges within plains supporting evergreen shrub communities dominated by *Tarchonanthus camphoratus*. The geology ranges from Ecca and Dwyka Group sediments and Karoo dolerites as well as Ventersdorp Supergroup lavas. The Ib land type is typical of the rock and boulder covered slopes. Prominent soil forms are the stony Mispah and gravel-rich Glenrosa forms derived from Jurassic dolerite, but calcrete-rich soil cover the lowlands. The unit is classified as being least threatened, with less than 2% previously conserved in the de-proclaimed Vaalbos National Park. No other formal conservation areas exist for this unit, but it is estimated that only about 2% has been transformed so far. No endemic species are known from this unit.

3.3.2. Desktop habitat delineation and possible species occurrences

Plant communities are usually delineated according to plant species correspondences, change in soil structure, topographical changes and disturbance regimes. They are then described according to unique characteristics and the dominant species found in each unit. However, it is not possible to provide accurate fine-scale community descriptions without conducting a field survey. Therefore, for the purpose of this assessment desktop-based recognizable habitat delineations were done, which is presented in Figure 7, but most likely resemble the same communities defined by Mucina and Rutherford (2012). A complete list of species that have been recorded in the region in the past is listed in Appendix 1.

i) Northern Upper Karoo

This community covers the majority of Wexford East (Figure 7). It is expected to primarily be presented as a grassy shrubland where dwarf shrubs like *Pentzia incana*, *Zygophyllum lichtensteinianum*, *Thesium hystrix*, *Lasiosiphon polycephalus*, *Rosenia humilis*, *Lycium* sp., *Aptosimum spinescens*, *A. albomarginatum*, *Chrysocoma ciliata*, *Helichrysum lucilioides*, *Aloe claviflora*, *Eriocephalus decussatus*, *Pteronia mucronata* and *Asparagus* sp. are found. The grassy matrix is likely to include *Enneapogon desvauxii*, *Cenchrus ciliaris*, *Aristida diffusa*, *A. adscensionis*, *Eragrostis echinocloidea* and *E. truncata*. Typically, *Senegalia mellifera* increases to form denser stands in areas where the veld was heavily grazed or disturbed. Other common tall shrubs that could be found here include *Boscia albitrunca* and *Lycium hirsutum*.

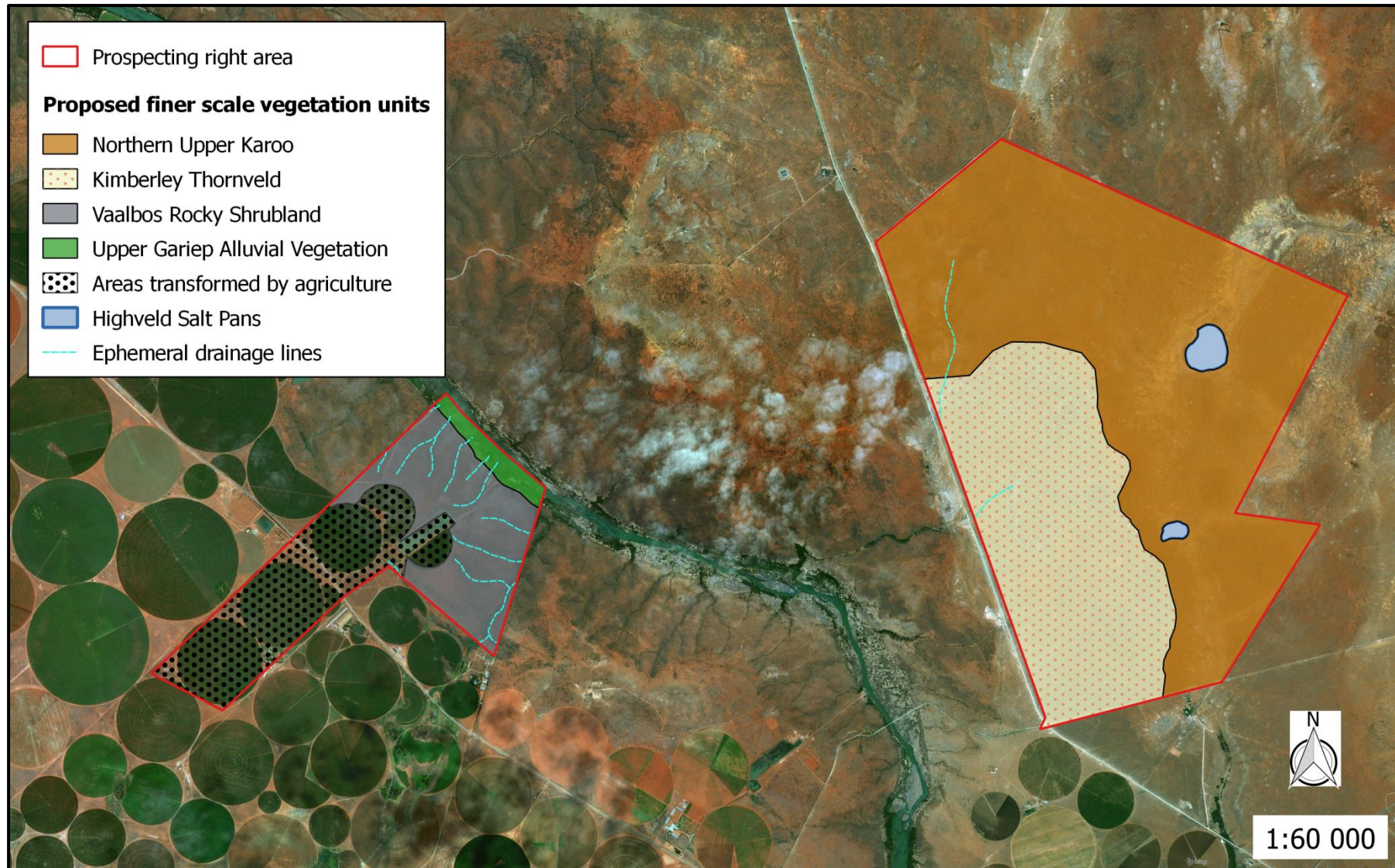


Figure 7. The distribution of fine-scale plant communities in the study area.

ii) Kimberley Thornveld

The unit occurs primarily on Wexford East, although it might have been present on Wexford West in those areas that have been transformed for agriculture (Figure 7). The plains are expected to have a well-developed tree layer with *Vachellia erioloba*, *V. tortilis*, *V. karroo* and *Boscia albitrunca*. Dense stands of *Tarchonanthus camphoratus* and *Senegalia mellifera* may also be present. Other trees and shrubs could include *Searsia lancea*, *Ehretia rigida* and *Grewia flava*, *Anthospermum rigidum*, *Helichrysum zeyheri*, *Hermannia comosa*, *Lycium pilifolium*, *Melolobium microphyllum* and *Wahlenbergia nodosa*. Grasses expected to be found here include *Eragrostis lehmanniana*, *Aristida canescens*, *A. congesta*, *Cymbopogon pospischilii*, *Digitaria eriantha*, *Enneapogon cenchroides*, *E. scoparius* and *Themeda triandra*.

i) Vaalbos rocky shrubland

This unit is mainly restricted to the ridges (Figure 7). The shrub layer is dominated by *Tarchonanthus camphoratus*, *Olea europaea* subsp. *africana*, *Euclea crispa*, *Diospyros lycioides*, *Searsia burchellii*, *S. lancea*, *Ziziphus mucronata*, *Vachellia tortilis* and *Buddleja saligna*, but *Boscia albitrunca*, *Cadaba aphylla*, *Ehretia rigida*, *Rhigozum obovatum*, *Asparagus suaveolens*, *Lycium pilifolium*, *Pentzia globosa* may also be found here. Grasses likely to be found here include *Aristida adscensionis*, *A. congesta*, *Elionurus muticus*, *Digitaria eriantha*, *Enneapogon scoparius*, *Eragrostis obtusa*, *Fingerhuthia africana*, *Heteropogon contortus* and *Hyparrhenia hirta*. Typical herbs associated with this unit include *Chascanum pinnatifidum*, *Hibiscus pusillus*, *Albuca setosa*, *Cheilanthes eckloniana*, *Pellaea calomelanos* and *Aloe grandidentata*.

ii) Upper Gariep Alluvial vegetation

This unit is typically represented as a riparian woodland that lines the immediate banks of the Orange River and comprises a dense canopy comprising tall trees (Figure 7) dominated by *Ziziphus mucronata*, *Vachellia karroo*, *Searsia pendulina*, *Salix mucronata* and *Diospyros lycioides*. The understory potentially includes shrubs like *Lycium hirsutum*, *Asparagus setaceus*, *A. suaveolens*, the herbs *Rubia cordifolia* and grasses such as *Setaria verticillata*.

iii) Highveld Salt Pans

At least two pans occur in the study area and both are situated on Wexford East (Figure 7). Although many of the pans in the Northern Cape are bare, it is expected that the pans in the study area are vegetated due the noticeable signatures evident on the satellite image. The plant communities are likely to be presented as shrubby grassland where shrubs affiliated with the terrestrial matrix, e.g. *Pentzia incana* and *Felicia filifolia* migrate into the pans and are found scattered in a grassy matrix, where species such as *Chloris virgata*, *Cynodon dactylon*, *Leptochloa fusca* *Enneapogon cenchroides*, *Eragrostis echinochloidea*, *E. bicolor*, *Panicum coloratum* and *Tragus berteronianus* can be found. *Salsola* shrubs are also usually commonly found in these pans.

iv) Ephemeral drainage lines

A number of drainage lines are associated with the steep slopes of the ridges that drain towards the river (Figure 7). These drainage lines are not expected to host a unique plant community, because they are not always well defined. They usually consist of a higher cover of rocks on the surface and are often distinguishable by woody riparian canopies that form along the channels. It is very likely that species of conservation concern, like *Boscia albitrunca*, *Olea europaea* subsp. *africana* and *Gymnosporia buxifolia* have pronounced occurrences here. Other trees and shrubs include *Ehretia rigida*, *Senegalia mellifera*, *Rhigozum obovatum*, *Searsia burchellii* and *Ziziphus mucronata* subsp. *mucronata*. Grasses typically associated with this unit include stands of *Cenchrus ciliaris*, *Enneapogon cenchroides* and *Setaria verticillata*.

3.3.3. Population of sensitive, threatened and protected plant species

The SANBI Red List provides information on the national conservation status of South Africa's indigenous plants, while the National Forests Act (No. 84 of 1998) (NFA) and the Northern Cape Nature Conservation Act (Act No. 9 of 2009) (NCNCA) restricts activities regarding sensitive plant species. Section 15 of the NFA prevents any person to cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister.

Section 49 (1) and 50 (1) of the NCNCA states that no person may, without a permit pick, transport, possess, or trade in a specimen of a specially protected (Schedule 1) or protected (Schedule 2) plants. Furthermore, Section 51(2) states that no person may, without a permit, pick an indigenous plant (Schedule 3) in such manner that it constitutes large-scale harvesting.

Most species previously recorded in the region are classified as least concern; a category which includes widespread and abundant taxa. However, one species, i.e. *Haworthia bolusii* (**Data Deficient - Taxonomically Problematic**) is listed under the National Environmental: Biodiversity Act (Act No. 10 of 2004) (NEMBA) (Table 2). This species prefers shallow, rocky soils and is most likely to be associated with the Northern Upper Karoo habitat as well as the ridge slopes.

Table 2. Plant species found in the region that are of conservation concern.

FAMILY	Scientific name	Status	NFA	NCNCA
AIZOACEAE	<i>Lithops hookeri</i>	LC		S2
	<i>Mestoklema arboriforme</i>	LC		S2
	<i>Plinthus cryptocarpus</i>	LC		S2
	<i>Plinthus karoaicus</i>	LC		S2
	<i>Plinthus sericeus</i>	LC		S2
	<i>Psilocaulon coriarium</i>	LC		S2
AMARYLLIDACEAE	<i>Nerine laticoma</i>	LC		S2
APOCYNACEAE	<i>Microloma armatum</i> var. <i>armatum</i>	LC		S2
	<i>Orbea cooperi</i>	LC		S2
ASPHODELACEAE	<i>Aloe claviflora</i>	LC		S2
	<i>Aloe grandidentata</i>	LC		S2
	<i>Haworthia bolusii</i> var. <i>blackbeardiana</i>	DDT		S2
BRASSICACEAE	<i>Boscia albitrunca</i>	LC	X	S2
CELASTRACEAE	<i>Gymnosporia buxifolia</i>	LC		S2
CRASSULACEAE	<i>Kalanchoe rotundifolia</i>	LC		S2
FABACEAE	<i>Vachellia erioloba</i>	LC	X	
OLEACEAE	<i>Olea europaea</i> subsp. <i>africana</i>	LC		S2

Species likely to occur on site that are protected in terms of the National Forests (NFA) Act No 84 of 1998 (Table 2) include *Vachellia erioloba* and *Boscia albitrunca*. The latter species is also protected according the NCNCA. It is expected to be most abundant on the ridges and Northern Upper Karoo habitats of the site, while *V. erioloba* is expected to occur on in the Kimberley Thornveld habitat. In order to damage or remove any protected trees (seedlings to adults) an application must be submitted to the Northern Cape Department

of Agriculture, Forestry and Fisheries (DAFF) and a licence obtained from DAFF at least three months prior to such activities. No specially protected species (Schedule 1) of the Northern Cape Nature Conservation (NCNCA) Act No. 9 of 2009 are expected to occur on site, but those Protected according to Schedule 2 is also listed in Table 2. In addition to these protected species; according to Section 51(2) of NCNCA, a permit is required from the Northern Cape, Department of Environment and Nature Conservation (DENC) for any large-scale clearance of all indigenous (Schedule 3) vegetation, before such activities commence.

3.3.4. Weeds and invader plant species

Weeds and invasive species are controlled in terms of the National Environmental Management: Biodiversity (NEMBA) Act 10 of 2004, the Conservation of Agricultural Resources (CARA) Act 43 of 1993, as well as the NCNCA (Schedule 6). These are species that do not naturally occur in a given area and exhibit tendencies to invade that area, and others; at the cost of locally indigenous species. To govern the control of such species, NEMBA and CARA have divided weeds and invader species into categories (see Table 3). All declared weeds and invasive species known from the region are listed in Table 4, along with their categories according to CARA, NEMBA and NCNCA.

Table 3. The categorisation of weeds and invader plant species, according to NEMBA and CARA.

NEMBA	CARA
<p>1a Listed invasive species that must be combatted or eradicated.</p>	<p>1 Plant species that must be removed and destroyed immediately. These plants serve no economic purpose and possess characteristics that are harmful to humans, animals and the environment.</p>
<p>1b Listed invasive species that must be controlled.</p>	<p>2 Plant species that may be grown under controlled conditions. These plants have certain useful qualities and are allowed in demarcated areas. In other areas they must be eradicated and controlled.</p>
<p>2 Listed invasive species that require a permit to carry out a restricted activity within an area.</p>	<p>3 Plant species that may no longer be planted. These are alien plants that have escaped from, or are growing in gardens and are proven to be invaders. No further planting is allowed. Existing plants may remain (except those within the flood line, 30 m from a watercourse, or in a wetland) and must be prevented from spreading.</p>
<p>3 Listed invasive species that are subject to exemptions and prohibitions</p>	

Table 4. A list of declared weeds and invasive species likely to occur in the study area.

Scientific name	Common name	CARA	NEMBA	NCNCA
<i>Argemone ochroleuca</i>	Mexican poppy	1	1b	S6
<i>Atriplex nummularia</i> subsp. <i>nummularia</i>	Old man saltbush	2	2	S6
<i>Prosopis velutina</i>	Velvet mesquite	2	3	S6
<i>Prosopis glandulosa</i> var. <i>glandulosa</i>	Honey mesquite	2	3	S6
<i>Tamarisk ramosissima</i>	Pink tamarisk	1	1b	S6

3.3.5. Indicators of bush encroachment

Bush encroacher species are controlled in terms of Regulation 16 of CARA; where land users of an area in which natural vegetation occurs and that contains communities of encroacher indicator plants are required to follow sound practices to prevent the deterioration of natural resources and to combat bush encroachment where it occurs. Declared indicators of bush encroachment in the Northern Cape, which are most likely to occur on site, are listed in Table 5.

Table 5. A list of declared indicators of bush encroachment in the Northern Cape most likely to occur in the study area.

Scientific name	Common name
<i>Euclea crispa</i>	Blue guarri
<i>Grewia flava</i>	Wild raisin
<i>Rhigozum trichotomum</i>	Three-thorn rhigozum
<i>Senegalia mellifera</i>	Black thorn
<i>Tarchonanthus camphoratus</i>	Camphor bush
<i>Vachellia karroo</i>	Sweet thorn
<i>Vachellia tortilis</i> subsp. <i>heteracantha</i>	Umbrella thorn

3.4. Faunal communities

According to Section 3(a) and 4(a) of the Northern Cape Nature Conservation (NCNCA) Act No. 9 of 2009, no person may, without a permit by any means hunt, kill, poison, capture, disturb, or injure any protected or specially protected animals. Furthermore, Section 12 (1) of NCNCA states that no person may, on a land of which he or she is not the owner, hunt a wild animal

without the written permission from the landowner. The many landscape features on Wexford provide diverse habitat opportunities to faunal communities. Animals likely to be found in the study area are discussed in their respective faunal groups below.

3.4.1. Mammals

As many as 54 terrestrial mammals and nine bat species have been recorded in the region (see Appendix 2). Eleven listed terrestrial mammal species and four listed bat species potentially occur in the area (Table 6). The African Straw-coloured Fruit-bat, Geoffroy’s Horseshoe Bat, Honey Badger, African Striped Weasel and Ground Pangolin have a high chance of occurring across the site, given their wide habitat tolerances. Pangolins however, are seldomly encountered due to their inconspicuous nature. The Dent’s Horseshoe Bat and Darling’s Horseshoe Bat also have a high chance to be found on site due to their preference for savanna habitat, while the Littledale’s whistling rat has a high potential occurring on site based on their preferences for shrubland habitat. The Cape Clawless Otter has a high potential to occur near the Orange River due to their preference for aquatic habitats.

Table 6. A list of mammal species found in the study area, which are of conservation concern in terms of the international (IUCN) Red List and the South African Red Data Book (SA RDB). Their respective NCNCA schedule numbers are indicated in superscript.

Scientific name	Common name	IUCN Status	SA RDB Status
² <i>Eidolon helvum</i>	African Straw-coloured Fruit-bat	NT	Not listed
² <i>Rhinolophus denti</i>	Dent's Horseshoe Bat	LC	NT
² <i>Rhinolophus clivosus</i>	Geoffroy’s Horseshoe Bat	LC	NT
² <i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat	LC	NT
² <i>Parotomys littledalei</i>	Littledale’s whistling rat	LC	NT
² <i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	LC	DD
¹ <i>Smutsia temminckii</i>	Ground Pangolin	VU	VU
² <i>Suncus varilla</i>	Lesser Dwarf Shrew	LC	DD
¹ <i>Atelerix frontalis</i>	South African Hedgehog	LC	NT
¹ <i>Felis nigripes</i>	Black-footed cat	VU	LC
² <i>Aonyx capensis</i>	Cape Clawless Otter	NT	LC
¹ <i>Hyaena brunnea</i>	Brown Hyena	NT	NT
¹ <i>Poecilogale albinucha</i>	African Striped Weasel	LC	DD
¹ <i>Mellivora capensis</i>	Honey Badger	LC	NT
² <i>Equus quagga</i>	Plains Zebra	NT	LC

On the other hand, the Bushveld Gerbil and Lesser Dwarf Shrew have a moderate potential of occurring in the more grassy areas on site. The South African Hedgehog and Black-footed cat may potentially occur on site on account of their preferences for arid areas. They are both however rather skittish and therefore they will most likely be found very seldomly. The Brown Hyaena has a low potential to be found on site mainly based on the fact that farm fences are restricting their occurrences across their natural distribution range.

Virtually all mammals of the study area are protected; either according to Schedule 1, 2 or 3 of NCNCA (see Appendix 2). Those that are specially protected include Aardvark, Ground Pangolin, South African Hedgehog, Aardwolf, African Wild Cat, Black-footed cat, Cape Fox, Brown hyena, Bat-eared Fox, African Striped Weasel, Striped Polecat and Honey Badger. Of these, Aardvark has a high potential to occur on site on the sandy plains. Problem animals (Schedule 4) include Black-backed Jackal, Vervet Monkey, Chacma Baboon and Caracal.

The core prospecting activities are associated with the calcrete and sandy plains. All fauna associated with these habitats will be impacted in the form of species- and/or habitat loss resulting from the prospecting activities.

3.4.2. Reptiles

The Wexford prospecting area lies within the distribution range of at least 36 reptile species (see Appendix 2), of which none are of international or national conservation concern. However, most are protected either according to Schedule 1, 2 or 3 of NCNCA, except for agamas, geckos and skinks (see Appendix 2). Specially protected species include *Karusasaurus polyzonus* (Southern Karusa Lizard) and *Chamaeleo dilepis dilepis* (Namaqua Chamaeleon). The habitat diversity for reptiles in the study area is high. The rocky ridge slopes are considered to be the most important habitat for reptile diversity at the site, while the ephemeral pans provide a special habitat for the marsh terrapin.

3.4.3. Amphibians

Eleven amphibian species are known from the region (Appendix 2). Low amphibian diversity is normal for an arid area, but is likely to increase within the aquatic and wetland ecosystem of the Orange River and pans (when wet). As a result, higher amphibian diversity is most likely to be found in these habitats, while only those species which are relatively independent of water are likely to be common in the terrestrial habitats.

The Giant Bull Frog (*Pyxicephalus adspersus*) is listed as Near Threatened and is protected according to Schedule 1 of the NCNCA. They prefer seasonal shallow grassy pans, vleis and other rain-filled depressions in open flat areas of grassland or savanna, but mainly remain buried up to 1 m underground until conditions become favourable. The site lies within the known distribution of this species and the numerous ephemeral pans on site could potentially provide the ideal habitat for this species. All other amphibians of the study area are protected according to Schedule 2 of NCNCA (see Appendix 2).

3.4.4. Avifauna

The study site does not fall within any of the Important Bird Areas (IBA) defined by Birdlife South Africa, but it is located near (< 100 km) of one IBA, i.e. Platberg-Karoo Conservancy (Figure 8).

Platberg-Karoo Conservancy lies \pm 50 km south-east of Wexford and contributes significantly to the conservation of large terrestrial birds and raptors. These include Blue Crane, Ludwig's Bustard, Kori Bustard, Blue Korhaan, Black Stork, Secretarybird, Martial Eagle, Verreaux's Eagle and Tawny Eagle. Threats in the area include overgrazing, which results in a depletion of palatable plant species, erosion, and encroachment by Karoo shrubs. The result is loss of suitable habitat and a decrease in the availability of food for large terrestrial birds. Centre-pivot irrigated croplands using underground water are increasing and agriculture is intensifying. Furthermore, strychnine poison was used extensively in the past to control damage-causing predators, such as black-backed jackal and caracal, which reduced scavenging raptor populations. Renewable energy developments are a new threat to this region.

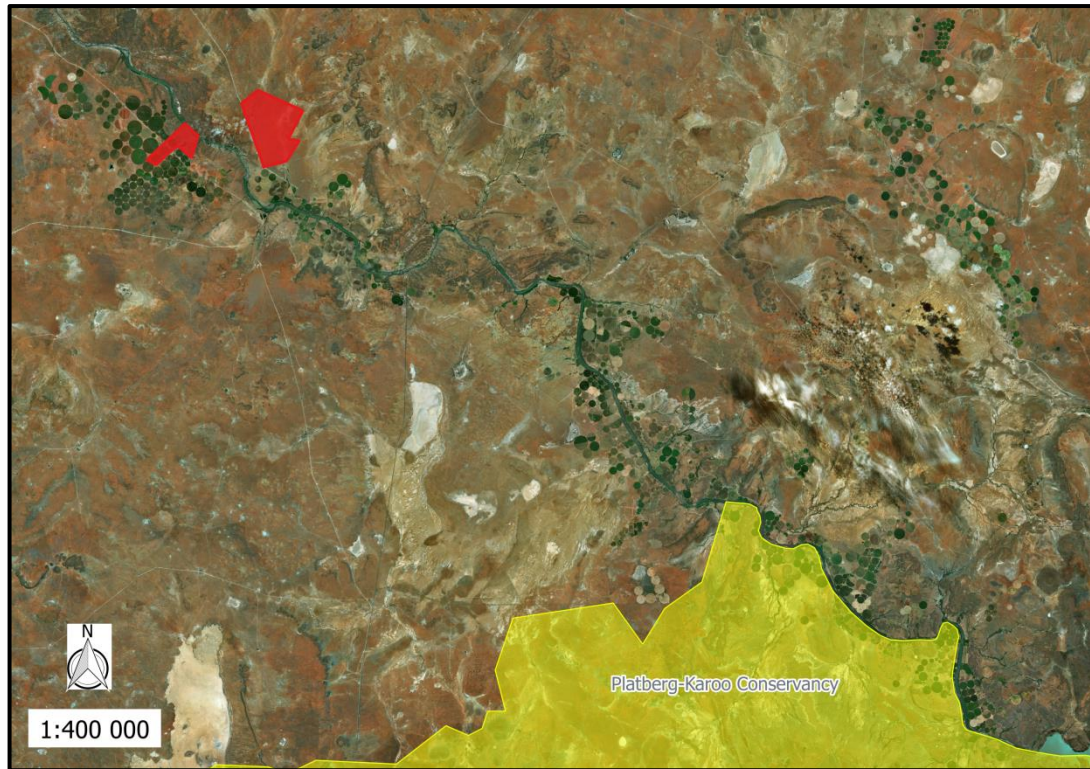


Figure 8. A map indicating the Important Bird Area (in yellow) near the study area (in red).

A total number of 261 bird species have been recorded from the region and all of these species are protected either according to Schedule 1, 2 or 3 of NCNCA (see Appendix 2). As many as 25 listed bird species are known from the region, all of which are classified as Vulnerable, Near Threatened or Endangered (Table 7). Furthermore, all birds are protected either according to Schedule 1, 2 or 3 of NCNCA (see Appendix 2). Those that are specially protected (Schedule 1) are also listed in Table 7.

The African Fish-Eagle (Schedule 1 of the NCNCA) is normally found in the vicinity of the Orange River. The ephemeral pans could potentially attract protected water birds, such as Chestnut-banded Plover, Maccoa Duck, Lesser Flamingo, Greater Flamingo and Greater Painted-snipe when inundated, while the remaining species could occur in the core areas by occasionally passing over, foraging or nesting.

Plants in general, from grass tufts to shrubs and tall trees provide important micro-habitats to birds and therefore any form of habitat destruction in the form of vegetation clearing will inevitably impact the bird population of the study site. However, due to their high mobility birds are rather resilient to local scale changes.

Table 7. Bird of conservation concern that are likely to occur on site. Species are indicated in terms of the SA Bird Atlas and Schedule 1 of the Northern Cape Nature Conservation Act (NCNCA).

Scientific name	Common name	SA Bird Atlas	NCNCA
<i>Accipiter badius</i>	Shikra		X
<i>Anthropoides paradisea</i>	Blue Crane	NT	
<i>Aquila rapax</i>	Tawny Eagle	EN	X
<i>Aquila verreauxii</i>	Verreaux's Eagle	VU	X
<i>Ardeotis kori</i>	Kori Bustard	NT	
<i>Bubo africanus</i>	Spotted Eagle-Owl		X
<i>Bubo lacteus</i>	Verreaux's Eagle-Owl		X
<i>Buteo rufofuscus</i>	Jackal Buzzard		X
<i>Buteo vulpinus</i>	Steppe Buzzard		X
<i>Caprimulgus europaeus</i>	European Nightjar		X
<i>Caprimulgus rufigena</i>	Rufous-cheeked Nightjar		X
<i>Caprimulgus tristigma</i>	Freckled Nightjar		X
<i>Charadrius pallidus</i>	Chestnut-banded Plover	NT	X
<i>Ciconia abdimii</i>	Abdim's Stork	NT	
<i>Ciconia nigra</i>	Black Stork	VU	X
<i>Circaetus pectoralis</i>	Black-chested Snake-Eagle		X
<i>Circus maurus</i>	Black Harrier	EN	X
<i>Circus pygargus</i>	Montagu's Harrier		X
<i>Circus ranivorus</i>	African Marsh-Harrier	EN	X
<i>Coracias garrulus</i>	European Roller	NT	
<i>Cursorius rufus</i>	Burchell's Courser	VU	
<i>Elanus caeruleus</i>	Black-shouldered Kite		X
<i>Falco biarmicus</i>	Lanner Falcon	VU	X
<i>Falco naumanni</i>	Lesser Kestrel		X
<i>Falco peregrinus</i>	Peregrine Falcon		X
<i>Falco rupicolis</i>	Rock Kestrel		X
<i>Falco rupicoloides</i>	Greater Kestrel		X
<i>Glareola nordmanni</i>	Black-winged Pratincole	NT	X
<i>Glaucidium perlatum</i>	Pearl-spotted Owlet		X
<i>Gyps africanus</i>	White-backed Vulture	CR	X
<i>Gyps coprotheres</i>	Cape Vulture	EN	X
<i>Haliaeetus vocifer</i>	African Fish-Eagle		X
<i>Hieraaetus pennatus</i>	Booted Eagle		X
<i>Leptoptilos crumeniferus</i>	Marabou Stork	NT	X
<i>Melierax gabar</i>	Gabar Goshawk		X
<i>Milvus migrans</i>	Black Kite		X
<i>Neotis ludwigii</i>	Ludwig's Bustard	EN	X
<i>Oxyura maccoa</i>	Maccoa Duck	NT	
<i>Phoenicopterus minor</i>	Lesser Flamingo	NT	X
<i>Phoenicopterus ruber</i>	Greater Flamingo	NT	X
<i>Polemaetus bellicosus</i>	Martial Eagle	EN	X
<i>Polihierax semitorquatus</i>	Pygmy Falcon		X
<i>Polyboroides typus</i>	African Harrier-Hawk		X
<i>Ptilopus granti</i>	Southern White-faced Scops-Owl		X
<i>Rostratula benghalensis</i>	Greater Painted-snipe	NT	X
<i>Sagittarius serpentarius</i>	Secretarybird	VU	X
<i>Torgos tracheliotus</i>	Lappet-faced Vulture	EN	X
<i>Tyto alba</i>	Barn Owl		X

3.4.5. Fish

Fish species expected to occur in the active channel of the Orange River is listed in Table 8, along with their IUCN status and sensitivity to physico-chemical and no-flow conditions. The Largemouth Yellowfish is endemic to the Orange-Senqu and Vaal River systems in the Orange-Senqu River Basin. It is also listed as Near Threatened (IUCN 2019) due to the continuous decline in water quality in most rivers and streams in its geographic range, the destruction of suitable spawning beds due to erosion, as well as their slow growth rate, late maturing and low fecundity. No prospecting activities are planned near the river and therefore the Wexford operation is not expected to have any impacts on the fish communities of the region.

Table 8. Fish species expected to occur in the active channel of the Orange River, along with their IUCN status and sensitivity to physico-chemical and no-flow conditions.

Scientific Name	Common name	IUCN	Phys-Chem sensitivity	No-Flow sensitivity
<i>Barbus anoplus</i>	Chubbyhead Barb	LC	Moderate	Moderate
<i>Barbus paludinosus</i>	Straightfin Barb	LC	Tolerant	Moderate
<i>Barbus trimaculatus</i>	Threespot barb	LC	Tolerant	Moderate
<i>Clarias gariepinus</i>	African Catfish	LC	Low	Low
<i>Labeo capensis</i>	Orange River Mudfish	LC	Moderate	High
<i>Labeo umbratus</i>	Moggel	LC	Low	Moderate
<i>Labeobarbus aeneus</i>	Vaal-orange Smallmouth Yellowfish	LC	Moderate	High
<i>Labeobarbus kimberleyensis</i>	Largemouth Yellowfish	NT	Moderate	Moderate
<i>Pseudocrenilabrus philander</i>	Southern Mouthbrooder	-	Low	Low
<i>Tilapia sparrmanii</i>	Banded Tilapia	LC	Low	Low

3.4.6. Invertebrates

Invertebrates dominate inland habitats and play a significant role in the overall function of the ecosystem (Kremen et al. 1993; Weisser and Siemann 2004). Their immense species diversity makes it almost impossible to list all species that may possibly occur on site. Nevertheless, key morphospecies as well as species of conservation concern are discussed here. Eight invertebrate species of the Northern Cape appear on the IUCN Red Data list of threatened species and are listed in Table 9, along with species that are specially protected according to Schedule 1 of the NCNCA. All other invertebrates from the class Insecta and Arachnida are protected either according to Schedule 2 or 3 of the NCNCA.

Table 9. Invertebrate species found in the Northern Cape that are of conservation concern.

CLASS	ORDER	Scientific Name	Common name	Status
ARACHNIDA	MYGALOMORPHAE	<i>Ceratogyrus</i> spp.	Horned Baboon Spiders	S1
		<i>Harpactira</i> spp.	Common Baboon Spiders	S1
		<i>Pterinochilus</i> spp.	Goldenbrown Baboon Spiders	S1
INSECTA	COLEOPTERA	<i>Circellium bacchus</i>	Cape Dung Beetle	S1
		<i>Colophon</i> spp.	All Stag Beetles	S1
	LEPIDOPTERA	<i>Lepidochrysops penningtoni</i>	Pennington's Blue	DD
	ORTHOPTERA	<i>Africariola longicauda</i>	Richtersveld Katydid	VU
		<i>Alfredectes browni</i>	Brown's Shieldback	DD
		<i>Brinckiella serricauda</i>	Serrated Winter Katydid	DD
		<i>Brinckiella arboricola</i>	Tree Winter Katydid	EN
		<i>Brinckiella aptera</i>	Mute Winter Katydid	VU
		<i>Brinckiella karoensis</i>	Karoo Winter Katydid	VU
			<i>Brinckiella mauerbergerorum</i>	Mauerberger's Winter Katydid
ONYCHOPHORA			Velvet worms	S1

Three major habitats delimit possible invertebrate communities on site, i.e. the ephemeral pan and a variety of terrestrial habitats collectively classified as Karoo vegetation for insect preference, according to Picker et al. (2004).

i. Perennial Orange River

Invertebrates expected to be associated with the Orange River include Flatworms, earthworms, leeches, freshwater crabs, mussels and prawn, basket clams, freshwater bivalve- and pulmonate snails, bladder snails, pond snails, prong-gilled mayflies, small squaregill mayflies and numerous other species of mayflies, jewel damselflies, narrowwinged damselflies, clubtail dragonflies, emerald dragonflies, skimmers dragonflies, grass moths, giant water bugs, water boatmen, water striders, water treaders, marsh treaders, creeping water bugs, water mites, sponges, water scorpions, backswimmers, pygmy backswimmers, riffle bugs, long-horned caddisflies, microcaddisflies, net-spinning caddisflies, diving beetles, riffle beetles, whirligig beetles, water scavenger beetles, long-toed water beetles, minute moss beetles, biting midges, meniscus midges, mosquitoes, house flies, black flies, horse flies, crane flies and nematoceran flies. No prospecting activities are planned near the Orange River and therefore the Wexford operation is not expected to have any direct impacts on the river invertebrate communities.

ii. **Ephemeral pans**

Ephemeral pans host species specifically adapted to ephemerality. Crustaceans in particular are specialist invertebrates that dominate these pans. Their eggs lie dormant in the soil until the pans are inundated. They then hatch and rapidly mature and reproduce to ensure continued persistence. Not much is known about the species distribution or conservation status of species in the Northern Cape, but typical taxa to be expected in the pans on Wexford include Notostraca, Anostraca, Spinicaudata, Cladocera, Ostracoda and Copepoda. Within a few days after the pans are inundated these species will attract a number of wetland birds. Therefore, these pans also act as important breeding and feeding links to birds in terms of connectivity, by providing stepping-stone corridors in an arid landscape. The disturbance or destruction of these pans will not only impact the specialised pan invertebrate communities locally, but will also have a regional and landscape-level effect.

iii. **Karoo vegetation**

Invertebrate communities associated with the karoo vegetation represent unique species assemblages, with an above-average representation of beetles, grasshoppers, flies, wasps and lacewings. Insects are widely distributed and extremely diverse. It is therefore impossible to list species occurrences without a dedicated study. However, the species of conservation concern (Table 9) are most likely to be associated with this invertebrate habitat and comprise the majority of the earmarked area for the Wexford operation.

3.5. Critical biodiversity areas and broad-scale processes

The proposed prospecting site falls within critical biodiversity areas (Figure 9), defined by the Northern Cape Critical Biodiversity Areas Map (Holness and Oosthuysen 2016). This map identifies biodiversity priority areas, i.e. Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape. The Orange River is classified as *Critical Biodiversity Area One*, with their associated buffer- and catchment areas classified as *Critical Biodiversity Area Two*. The ephemeral pans are classified as *Ecological Support Areas*, while the remainder of the study area on Wexford East is classified as *Other Natural Areas* (Figure 9). No protected areas occur on site. Conversely, according to the Mining and Biodiversity Guidelines (DENC et al. 2013) no areas on the study site is recognised to have biodiversity importance.

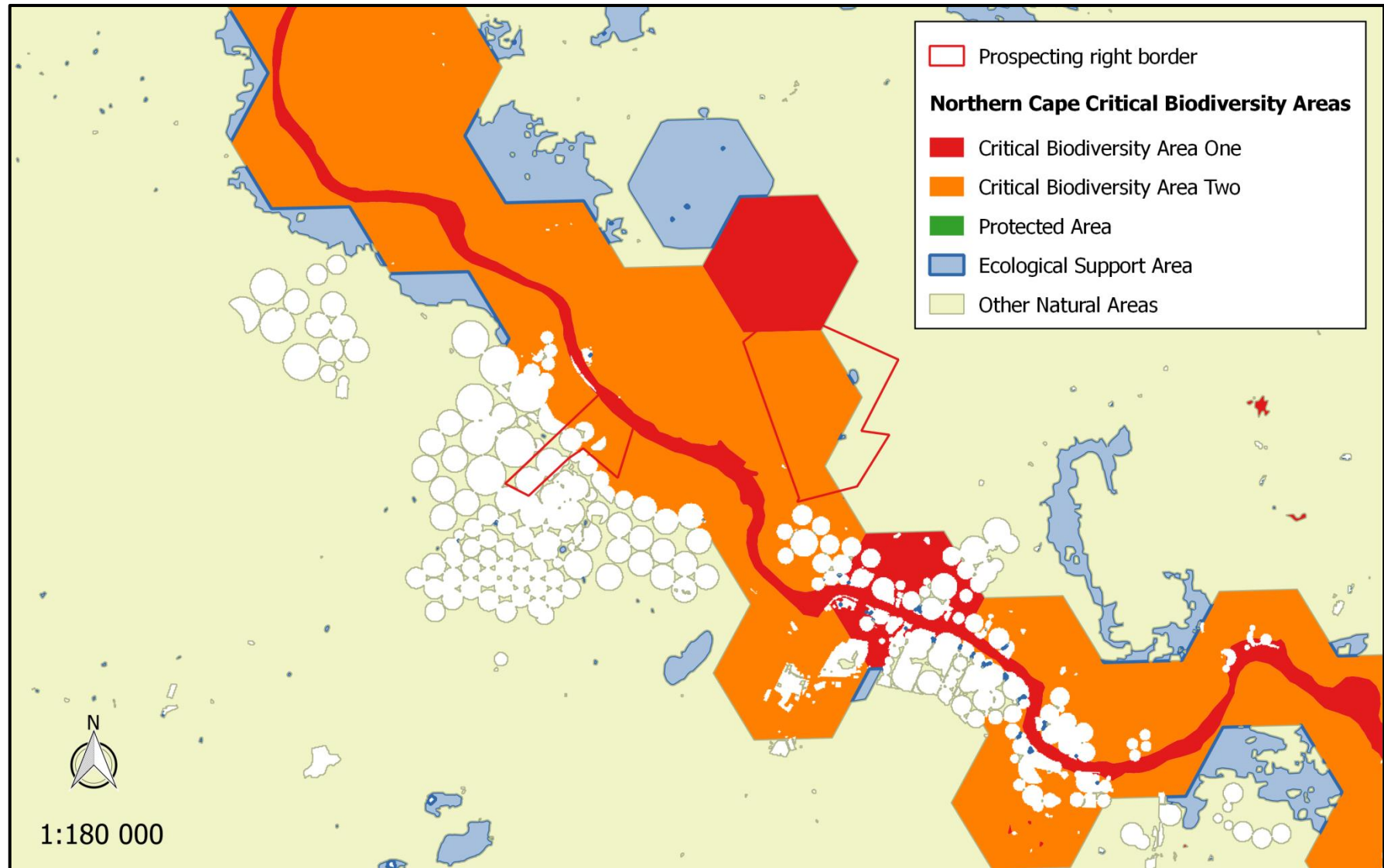


Figure 9. The study area in relation to the Northern Cape Critical Biodiversity Areas.

According to the Wetland Freshwater Priority Areas project, all of the ephemeral pans in the study area are Vulnerable and not protected. They have also been classified with a Present Ecological State of A/B, which means that they are in a *Natural* or *Good Condition*. None of the wetlands have however been identified as significant wetlands in terms of Ramsar sites, IUCN Frog localities, threatened water bird localities or Crane breeding grounds.

Most of the broad-scale vegetation units of the study area (Northern Upper Karoo, Highveld Salt Pans, Kimberley Thornveld and Vaalbos Rocky Shrubland) are classified as least threatened and therefore no formal fine-scale conservation planning has been conducted. However, the Upper Gariep Alluvial Vegetation is classified as Vulnerable. Therefore, all rivers (ephemeral and perennial), their riverbeds and associated 100 m buffers have been identified as ecological corridors within the Pixley Ka Seme District Municipality (Rumboll 2014). Here, special care must be taken with mining and agricultural practises so as to avoid water pollution and over extraction. These should be maintained to limit the potential impact of development on the water resources. Furthermore, the Wexford operation falls within a zone where one of the most significant crop irrigation in the Northern Cape occurs (Durand 2006). This increases the cumulative impacts in the vicinity of the study area Figure 10.



Figure 10. The extent of crop irrigation along the Orange River north of Hopetown.

3.6. Site sensitivity

The sensitivity map for the Wexford prospecting operation is illustrated in Figure 11. The ephemeral pans, drainage lines and Upper Gariep Alluvial Vegetation (along with the banks and channels of the Orange River) are considered to be of **very high** sensitivity due to their vital ecological and hydrological functionality and significance. The Upper Gariep Alluvial Vegetation is regarded to be vulnerable and all watercourses in the study area are also unique habitats protected in terms of the National Water Act (Act No 36 of 1998). These units are essentially no-go areas.

The Vaalbos Rocky Shrubland associated with ridges are considered to be of **high** sensitivity, on account of the steep slopes which increases erosion and runoff risk during disturbances. Furthermore, it is expected to provide important microhabitats to reptiles and other fauna and potentially host a high density of plant species of conservation concern. This unit is not regarded as a no-go area, but activities should only proceed with caution as it may not be possible to mitigate all impacts appropriately.

The Kimberley Thornveld and Northern Upper Karoo units are considered to be of **medium** sensitivity. These areas have very gradual slopes and although it is expected to be affected by the prospecting operation, the nature of the impacts is likely to be largely local and the risk of secondary impact such as erosion is low. Activities within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.

The transformed areas are considered to be of **low** ecological sensitivity on account of the transformation of natural habitats that has already occurred here.

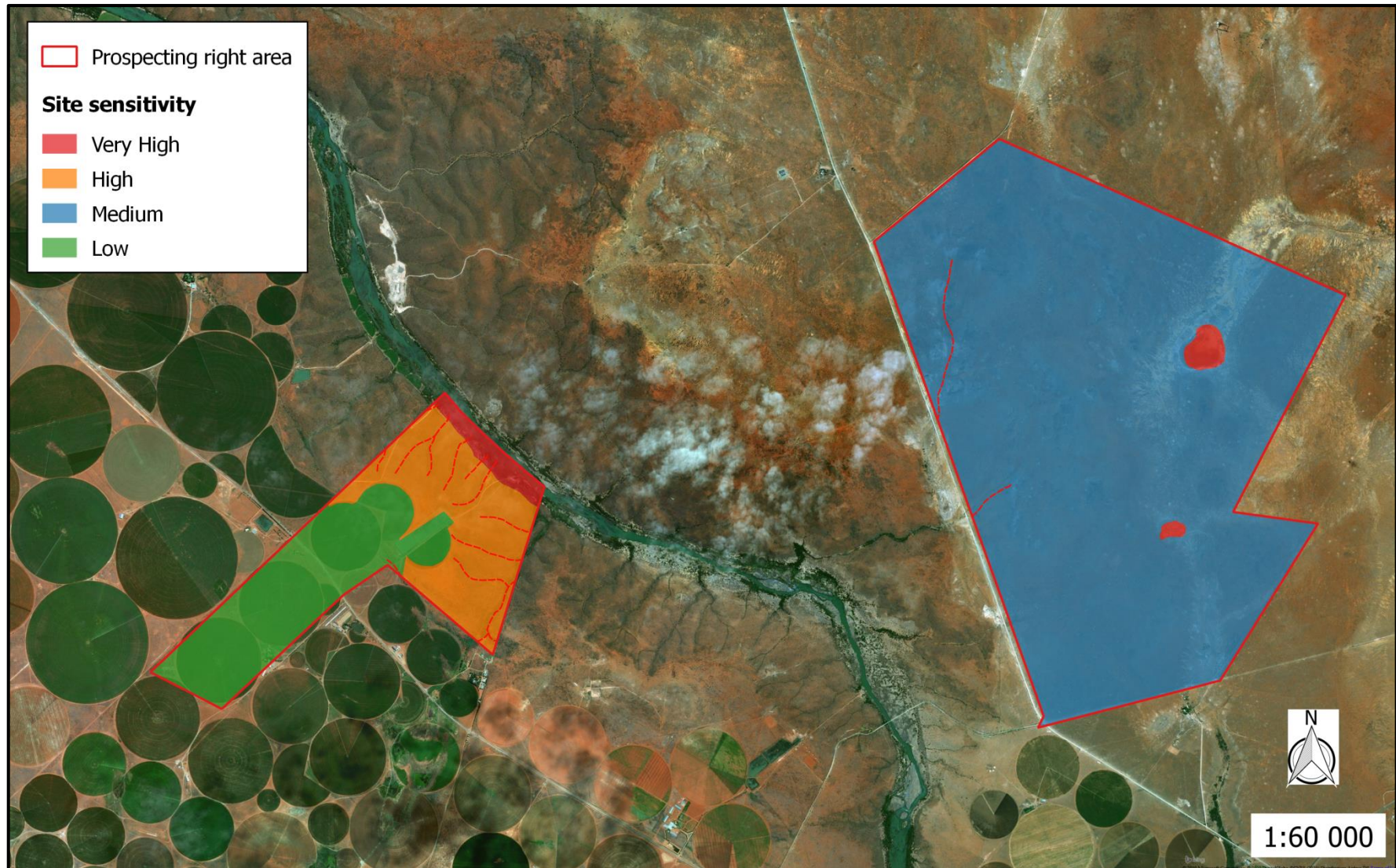


Figure 11. A sensitivity map for the Wexford prospecting area.

4. ECOLOGICAL IMPACT ASSESSMENT

In this section, the potential impacts and associated risk factors that may be generated by the Wexford prospecting operation are identified and described. A detailed analysis of each impact is provided in Table 10. The impacts are assessed in terms of the relevant ecological aspects and each impact is associated with an outline of specific mitigation measures, which with proper implementation, monitoring and auditing, will serve to reduce the significance of the impact. In order to ensure that the impacts identified are broadly applicable and inclusive, all the likely or potential impacts that may be associated with the prospecting activities are listed.

4.1. Topography, soil erosion and associated degradation of landscapes

4.1.1. Loss of soil fertility

Source of the impact

The removal of any topsoil during the construction of roads and drill pads.

Description of the impact

Improper stockpiling and soil compaction can result in soil sterilisation. Leaching can also occur, resulting in the loss of nutrients.

Mitigation and monitoring

- If any topsoil is removed during creation of roads or drill pads then these stockpiles must be kept as small as possible in order to prevent compaction and the formation of anaerobic conditions.
- Topsoil must be stockpiled for the shortest possible timeframes in order to ensure that the quality of the topsoil is not impaired.
- Topsoil must not be handled when the moisture content exceeds 12 %.
- Topsoil stockpiles must be kept separate from sub-soils.
- The topsoil should be replaced as soon as possible on to the backfilled areas, thereby allowing for the re-growth of the seed bank contained within the topsoil.

Table 10. A detailed analysis of ecological impacts identified for the Wexford prospecting operation.

	IMPACT	Phase			Extent	Duration	Severity	Probability	Significance	Significance after Mitigation
		C	O	D						
Landscape	Loss of soil fertility	✓	✓	✓	Local (2)	Residual (4)	High (3)	Rare and infrequent (5)	Low (45)	Very low
	Increase in soil erosion	✓	✓	✓	Local (2)	Decommissioning (3)	High (3)	Possible but infrequently (7)	Low - Medium (56)	Low
Flora	Loss of indigenous vegetation	✓	✓	✓	On-site (1)	Short term (1)	Minimal (1)	Possible but infrequent (7)	Very low (21)	Very low
	Loss of Red data and/or protected floral species	✓	✓		Local (2)	Residual (4)	High (3)	Possible but infrequent (7)	Low - Medium (63)	Low
	Introduction or spread of alien species	✓	✓	✓	Regional (4)	Residual (4)	High (3)	Rare and infrequent (5)	Low-Medium (55)	Low
	Bush encroachment			✓	Local (2)	Residual (4)	Medium (2)	Rare and infrequent (5)	Low (40)	Very low

	IMPACT	Phase			Extent	Duration	Severity	Probability	Significance	Significance after Mitigation
		C	O	D						
Fauna	Habitat fragmentation	✓	✓	✓	Local (2)	Decommissioning (3)	Medium (2)	Possible but infrequent (7)	Low (49)	Very low
	Disturbance, displacement and killing of fauna	✓	✓		Regional (3)	Decommissioning (3)	Medium (2)	Possible for life of operation (9)	Low-Medium (72)	Low
Ecological Processes	Compromise of ecological processes	✓	✓		Regional (3)	Residual (4)	High (3)	Highly unlikely and infrequent (4)	Low (40)	Very low

4.1.2. Soil erosion

Source of the impact

Clearing of vegetation and disturbance during the construction of roads and drill pads; alterations to slopes, pan and river catchments and drainage line characteristics.

Description of the impact

Vegetation will be stripped for construction of new roads and drill pads and these areas will be bare and susceptible to erosion. Any topsoil and overburden that is stripped and piled on surrounding areas can be eroded by wind, rain and flooding. The soil/sediments will be carried away during runoff. The affected areas should be rehabilitated, but full restoration might only occur over a number of years, subsequent to the re-establishment of vegetation and hydrologic regime.

Mitigation and monitoring

- Re-establishment of plant cover on disturbed areas must take place as soon as possible, once activities in the area have ceased.
- Any road construction over drainage lines or pan and river catchments should be done to allow continuance of the natural hydrological regime.
- Ground exposure should be minimised in terms of the surface area and duration.
- Disturbances during the rainy season (November to March) should be monitored and controlled.
- Run-off from exposed ground should be controlled with flow retarding barriers.
- Regular audits carried out to identify areas where erosion is occurring; followed by appropriate remedial actions.

4.2. Vegetation and floristics

4.2.1. Loss of indigenous vegetation

Source of the impact

Construction of roads and drill pads; vehicular movement.

Description of the impact

The construction of roads and drill pads will damage or destroy natural vegetation. It is expected that trampled vegetation will not be significantly affected and any destruction to natural vegetation will be at a very small scale, based on the low invasive nature of drilling activities. It is likely that areas of high ecological function will rehabilitate following such disturbance events. Vehicle traffic generates lots of dust which can reduce the growth success and seed dispersal of many small plant species; however traffic volumes associated with drilling activities are very low.

Mitigation and monitoring

- Minimise the footprint of transformation, by keeping to existing roads where possible.
- Ensure measures for the adherence to the speed limit to minimise dust plumes.
- Encourage the growth of natural plant species by sowing indigenous seeds or by planting seedlings where major vegetation clearance has taken place.
- Apply for permits to authorise the large-scale clearance of indigenous vegetation from DENC.

4.2.2. Loss of Red data and/or protected floral species

Source of the impact

Removal of listed or protected plant species during the construction of roads and drill pads and/or illegal harvesting.

Description of the impact

It is possible that prospecting activities will destroy protected species and other species of conservation concern through construction of drill pads and roads, vehicular movement and if any illegal harvesting occurs.

Mitigation and monitoring

- All footprint areas of the prospecting activities must be scanned for Red Listed and protected plant species prior to any destructive activities.
- It is recommended that these plants are identified and marked prior to intended activity.
- These plants should, where possible, be incorporated into the activity layout and left in situ.
- However, if threatened by destruction, these plants should be removed (with the relevant permits from DAFF and/or DENC) and relocated if possible.
- A management plan should be implemented to ensure proper establishment of ex situ individuals, and should include a monitoring programme for at least two years after re-establishment in order to ensure successful translocation.
- The appointment of a full-time ECO must render guidance to the staff and contractors with respect to suitable areas for all related disturbance, and must ensure that all contractors and workers undergo Environmental Induction prior to commencing with work on site. The environmental induction should occur in the appropriate languages for the workers who may require translation.
- All those working on site must be educated about the conservation importance of the flora occurring on site.
- Employ measures to ensure that no illegal harvesting takes place.

4.2.3. Introduction or spread of alien species

Source of the impact

Clearing of vegetation and disturbance during the construction of roads and drill pads.

Description of the impact

The extent of alien invasive species in the study area is unknown. However, general clearing of vegetation destroy natural vegetation, wherafter invasive plants can increase due to their opportunistic nature in disturbed areas. If invasive plants establish in disturbed areas, it may cause an impact beyond the boundaries of the prospecting site. These alien invasive species are thus a threat to surrounding natural vegetation and can result in the decrease of biodiversity and ecological value of the area. Therefore, if alien invasive species are not controlled and managed, their propagation into new areas could have a high impact on the surrounding natural vegetation in the long term. With proper mitigation, the impacts can be substantially reduced. However, based on the low invasive nature of drilling activities, this impact is not likely to occur during the proposed operation.

Mitigation and monitoring

- Minimise the footprint of transformation.
- Encourage the growth of natural plant species.
- Mechanical methods of control to be implemented if needed.
- Annual follow-up operations to be implemented.

4.2.4. Encouraging bush encroachment

Source of the impact

Clearing of vegetation and disturbance during the construction of roads and drill pads.

Description of the impact

The potential extent of bush encroaching species on site is unknown. While general clearing of the area and prospecting activities destroy natural vegetation, bush encroaching plants can increase due to their opportunistic nature in disturbed areas. If encroaching plants establish in disturbed areas, it may the lower potential for future land use and decrease biodiversity. With proper mitigation, the impacts can be substantially reduced and if any such species are removed during prospecting activities the prospecting operation can have a positive effect by reducing bush encroachment.

Mitigation and monitoring

- Minimise the footprint of transformation.
- Encourage the growth of natural plant species.
- Mechanical methods of control to be implemented if needed.
- Annual follow-up operations to be implemented.

4.3. Fauna

4.3.1. Habitat fragmentation

Source of the impact

Clearing of vegetation and disturbance during the construction of roads and drill pads.

Description of the impact

Prospecting activities could result in the loss of connectivity and fragmentation of natural habitat, which generally leads to the loss of migration corridors, in turn resulting in degeneration of the affected population's genetic make-up. This impact will be most profound if trees are removed or characteristics of watercourses are altered. However, due to the low invasive nature of drilling activities this impact will not be significant.

Mitigation and monitoring

- All activities associated with the prospecting operation must be planned, where possible in order to encourage faunal dispersal and should minimise dissection or fragmentation of any important faunal habitat type.
- Limit the removal of trees.
- The extent of the earmarked area should be demarcated on site layout plans. No staff, contractors or vehicles may leave the demarcated area except those authorised to do so.
- Those pristine areas surrounding the earmarked area that are not part of the demarcated area should be considered as a no go zone for employees, machinery or even visitors.
- Employ sound rehabilitation measures to restore the characteristics of any affected watercourses.

4.3.2. Disturbance, displacement and killing of fauna

Source of the impact

Vegetation clearing; increase in noise and vibration; human and vehicular movement on site resulting from prospecting activities.

Description of the impact

The transformation of natural habitats will result in the loss of micro habitats, affecting individual species and ecological processes. This will result in the displacement of faunal species that depend on such habitats, e.g. birds that nest in trees or reptiles residing in rock crevices. Increased noise and vibration will disturb and possibly displace wildlife. Fast moving vehicles cause road kills of small mammals, birds, reptiles, amphibians and a large number of invertebrates. Intentional killing of snakes, reptiles, vultures and owls will negatively affect the local populations.

Mitigation and monitoring

- Careful planning of the operation is needed in order to avoid the destruction of pristine habitats and minimise the overall disturbance footprint.
- The extent of the prospecting activities should be demarcated on site layout plans, and no personnel or vehicles may leave the demarcated area except if authorised to do so. Areas surrounding the earmarked site that are not part of the demarcated area should be considered as a no go zone.
- However, if any of the protected species are threatened by destruction, the relevant permits from DENC should be obtained followed by the relevant mitigation procedures stipulated in the permits.
- A full-time ECO must render guidance to the staff and contractors with respect to suitable areas for all related disturbance.
- Everyone on site must undergo environmental induction for awareness on not harming or collecting species that are often persecuted out of superstition and to be educated about the conservation importance of the fauna occurring on site.
- Reptiles and amphibians that are exposed during the clearing operations should be captured for later release or translocation by a qualified expert.
- Employ measures that ensure adherence to the speed limit to lower the risk of animals being killed on the roads.

4.4. Broad-scale ecological processes

Source of the impact

Clearing of vegetation and disturbance during the construction of roads and drill pads; alterations to slopes, pan-, river- and drainage line characteristics.

Description of the impact

Transformation of intact habitat on a cumulative basis would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations. The fragmentation of ephemeral drainage ways, pans, river beds and riparian vegetation will destroy connectivity of vital ecological corridors and it will disrupt the hydrological regime on a landscape level. However, due to the low invasive nature of the proposed activity the potential for cumulative impacts is not significant during the proposed prospecting operation.

Mitigation and monitoring

- Minimise the footprint of transformation.
- Encourage proper rehabilitation of affected areas.
- Encourage the growth of natural plant species.
- Encourage the preservation of ecological corridors.
- Employ sound rehabilitation measures to restore the characteristics of any affected watercourses.

5. CONCLUSION, RECOMMENDATIONS AND OPINION REGARDING AUTHORISATION

Six potential plant communities were identified on site of which the Upper Gariep Alluvial Vegetation (along with the banks and channels of the Orange River), ephemeral drainage lines and ephemeral pan are considered to be of very high sensitivity. The Vaalbos Rocky Shrubland on the ridges are considered to be of high sensitivity, while the Northern Upper Karoo and Kimberley Thornveld vegetation units are considered to be of medium sensitivity. The area transformed for agriculture is considered to be of low sensitivity. The most profound impacts are expected to be related to the loss of plant species of conservation concern as well as the disruption of ecological corridors and the hydrological regime if any of the tributaries to the Orange River are cut off, or if the ephemeral pans and ephemeral drainage lines are modified through road creation or drill pad establishment.

Species of conservation concern that are likely to be found in the prospecting area include *Lithops hookeri*, *Mestoklema arboriforme*, *Plinthus cryptocarpus*, *P. karoocicus*, *P. sericeus*, *Psilocaulon coriarium*, *Nerine laticoma*, *Microloma armatum* var. *armatum*, *Orbea cooperi*, *Aloe claviflora*, *Aloe grandidentata*, *Haworthia bolusii*, *Boscia albitrunca*, *Gymnosporia buxifolia*, *Kalanchoe rotundifolia* and *Vachellia erioloba*. Permit applications regarding protected flora as well as the harvesting of indigenous vegetation need to be lodged with the Northern Cape Department of Environment and Nature Conservation three months prior to any clearance of vegetation.

Similarly, if any of the *Boscia albitrunca* or *Vachellia erioloba* trees are to be affected, a licence application regarding protected trees should be lodged with Department of Agriculture, Forestry and Fisheries three months prior to any potential disturbances to these trees.

To conclude, disturbances to the natural habitat and associated fauna within the study area are inevitable. However, the significance of the impacts is low due to the low invasive nature of drilling activities. Nevertheless, any significance of the impacts will be affected by the success of the mitigation measures implemented and the rehabilitation programme for the prospecting area. In my opinion, authorisation for the proposed operation should be granted. However, the applicant should still commit to the adherence of effective avoidance, management, mitigation and rehabilitation measures.

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APPENDICES

APPENDIX 1

Plant species list

FAMILY	SPECIES	STATUS	NFA	NCNCA
ACANTHACEAE	<i>Justicia incana</i>	LC		
	<i>Justicia thymifolia</i>	LC		
AIZOACEAE	<i>Lithops hookeri</i>	LC		S2
	<i>Mestoklema arboriforme</i>	LC		S2
	<i>Plinthus cryptocarpus</i>	LC		S2
	<i>Plinthus karooicus</i>	LC		S2
	<i>Plinthus sericeus</i>	LC		S2
	<i>Psilocalyon coriarium</i>	LC		S2
AMARANTHACEAE	<i>Atriplex nummularia</i>	Nat. Exotic		
	<i>Chenopodium album</i>	Nat. Exotic		
	<i>Salsola aphylla</i>	LC		
	<i>Salsola calluna</i>	LC		
	<i>Salsola geminiflora</i>	LC		
	<i>Salsola glabrescens</i>	LC		
	<i>Salsola smithii</i>	LC		
AMARYLLIDACEAE	<i>Nerine laticoma</i>	LC		S2
ANACARDIACEAE	<i>Searsia burchellii</i>	LC		
	<i>Searsia ciliata</i>	LC		
	<i>Searsia lancea</i>	LC		
	<i>Searsia pendulina</i>	LC		
APIACEAE	<i>Ammi majus</i> var. <i>glaucofolium</i>	Nat. Exotic		
APOCYNACEAE	<i>Microloma armatum</i> var. <i>armatum</i>	LC		S2
	<i>Orbea cooperi</i>	LC		S2
ASPARAGACEAE	<i>Asparagus cooperi</i>	LC		
	<i>Asparagus setaceus</i>	LC		
	<i>Asparagus suaveolens</i>	LC		
ASPHODELACEAE	<i>Aloe claviflora</i>	LC		S2
	<i>Aloe grandidentata</i>	LC		S2
	<i>Haworthia bolusii</i> var. <i>blackbeardiana</i>	DDT		S2
ASTERACEAE	<i>Chrysocoma ciliata</i>	LC		
	<i>Eriocephalus decussatus</i>	LC		
	<i>Felicia filifolia</i> subsp. <i>filifolia</i>	LC		
	<i>Garuleum schinzii</i> subsp. <i>schinzii</i>	LC		
	<i>Helichrysum arenicola</i>	LC		
	<i>Helichrysum lineare</i>	LC		
	<i>Helichrysum lucilioides</i>	LC		
	<i>Helichrysum zeyheri</i>	LC		
	<i>Pentzia globosa</i>	LC		
	<i>Pentzia incana</i>	LC		
	<i>Pentzia quinquefida</i>	LC		
	<i>Pteronia glauca</i>	LC		
	<i>Pteronia mucronata</i>	LC		
	<i>Rosenia humilis</i>	LC		
	<i>Senecio consanguineus</i>	LC		
	<i>Tarchonanthus camphoratus</i>	Decl Enchr		
BIGNONIACEAE	<i>Rhigozum obovatum</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
BIGNONIACEAE	<i>Rhigozum trichotomum</i>	Decl Enchr		
BRASSICACEAE	<i>Boscia albitrunca</i>	LC	X	S2
	<i>Cadaba aphylla</i>	LC		
CAMPANULACEAE	<i>Wahlenbergia nodosa</i>	LC		
CELASTRACEAE	<i>Gymnosporia buxifolia</i>	LC		S2
CRASSULACEAE	<i>Kalanchoe rotundifolia</i>	LC		S2
EBENACEAE	<i>Diospyros lycioides</i>	LC		
	<i>Euclea crispa</i>	Decl Enchr		
FABACEAE	<i>Leobordea platycarpa</i>	LC		
	<i>Leptochloa fusca</i>	LC		
	<i>Melolobium microphyllum</i>	LC		
	<i>Prosopis glandulosa</i> var. <i>glandulosa</i>			
	<i>Prosopis velutina</i>			
	<i>Rhynchosia capensis</i>	LC		
	<i>Schotia afra</i> var. <i>afra</i>	LC		
	<i>Senegalia mellifera</i>	Decl Enchr		
	<i>Trifolium africanum</i>	LC		
	<i>Vachellia erioloba</i>	LC	X	
	<i>Vachellia karroo</i>	Decl Enchr		
	<i>Vachellia tortilis</i>	Decl Enchr		
GENTIANACEAE	<i>Sebaea pentandra</i> var. <i>burchellii</i>	LC		
HYACINTHACEAE	<i>Albuca setosa</i>	LC		
MALVACEAE	<i>Grewia flava</i>	Decl Enchr		
	<i>Hermannia comosa</i>	LC		
	<i>Hermannia cuneifolia</i> var. <i>glabrescens</i>	LC		
	<i>Hermannia linearifolia</i>	LC		
	<i>Hibiscus pusillus</i>	LC		
	<i>Malva pusilla</i>	Nat. Exotic		
OLEACEAE	<i>Olea europaea</i> subsp. <i>africana</i>	LC		S2
PAPAVERACEAE	<i>Argemone ochroleuca</i>			
POACEAE	<i>Antheophora pubescens</i>	LC		
	<i>Aristida canescens</i>	LC		
	<i>Aristida congesta</i>	LC		
	<i>Aristida diffusa</i>	LC		
	<i>Arstida adscensionis</i>	LC		
	<i>Brachiaria marlothii</i>	LC		
	<i>Cenchrus ciliaris</i>	LC		
	<i>Centropodia glauca</i>	LC		
	<i>Chloris virgata</i>	LC		
	<i>Cymbopogon pospischilii</i>	Nat. Exotic		
	<i>Cynodon dactylon</i>	LC		
	<i>Digiteria eriantha</i>	LC		
	<i>Ehretia rigida</i>	LC		
	<i>Elionurus muticus</i>	LC		
	<i>Enneapogon cenchroides</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
POACEAE	<i>Enneapogon desvauxii</i>	LC		
	<i>Enneapogon scoparius</i>	LC		
	<i>Eragrostis bicolor</i>	LC		
	<i>Eragrostis biflora</i>	LC		
	<i>Eragrostis echinochloidea</i>	LC		
	<i>Eragrostis lehmanniana</i>	LC		
	<i>Eragrostis obtusa</i>	LC		
	<i>Eragrostis porosa</i>	LC		
	<i>Eragrostis truncata</i>	LC		
	<i>Fingerhuthia africana</i>	LC		
	<i>Heteropogon contortus</i>	LC		
	<i>Hyparrhenia hirta</i>	LC		
	<i>Panicum coloratum</i>	LC		
	<i>Setaria verticillata</i>	LC		
	<i>Stipagrostis namaquensis</i>	LC		
	<i>Stipagrostis obtusa</i>	LC		
	<i>Stipagrostis uniplumis</i> var. <i>uniplumis</i>	LC		
	<i>Themeda triandra</i>	LC		
	<i>Tragus berteronianus</i>	LC		
	<i>Tragus racemosus</i>	LC		
POLYGALACEAE	<i>Polygala krumanina</i>	LC		
PTERIDACEAE	<i>Cheilanthes eckloniana</i>	LC		
	<i>Pellaea calomelanos</i>	LC		
RANUNCULACEAE	<i>Ranunculus multifidus</i>	LC		
RHAMNACEAE	<i>Ziziphus mucronata</i> subsp. <i>mucronata</i>	LC		
RUBIACEAE	<i>Anthospermum rigidum</i>	LC		
	<i>Rubia cordifolia</i>	LC		
SALICACEAE	<i>Salix mucronata</i>	LC		
SANTALACEAE	<i>Osyris lanceolata</i>	LC		
	<i>Thesium hystrix</i>	LC		
	<i>Viscum hoolei</i>	LC		
SCROPHULARIACEAE	<i>Aptosimum albomarginatum</i>	LC		
	<i>Aptosimum spinescens</i>	LC		
	<i>Buddleja saligna</i>	LC		
	<i>Peliostomum organoides</i>	LC		
	<i>Selago albida</i>	LC		
	<i>Selago geniculata</i>	LC		
	<i>Selago mixta</i>	LC		
SOLANACEAE	<i>Lycium hirsutum</i>	LC		
	<i>Lycium pilifolium</i>	LC		
TAMARICACEAE	<i>Tamarix ramosissima</i>			
THYMELAEACEAE	<i>Lasiosiphon polycephalus</i>	LC		
VERBENACEAE	<i>Chascanum pinnatifidum</i>	LC		
ZYGOPHYLLACEAE	<i>Zygophyllum lichtensteiniana</i>	LC		

APPENDIX 2

Fauna species list

LIST OF MAMMALS

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
CHIROPTERA	² <i>Eidolon helvum</i>	African Straw-coloured Fruit-bat	NT	Not listed	Wide habitat tolerance.	High
	² <i>Eptesicus hottentotus</i>	Long-tailed Serotine Bat	LC	LC	Mainly close to rivers and surrounding habitats.	High
	² <i>Neoromicia capensis</i>	Cape Bat	LC	LC	Wide habitat tolerance, but often found in arid areas, grassland, bushveld and <i>Acacia</i> woodland. Animals roost under the bark of trees and similar vegetation.	High
	³ <i>Miniopterus natalensis</i>	Natal Long-fingered Bat	LC	Not listed	Mainly roosts in caves or mine shafts, but also in crevices and holes in trees.	Medium
	² <i>Nycteris thebaica</i>	Common Slit-faced Bat	LC	LC	Savanna species with wide habitat tolerance. Roosts in caves, mine adits, aardvark holes, rock crevices and hollow trees in open savanna woodland.	High
	² <i>Rhinolophus denti</i>	Dent's Horseshoe Bat	LC	NT	Savanna habitats.	High
	² <i>Rhinolophus clivus</i>	Geoffroy's Horseshoe Bat	LC	NT	Wide habitat tolerance.	High
	² <i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat	LC	NT	Savanna habitats.	High
	² <i>Tadarida aegyptiaca</i>	Egyptian Free-tailed Bat	LC	LC	Wide habitat tolerance.	High

LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
MACROSCELIDIDAE	² <i>Macroselides proboscideus</i>	Round-eared Sengi	LC	LC	A habitat specialist occupying gravel plains associated with alluvial plains and relatively flat areas between higher elevation areas such as outcrops, scarps, hills, and mountains.	High
	² <i>Elephantulus rupestris</i>	Western Rock Sengi	LC	LC	Arid habitats, including deserts, dry savannas, and dry shrublands. Typically associated with rocky ridges, outcrops or koppies (rocky hills), and boulder fields at the bases of mountains.	High
TUBULENTATA	¹ <i>Orycteropus afer</i>	Aardvark	LC	LC	Wide habitat tolerance, being found in open woodland, scrub and grassland, especially associated with sandy soil.	High
HYRACOIDEA	² <i>Procavia capensis</i>	Rock Hyrax	LC	LC	Outcrops of rocks, especially granite formations and dolomite intrusions in the Karoo. Also erosion gullies.	High

LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
LAGOMORPHA	² <i>Lepus capensis</i>	Cape Hare	LC	LC	Dry, open regions, with palatable bush and grass.	High
	² <i>Lepus saxatilis</i>	Scrub Hare	LC	LC	Common in agriculturally developed areas, especially in crop-growing areas or in fallow lands where there is some bush development.	Moderately high
	² <i>Pronolagus rupestris</i>	Smith's Red Rock Rabbit	LC	LC	Rocky habitats, from isolated outcrops to mountain ranges; in high and low rainfall areas, but absent from true desert.	Moderately high
RODENTIA	² <i>Hystrix africaeaustralis</i>	Cape Porcupine	LC	LC	Catholic in habitat requirements.	High
	² <i>Xerus inauris</i>	South African Ground Squirrel	LC	LC	Open terrain with a sparse bush cover and hard substrate.	High
	² <i>Pedetes capensis</i>	Springhare	LC	LC	Occurs widespread: open sandy ground, sandy scrub, overgrazed grassland, edges of vleis and dry river beds.	High
	² <i>Graphiurus ocularis</i>	Spectacled Dormouse	LC	LC	Rocky habitats, but also trees.	High

LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
RODENTIA	² <i>Saccostomus campestris</i>	Pouched Mouse	LC	LC	Wide habitat tolerance but prefers soft, particularly sandy soils; can be found in open and dense vegetation and in rocky areas; annual rainfall of 250 - 1 200 mm.	High
	² <i>Malacothrix typica</i>	Large-eared (Gerbil) Mouse	LC	LC	Short grass habitats over hard soil.	Moderately high
	³ <i>Rhabdomys dilectus</i>	Mesic Four-striped Grass Mouse	LC	<i>Not listed</i>	Wide habitat tolerance, from desert fringe to high-rainfall montane areas with grass cover.	High
	² <i>Rhabdomys pumilio</i>	Four-striped Grass Mouse	LC	LC	Essentially a grassland species; occurs in wide variety of habitats where there is good grass cover.	High
	³ <i>Mus musculus</i>	House Mouse	LC	<i>Not listed</i>	Wide habitat tolerance.	High
	² <i>Thallomys nigricauda</i>	Black-tailed Tree Rat	LC	LC	Arboreal species generally associated with <i>Acacia</i> bushland habitats.	Moderately high

LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
RODENTIA	² <i>Mastomys coucha</i>	Southern Multimammate Mouse	LC	LC	Wide habitat tolerance.	High
	² <i>Parotomys littledalei</i>	Littledale's Whistling Rat	LC	NT	Occurs in shrublands and is not known to persist in disturbed or modified habitats.	High
	² <i>Micaelamys namaquensis</i>	Namaqua Rock Mouse	LC	LC	Catholic habitat requirements, but prefer rocky hills, outcrops or boulder-strewn hillsides.	High
	² <i>Myotomys unisulcatus</i>	Bush Karoo Rat	LC	LC	Shrub and fynbos associations in areas with rocky outcrops. Tend to avoid damp situations but exploit the semi-arid Karoo through behavioural adaptation.	High
	² <i>Cryptomys hottentotus</i>	African Mole Rat	LC	LC	Occurs in a wide range of substrates and habitats	High
	² <i>Desmodillus auricularis</i>	Cape Short-tailed Gerbil	LC	LC	Tend to occur on hard ground, unlike other gerbil species, with some cover of grass or karroid bush.	High

LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
RODENTIA	² <i>Gerbillurus paeba</i>	Pygmy Hairy-footed Gerbil	LC	LC	Associated with Nama and Succulent Karoo preferring sandy soil or sandy alluvium with a grass, scrub or light woodland cover.	High
	² <i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	LC	DD	Sandy soils; wooded and more open grassland; areas of cultivation.	High
	² <i>Gerbilliscus brantsii</i>	Highveld Gerbil	LC	LC	Sandy soils; wooded and more open grassland; areas of cultivation.	High
PRIMATES	⁴ <i>Papio ursinus</i>	Chacma Baboon	LC	LC	Can exploit fynbos, montane grasslands, riverine courses in deserts, and simply need water and access to refuges.	Moderately high
	⁴ <i>Chlorocebus pygerythrus</i>	Vervet Monkey	LC	LC	Woodland savanna, riverine woodland, isolated stands of trees along river courses.	High
PHOLIDOTA	¹ <i>Smutsia temminckii</i>	Ground Pangolin	VU	VU	Low to high rainfall areas, including open grassland, woodland and rocky hills, but excluding forest and true desert; nevertheless present throughout the Kalahari sand country.	Moderately high

LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
EULIPTYPHLA	² <i>Crocidura cyanea</i>	Reddish-Grey Musk Shrew	LC	DD	Occurs in relatively dry terrain, with a mean annual rainfall of less than 500 mm. Occur in karroid scrub and in fynbos often in association with rocks.	High
	² <i>Suncus varilla</i>	Lesser Dwarf Shrew	LC	DD	Generally associated with termite mounds, grassland habitat.	High
	¹ <i>Atelerix frontalis</i>	South African Hedgehog	LC	NT	Generally found in semi-arid and sub-temperate environments with ample ground cover.	Moderately high
CARNIVORA	¹ <i>Proteles cristata</i>	Aardwolf	LC	LC	Common in the 100-600mm rainfall range of country, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes.	High
	⁴ <i>Caracal caracal</i>	Caracal	LC	LC	Caracals tolerate arid regions, occur in semi-desert and karroid conditions.	High
	¹ <i>Felis silvestris</i>	African Wild Cat	LC	LC	Wide habitat tolerance.	High

LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
CARNIVORA	¹ <i>Felis nigripes</i>	Black-footed cat	VU	LC	Associated with arid country, particularly areas with open habitat that provides some cover in the form of tall stands of grass or scrub.	Moderately high
	² <i>Genetta genetta</i>	Common (Small-spotted) Genet	LC	LC	Occur in open arid habitats.	High
	² <i>Suricata suricatta</i>	Suricate	LC	LC	Open arid country with hard and stony substrate. Occur in Nama- and Succulent Karoo but also fynbos.	High
	² <i>Cynictis penicillata</i>	Yellow Mongoose	LC	LC	Semi-arid country on a sandy substrate.	High
	² <i>Herpestes sanguineus</i>	Slender Mongoose	LC	LC	Wide habitat tolerance, but areas with adequate cover.	High
	¹ <i>Vulpes chama</i>	Cape Fox	LC	LC	Associated with open country, open grassland, grassland with scattered thickets and coastal or semi-desert scrub.	High

LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
CARNIVORA	⁴ <i>Canis mesomelas</i>	Black-backed Jackal	LC	LC	Wide habitat tolerance.	High
	² <i>Aonyx capensis</i>	Cape Clawless Otter	NT	LC	Rivers, marshes, dams and lakes; dry stream beds if pools of water exist.	High
	¹ <i>Hyena brunnea</i>	Brown Hyena	NT	NT	Found in dry areas, generally with annual rainfall of 100 - 700 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna.	Low
	¹ <i>Otocyon megalotis</i>	Bat-eared Fox	LC	LC	Open country with mean annual rainfall of 100-600 mm.	High
	¹ <i>Poecilogale albinucha</i>	African Striped Weasel	LC	DD	Wide habitat tolerance, but most common in grassland areas.	High
	¹ <i>Ictonyx striatus</i>	Striped Polecat	LC	LC	Widely distributed throughout the sub-region.	High
	¹ <i>Mellivora capensis</i>	Honey Badger	LC	NT	Wide habitat tolerance.	High

LIST OF MAMMALS (continued)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript

	Scientific name	Common name	IUCN	RDB	Habitat	Potential occurrence
CETARTIODACTYLA	² <i>Oryx gazella</i>	Gemsbok	LC	LC	Semi-arid and arid bushland and grassland of the Kalahari and Karoo and adjoining regions of Southern Africa.	Low
	² <i>Tragelaphus strepsiceros</i>	Greater Kudu	LC	LC	Wooded savanna	High
	² <i>Antidorcas marsupialis</i>	Springbok	LC	LC	Open arid plains with short vegetation	Moderately high
	² <i>Raphicerus campestris</i>	Steenbok	LC	LC	Inhabits open country.	High
	² <i>Sylvicapra grimmia</i>	Common Duiker	LC	LC	Presence of bushes are important.	High

LIST OF REPTILES

Reptiles protected according to NCNCA are indicated with their respective Schedule no. in superscript.

Family	Scientific name	Common name	IUCN status
AGAMIDAE	³ <i>Agama aculeata aculeata</i>	Western Ground Agama	LC
	³ <i>Agama atra</i>	Southern Rock Agama	LC
AMPHISBAENIDAE	³ <i>Monopeltis capensis</i>	Cape Worm Lizard	LC
	³ <i>Monopeltis infuscata</i>	Dusky Worm Lizard	LC
	³ <i>Zygaspis quadrifrons</i>	Kalahari Dwarf Worm Lizard	LC
CHAMAELEONIDAE	¹ <i>Chamaeleo dilepis dilepis</i>	Common Flap-neck Chameleon	LC
COLUBRIDAE	² <i>Dispholidus typus</i>	Boomslang	LC
	² <i>Philothamnus semivariegatus</i>	Spotted Bush Snake	LC
CORDYLIDAE	¹ <i>Karusasaurus polyzonus</i>	Southern Karusa Lizard	LC
ELAPIDAE	³ <i>Naja nivea</i>	Cape Cobra	LC
GEKKONIDAE	³ <i>Chondrodactylus bibronii</i>	Bibron's Gecko	LC
	³ <i>Pachydactylus capensis</i>	Cape Gecko	LC
	³ <i>Pachydactylus mariquensis</i>	Common Banded Gecko	LC
	³ <i>Ptenopus garrulus garrulus</i>	Common Barking Gecko	LC
GERRHOSAURIDAE	³ <i>Gerrhosaurus flavigularis</i>	Yellow-throated Plated Lizard	LC
LACERTIDAE	² <i>Heliobolus lugubris</i>	Bushveld Lizard	LC
	² <i>Nucras intertexta</i>	Spotted Sandveld Lizard	LC
	² <i>Pedioplanis lineocellata lineocellata</i>	Spotted Sand Lizard	LC
	² <i>Pedioplanis namaquensis</i>	Namaqua Sand Lizard	LC
LAMPROPHIIDAE	² <i>Boaedon capensis</i>	Common House Snake	LC
	² <i>Lamprophis aurora</i>	Aurora Snake	LC
	³ <i>Psammophis trinasalis</i>	Fork-marked Sand Snake	LC
	³ <i>Psammophylax tritaeniatus</i>	Striped Grass Snake	LC
	³ <i>Pseudaspis cana</i>	Mole Snake	LC
LEPTOTYPHLOPIDAE	³ <i>Leptotyphlops scutifrons</i>	Peter's Thread Snake	LC
PELOMEDUSIDAE	³ <i>Pelomedusa subrufa</i>	Marsh Terrapin	LC
SCINCIDAE	³ <i>Trachylepis capensis</i>	Cape Skink	LC
	³ <i>Trachylepis sulcata sulcata</i>	Western Rock Skink	LC
	³ <i>Trachylepis variegata</i>	Variegated Skink	LC

LIST OF REPTILES (continued)

Reptiles protected according to NCNCA are indicated with their respective Schedule no. in superscript.

Family	Scientific name	Common name	IUCN status
TESTUDINIDAE	³ <i>Homopus femoralis</i>	Greater Dwarf Tortoise	LC
	³ <i>Psammobates oculifer</i>	Serrated Tent Tortoise	LC
	³ <i>Psammobates tentorius</i>	Tent Tortoise	LC
	³ <i>Stigmochelys pardalis</i>	Leopard Tortoise	LC
TYPHLOPIDAE	³ <i>Rhinotyphlops lalandei</i>	Delalande's Beaked Blind Snake	LC
VARANIDAE	² <i>Varanus albigularis albigularis</i>	Southern Rock Monitor	LC
VIPERIDAE	³ <i>Bitis arietans arietans</i>	Puff Adder	LC

LIST OF AMPHIBIANS

Amphibians protected according to NCNCA are indicated with their respective Schedule no. in superscript.

Family	Scientific name	Common name	IUCN status
BUFONIDAE	² <i>Amietophrynus gutturalis</i>	Guttural Toad	LC
	² <i>Amietophrynus poweri</i>	Western Olive Toad	LC
	² <i>Bufo gariensis</i>	Karoo Toad	LC
HYPEROLIIDAE	² <i>Kassina senegalensis</i>	Bubbling Kassina	LC
MICROHYLIDAE	² <i>Breviceps adspersus</i>	Bushveld Rain Frog	LC
PIPIDAE	² <i>Xenopus laevis</i>	Common Platanna	LC
PYXICEPHALIDAE	² <i>Amietia queketti</i>	Common River Frog	LC
	² <i>Cacosternum boettgeri</i>	Boettger's Caco	LC
	¹ <i>Pyxicephalus adspersus</i>	Giant Bullfrog	NT
	² <i>Tomopterna cryptotis</i>	Tremolo Sand Frog	LC
	² <i>Tomopterna tandyi</i>	Tandy's Sand Frog	LC

LIST OF BIRDS

Birds protected according to NCNCA are indicated with their respective Schedule no. in superscript.

Scientific name	Common name	IUCN status
¹ <i>Accipiter badius</i>	Shikra	
² <i>Acrocephalus baeticatus</i>	African Reed-Warbler	
² <i>Acrocephalus gracilirostris</i>	Lesser Swamp-Warbler	
² <i>Actitis hypoleucos</i>	Common Sandpiper	
² <i>Alcedo cristata</i>	Malachite Kingfisher	
² <i>Alopochen aegyptiacus</i>	Egyptian Goose	
² <i>Amadina erythrocephala</i>	Red-headed Finch	
² <i>Amaurornis flavirostris</i>	Black Crake	
² <i>Anas capensis</i>	Cape Teal	
² <i>Anas erythrorhyncha</i>	Red-billed Teal	
² <i>Anas hottentota</i>	Hottentot Teal	
² <i>Anas smithii</i>	Cape Shoveler	
² <i>Anas sparsa</i>	African Black Duck	
² <i>Anas undulata</i>	Yellow-billed Duck	
² <i>Anhinga rufa</i>	African Darter	
² <i>Anthoscopus minutus</i>	Cape Penduline-Tit	
² <i>Anthropoides paradisea</i>	Blue Crane	NT
² <i>Anthus cinnamomeus</i>	African Pipit	
² <i>Anthus vaalensis</i>	Buffy Pipit	
² <i>Apus affinis</i>	Little Swift	
² <i>Apus apus</i>	Common Swift	
² <i>Apus bradfieldi</i>	Bradfield's Swift	
² <i>Apus caffer</i>	White-rumped Swift	
² <i>Apus horus</i>	Horus Swift	
¹ <i>Aquila rapax</i>	Tawny Eagle	EN
¹ <i>Aquila verreauxii</i>	Verreaux's Eagle	VU
² <i>Ardea cinerea</i>	Grey Heron	
² <i>Ardea goliath</i>	Goliath Heron	
² <i>Ardea melanocephala</i>	Black-headed Heron	
² <i>Ardea purpurea</i>	Purple Heron	
² <i>Ardeola ralloides</i>	Squacco Heron	
² <i>Ardeotis kori</i>	Kori Bustard	NT
² <i>Batis pririt</i>	Pririt Batis	
² <i>Bostrychia hagedash</i>	Hadedda Ibis	
² <i>Bradornis infuscatus</i>	Chat Flycatcher	
² <i>Bradornis mariquensis</i>	Marico Flycatcher	
¹ <i>Bubo africanus</i>	Spotted Eagle-Owl	
¹ <i>Bubo lacteus</i>	Verreaux's Eagle-Owl	
² <i>Bubulcus ibis</i>	Cattle Egret	
² <i>Burhinus capensis</i>	Spotted Thick-knee	

LIST OF BIRDS (continued)

Birds protected according to NCNCA are indicated with their respective Schedule no. in superscript.

Scientific name	Common name	IUCN status
¹ <i>Buteo rufofuscus</i>	Jackal Buzzard	
¹ <i>Buteo vulpinus</i>	Steppe Buzzard	
² <i>Calandrella cinerea</i>	Red-capped Lark	
² <i>Calendulauda africanoides</i>	Fawn-coloured Lark	
² <i>Calendulauda bradfieldi</i>	Bradfield's Lark	
² <i>Calidris alba</i>	Sanderling	
² <i>Calidris ferruginea</i>	Curlew Sandpiper	
² <i>Calidris minuta</i>	Little Stint	
² <i>Campethera abingoni</i>	Golden-tailed Woodpecker	
¹ <i>Caprimulgus europaeus</i>	European Nightjar	
¹ <i>Caprimulgus rufigena</i>	Rufous-cheeked Nightjar	
¹ <i>Caprimulgus tristigma</i>	Freckled Nightjar	
² <i>Cercomela familiaris</i>	Familiar Chat	
² <i>Cercomela sinuata</i>	Sickle-winged Chat	
² <i>Cercotrichas coryphoeus</i>	Karoo Scrub-Robin	
² <i>Cercotrichas paena</i>	Kalahari Scrub-Robin	
² <i>Ceryle rudis</i>	Pied Kingfisher	
² <i>Charadrius asiaticus</i>	Caspian Plover	
² <i>Charadrius hiaticula</i>	Common Ringed Plover	
¹ <i>Charadrius pallidus</i>	Chestnut-banded Plover	NT
² <i>Charadrius pecuarius</i>	Kittlitz's Plover	
² <i>Charadrius tricollaris</i>	Three-banded Plover	
² <i>Chersomanes albofasciata</i>	Spike-heeled Lark	
² <i>Chlidonias hybridus</i>	Whiskered Tern	
² <i>Chlidonias leucopterus</i>	White-winged Tern	
² <i>Chrysococcyx caprius</i>	Diderick Cuckoo	
² <i>Ciconia abdimii</i>	Abdim's Stork	NT
² <i>Ciconia ciconia</i>	White Stork	
¹ <i>Ciconia nigra</i>	Black Stork	VU
² <i>Cinnyris fusca</i>	Dusky Sunbird	
² <i>Cinnyris mariquensis</i>	Marico Sunbird	
¹ <i>Circaetus pectoralis</i>	Black-chested Snake-Eagle	
¹ <i>Circus maurus</i>	Black Harrier	EN
¹ <i>Circus pygargus</i>	Montagu's Harrier	
¹ <i>Circus ranivorus</i>	African Marsh-Harrier	EN
² <i>Cisticola aridulus</i>	Desert Cisticola	
² <i>Cisticola fulvicapillus</i>	Neddicky	
² <i>Cisticola juncidis</i>	Zitting Cisticola	
² <i>Cisticola subruficapillus</i>	Grey-backed Cisticola	
² <i>Cisticola tinniens</i>	Levaillant's Cisticola	

LIST OF BIRDS (continued)

Birds protected according to NCNCA are indicated with their respective Schedule no. in superscript.

Scientific name	Common name	IUCN status
² <i>Clamator glandarius</i>	Great Spotted Cuckoo	
² <i>Clamator jacobinus</i>	Jacobin Cuckoo	
² <i>Colius colius</i>	White-backed Mousebird	
² <i>Columba guinea</i>	Speckled Pigeon	
² <i>Columba livia</i>	Rock Dove	
² <i>Coracias caudata</i>	Lilac-breasted Roller	
² <i>Coracias garrulus</i>	European Roller	NT
² <i>Coracias naevia</i>	Purple Roller	
² <i>Corvus albus</i>	Pied Crow	
² <i>Corvus capensis</i>	Cape Crow	
² <i>Cossypha caffra</i>	Cape Robin-Chat	
² <i>Coturnix coturnix</i>	Common Quail	
² <i>Creatophora cinerea</i>	Wattled Starling	
² <i>Cuculus clamosus</i>	Black Cuckoo	
² <i>Cursorius rufus</i>	Burchell's Courser	VU
² <i>Cursorius temminckii</i>	Temminck's Courser	
² <i>Cypsiurus parvus</i>	African Palm-Swift	
² <i>Dendrocygna bicolor</i>	Fulvous Duck	
² <i>Dendrocygna viduata</i>	White-faced Duck	
² <i>Dendropicos fuscescens</i>	Cardinal Woodpecker	
² <i>Dicrurus adsimilis</i>	Fork-tailed Drongo	
² <i>Egretta alba</i>	Great Egret	
² <i>Egretta garzetta</i>	Little Egret	
² <i>Egretta intermedia</i>	Yellow-billed Egret	
¹ <i>Elanus caeruleus</i>	Black-shouldered Kite	
² <i>Emberiza capensis</i>	Cape Bunting	
² <i>Emberiza flaviventris</i>	Golden-breasted Bunting	
² <i>Emberiza impetuani</i>	Lark-like Bunting	
² <i>Emberiza tahapisi</i>	Cinnamon-breasted Bunting	
² <i>Eremomela icteropygialis</i>	Yellow-bellied Eremomela	
² <i>Eremopterix verticalis</i>	Grey-backed Sparrowlark	
² <i>Estrilda astrild</i>	Common Waxbill	
² <i>Estrilda erythronotos</i>	Black-faced Waxbill	
² <i>Euplectes afer</i>	Yellow-crowned Bishop	
² <i>Euplectes orix</i>	Southern Red Bishop	
² <i>Eupodotis afraoides</i>	Northern Black Korhaan	
² <i>Eupodotis ruficrista</i>	Red-crested Korhaan	
¹ <i>Falco biarmicus</i>	Lanner Falcon	VU
¹ <i>Falco naumanni</i>	Lesser Kestrel	-

LIST OF BIRDS (continued)

Birds protected according to NCNCA are indicated with their respective Schedule no. in superscript.

Scientific name	Common name	IUCN status
¹ <i>Falco peregrinus</i>	Peregrine Falcon	-
¹ <i>Falco rupicolis</i>	Rock Kestrel	-
¹ <i>Falco rupicoloides</i>	Greater Kestrel	-
² <i>Fulica cristata</i>	Red-knobbed Coot	
² <i>Gallinago nigripennis</i>	African Snipe	
² <i>Gallinula chloropus</i>	Common Moorhen	
¹ <i>Glareola nordmanni</i>	Black-winged Pratincole	NT
¹ <i>Glaucidium perlatum</i>	Pearl-spotted Owlet	-
² <i>Granatina granatina</i>	Violet-eared Waxbill	
¹ <i>Gyps africanus</i>	White-backed Vulture	CR
¹ <i>Gyps coprotheres</i>	Cape Vulture	EN
² <i>Halcyon chelicuti</i>	Striped Kingfisher	
¹ <i>Haliaeetus vocifer</i>	African Fish-Eagle	-
¹ <i>Hieraaetus pennatus</i>	Booted Eagle	-
² <i>Himantopus himantopus</i>	Black-winged Stilt	
² <i>Hippolais icterina</i>	Icterine Warbler	
² <i>Hirundo albigularis</i>	White-throated Swallow	
² <i>Hirundo cucullata</i>	Greater Striped Swallow	
² <i>Hirundo dimidiata</i>	Pearl-breasted Swallow	
² <i>Hirundo fuligula</i>	Rock Martin	
² <i>Hirundo rustica</i>	Barn Swallow	
² <i>Hirundo semirufa</i>	Red-breasted Swallow	
² <i>Hirundo spilodera</i>	South African Cliff-Swallow	
² <i>Indicator indicator</i>	Greater Honeyguide	
² <i>Ixobrychus minutus</i>	Little Bittern	
² <i>Lagonosticta senegala</i>	Red-billed Firefinch	
² <i>Lamprotornis nitens</i>	Cape Glossy Starling	
² <i>Laniarius atrococcineus</i>	Crimson-breasted Shrike	
² <i>Lanius collaris</i>	Common Fiscal	
² <i>Lanius collurio</i>	Red-backed Shrike	
² <i>Lanius minor</i>	Lesser Grey Shrike	
² <i>Larus cirrocephalus</i>	Grey-headed Gull	
¹ <i>Leptoptilos crumeniferus</i>	Marabou Stork	NT
² <i>Malcorus pectoralis</i>	Rufous-eared Warbler	
² <i>Megaceryle maxima</i>	Giant Kingfisher	
² <i>Melierax canorus</i>	Southern Pale Chanting	
¹ <i>Melierax gabar</i>	Gabar Goshawk	-
² <i>Merops apiaster</i>	European Bee-eater	
² <i>Merops hirundineus</i>	Swallow-tailed Bee-eater	
² <i>Milvus aegyptius</i>	Yellow-billed Kite	

LIST OF BIRDS (continued)

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Scientific name	Common name	IUCN status
¹ <i>Milvus migrans</i>	Black Kite	-
² <i>Mirafra fasciolata</i>	Eastern Clapper Lark	
² <i>Mirafra passerina</i>	Monotonous Lark	
² <i>Monticola brevipes</i>	Short-toed Rock-Thrush	
² <i>Motacilla capensis</i>	Cape Wagtail	
² <i>Muscicapa striata</i>	Spotted Flycatcher	
² <i>Myrmecocichla formicivora</i>	Anteating Chat	
¹ <i>Neotis ludwigii</i>	Ludwig's Bustard	EN
² <i>Netta erythrophthalma</i>	Southern Pochard	
² <i>Nilaus afer</i>	Brubru	
² <i>Numenius phaeopus</i>	Common Whimbrel	
² <i>Numida meleagris</i>	Helmeted Guineafowl	
² <i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	
² <i>Oena capensis</i>	Namaqua Dove	
² <i>Oenanthe monticola</i>	Mountain Wheatear	
² <i>Oenanthe pileata</i>	Capped Wheatear	
² <i>Onychognathus naboroupp</i>	Pale-winged Starling	
² <i>Oriolus oriolus</i>	Eurasian Golden Oriole	
² <i>Ortygospiza atricollis</i>	African Quailfinch	
² <i>Oxyura maccoa</i>	Maccoa Duck	NT
² <i>Parisoma layardi</i>	Layard's Tit-Babbler	
² <i>Parisoma subcaeruleum</i>	Chestnut-vented Tit-Babbler	
² <i>Parus cinerascens</i>	Ashy Tit	
² <i>Passer diffusus</i>	Southern Grey-headed Sparrow	
² <i>Passer domesticus</i>	House Sparrow	
² <i>Passer melanurus</i>	Cape Sparrow	
² <i>Passer motitensis</i>	Great Sparrow	
² <i>Phalacrocorax africanus</i>	Reed Cormorant	
² <i>Phalacrocorax lucidus</i>	White-breasted Cormorant	
² <i>Philetairus socius</i>	Sociable Weaver	
² <i>Philomachus pugnax</i>	Ruff	
¹ <i>Phoenicopterus minor</i>	Lesser Flamingo	NT
¹ <i>Phoenicopterus ruber</i>	Greater Flamingo	NT
² <i>Phylloscopus trochilus</i>	Willow Warbler	
² <i>Platalea alba</i>	African Spoonbill	
² <i>Plectropterus gambensis</i>	Spur-winged Goose	
² <i>Plegadis falcinellus</i>	Glossy Ibis	
² <i>Plocepasser mahali</i>	White-browed Sparrow-Weaver	
² <i>Ploceus velatus</i>	Southern Masked-Weaver	

LIST OF BIRDS (continued)

Birds protected according to NCNCA are indicated with their respective Schedule no. in superscript.

Scientific name	Common name	IUCN status
² <i>Podiceps cristatus</i>	Great Crested Grebe	
² <i>Podiceps nigricollis</i>	Black-necked Grebe	
¹ <i>Polemaetus bellicosus</i>	Martial Eagle	EN
¹ <i>Polihierax semitorquatus</i>	Pygmy Falcon	-
¹ <i>Polyboroides typus</i>	African Harrier-Hawk	-
² <i>Porphyrio madagascariensis</i>	African Purple Swamphen	
² <i>Prinia flavicans</i>	Black-chested Prinia	
² <i>Psophocichla litsipsirupa</i>	Groundscraper Thrush	
² <i>Pterocles burchelli</i>	Burchell's Sandgrouse	
² <i>Pterocles namaqua</i>	Namaqua Sandgrouse	
¹ <i>Ptilopus granti</i>	Southern White-faced Scops-Owl	-
² <i>Pycnonotus nigricans</i>	African Red-eyed Bulbul	
² <i>Pytilia melba</i>	Green-winged Pytilia	
² <i>Quelea quelea</i>	Red-billed Quelea	
² <i>Rallus caerulescens</i>	African Rail	
² <i>Recurvirostra avosetta</i>	Pied Avocet	
² <i>Rhinopomastus cyanomelas</i>	Common Scimitarbill	
² <i>Rhinoptilus africanus</i>	Double-banded Courser	
² <i>Riparia paludicola</i>	Brown-throated Martin	
² <i>Riparia riparia</i>	Sand Martin	
¹ <i>Rostratula benghalensis</i>	Greater Painted-snipe	NT
¹ <i>Sagittarius serpentarius</i>	Secretarybird	VU
² <i>Scleroptila levaillantoides</i>	Orange River Francolin	
² <i>Scopus umbretta</i>	Hamerkop	
² <i>Serinus albogularis</i>	White-throated Canary	
² <i>Serinus atrogularis</i>	Black-throated Canary	
² <i>Serinus flaviventris</i>	Yellow Canary	
² <i>Sigelus silens</i>	Fiscal Flycatcher	
² <i>Spizocorys conirostris</i>	Pink-billed Lark	
² <i>Sporopipes squamifrons</i>	Scaly-feathered Finch	
² <i>Spreo bicolor</i>	Pied Starling	
² <i>Stenostira scita</i>	Fairy Flycatcher	
² <i>Streptopelia capicola</i>	Cape Turtle-Dove	
² <i>Streptopelia semitorquata</i>	Red-eyed Dove	
² <i>Streptopelia senegalensis</i>	Laughing Dove	
² <i>Struthio camelus</i>	Common Ostrich	
² <i>Sylvia borin</i>	Garden Warbler	
² <i>Sylvietta rufescens</i>	Long-billed Crombec	
² <i>Tachybaptus ruficollis</i>	Little Grebe	
² <i>Tachymarptis melba</i>	Alpine Swift	

LIST OF BIRDS (continued)

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Scientific name	Common name	IUCN status
² <i>Tadorna cana</i>	South African Shelduck	
² <i>Tchagra australis</i>	Brown-crowned Tchagra	
² <i>Telophorus zeylonus</i>	Bokmakierie	
² <i>Threskiornis aethiopicus</i>	African Sacred Ibis	
² <i>Tockus leucomelas</i>	Southern Yellow-billed Hornbill	
² <i>Tockus nasutus</i>	African Grey Hornbill	
¹ <i>Torgos tracheliotus</i>	Lappet-faced Vulture	EN
² <i>Trachyphonus vaillantii</i>	Crested Barbet	
² <i>Tricholaema leucomelas</i>	Acacia Pied Barbet	
² <i>Tringa glareola</i>	Wood Sandpiper	
² <i>Tringa nebularia</i>	Common Greenshank	
² <i>Tringa stagnatilis</i>	Marsh Sandpiper	
² <i>Turdus smithi</i>	Karoo Thrush	
² <i>Turnix sylvatica</i>	Small Buttonquail	
¹ <i>Tyto alba</i>	Barn Owl	-
² <i>Upupa africana</i>	African Hoopoe	
² <i>Urocolius indicus</i>	Red-faced Mousebird	
² <i>Vanellus armatus</i>	Blacksmith Lapwing	
² <i>Vanellus coronatus</i>	Crowned Lapwing	
² <i>Vidua chalybeata</i>	Village Indigobird	
² <i>Vidua macroura</i>	Pin-tailed Whydah	
² <i>Vidua regia</i>	Shaft-tailed Whydah	
² <i>Zosterops pallidus</i>	Orange River White-eye	