



ECOLOGICAL ASSESSMENT REPORT

Thunderflex 78 (Pty) Ltd

Turksvypan Diamond Prospecting Operation



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Thunderflex 78 (Pty) Ltd

**Remaining extent of the Farm Mesnard 38;
Farm Rooipan 43;
Portion 1 (Brakfontein) and Portion 2 of the Farm Kogelbeen 44;
Farm La Provence 51;
Remaining Extent and Portion 1 (Turksvypan) of the Farm 52;
Portion 1 of the Farm Hopefield Estate 552;
Remaining extent of the Farm 565.**

District of Hay

Northern Cape Province

**Ecological Assessment Report in application for Environmental
Authorisation related to a Prospecting Right Application (NC 30/5/1/
1/2/12433 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 Remaining extent of the Farm Mesnard 38, the Farm Rooipan 43, Portion 1 (Brakfontein) and Portion 2 of the Farm Kogelbeen 44, the Farm La Provence 51, the Remaining Extent and Portion 1 (Turksvypan) of the Farm 52, Portion 1 of the Farm Hopefield Estate 552 and the Remaining extent of the Farm 565. The prospecting right area is located within the Hay District Municipality 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. Five plant communities potentially occur on site of which the ephemeral drainage lines and ephemeral pans are considered to be of very high sensitivity. The plant community associated with the hills are considered to be of high sensitivity, while the plains of the study area are considered to be of medium sensitivity. No profound impacts are expected to be related to the proposed prospecting operation due to the low invasive nature of drilling activities. However, the most likely impacts are expected to be related to the disruption of the hydrological regime if any of the ephemeral pans or pan catchments are modified through road creation or drill pad establishment.

Authorisation can be granted if the applicant commits 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 the Remaining extent of the Farm Mesnard 38, the Farm Rooipan 43, Portion 1 (Brakfontein) and Portion 2 of the Farm Kogelbeen 44, the Farm La Provence 51, the Remaining Extent and Portion 1 (Turksvypan) of the Farm 52, Portion 1 of the Farm Hopefield Estate 552 and the Remaining extent of the Farm 565 (from hereon referred to as Turksvypan). The prospecting right area is located within the Hay District Municipality of the Northern Cape Province. It lies approximately 10 km north of the town Griekwastad. The private road that leads to the property turns off from an unnamed gravel road that turns off from the R325 just north of Griekwastad, and leads to Lime Acres (Figure 1). The total extent of the prospecting right area is $\pm 18\,162$ ha.

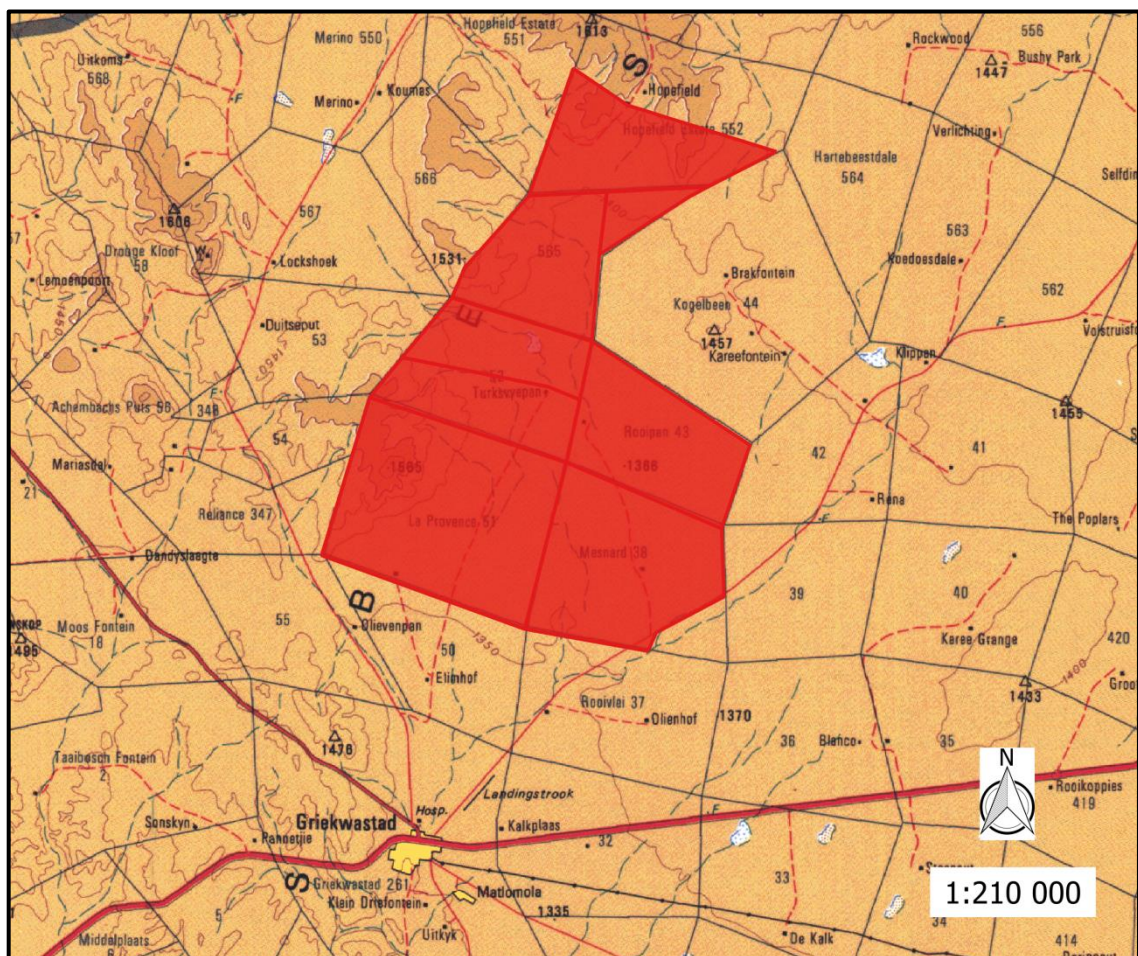


Figure 1. The location of the Turksvypan prospecting area is indicated in red.

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 and therefore Boscia Ecological Consulting has been appointed by the applicant to conduct a desktop assessment and provide an ecological assessment report.

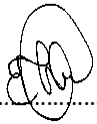
This assessment report describes the characteristics of habitats in the proposed prospecting area, identifies the biodiversity and species of conservation concern, identifies invasive and encroaching species and their distribution, indicates the source of impacts from the prospecting operation and assesses 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 gravel deposits that are believed to have derived from eroded diamondiferous Finsch kimberlite material. These gravels are mainly associated with quaternary deposits confined to the Daniel Alluvial Channel (Figure 2). The presence of diamondiferous gravels on Turksvypan 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 Turksvypan 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. 2823CA, 2823CB, 2823CC and 2823CD as well as other reports from the surrounding areas.

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 Tsantsabane (NC085) and Siyancuma (NC078) Local Municipalities, 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:

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

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 majority of the study site is non-arable with low to moderate potential grazing land, while the hills in the north and west are classified as wilderness. The grazing capacity is between 14 and 21 ha/AU, with the agricultural region being demarcated for cattle farming. The area is categorised to have no suitability for crop production.

Turksvypan is mainly used for agriculture. The natural pastures are used for grazing camps and evidence of cultivated land is visible on the topographical maps and satellite images (Figure 3). Existing infrastructure includes homesteads and farm roads and tracks. Historically, the hills in the north were mined and apart from the current Thunderflex prospecting application for diamonds, the farm has also been subject to applications for the prospecting of limestone.

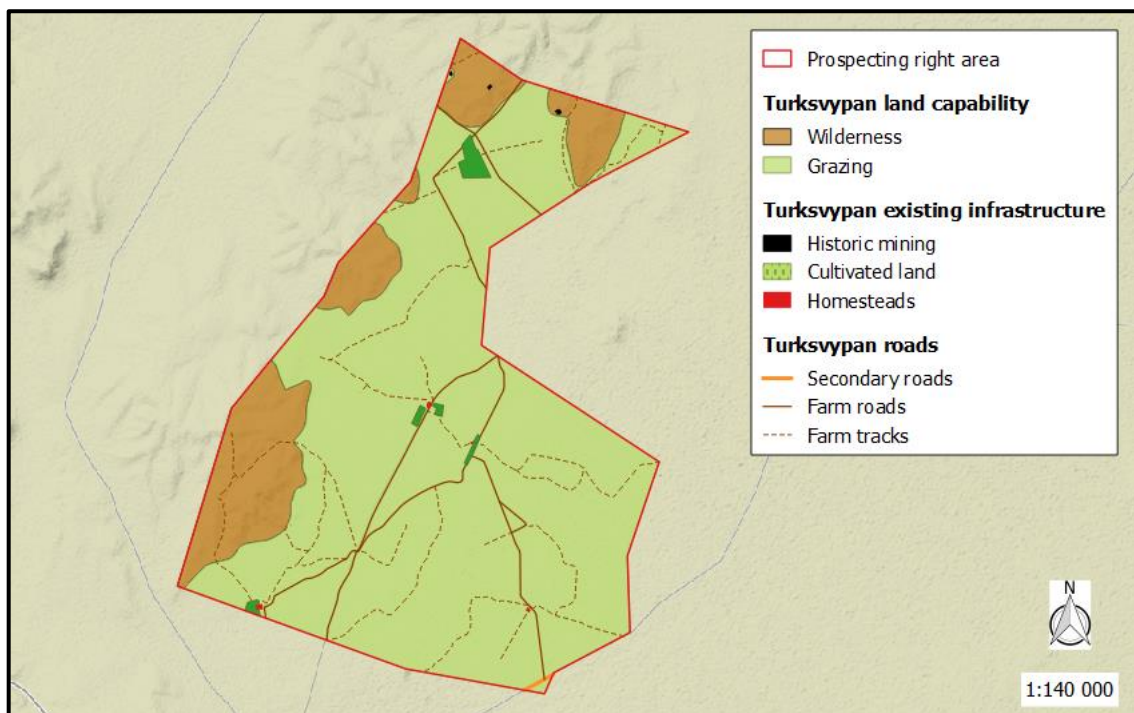


Figure 3. Evidence of existing infrastructure and past disturbances in the study area.

3.2. Geology, soils and topography

According to Hornsveld (1977) the geological features on Turksvypan comprise Quaternary and Vaalian deposits (Figure 4). The areas in the vicinity of the hills in the west and north as well as large parts in the south-east comprise rocks from the Griqualand West Sequence. The hills itself is associated with Kuruman banded ironstone of the Asbestos Hills Formations from the Griquatown Group; while a large section in the south-east of the property consist of Lime Acres dolomitic limestone of the Ghaaplato Formation from the Campbell Group. Diamondiferous gravels are mainly associated with the quaternary deposits, which are confined to the Daniel Alluvial Channel and include those areas associated with wind-blown sand, surface rubble, alluvium, river-terrace gravel and surface limestone (Figure 4).

The study area is primarily characterised by plains with open low hills or ridges, but along the western and northern border of the site the terrain transforms into open hills or ridges. A small portion in the south-east comprises level plains with some relief. Altitude ranges from 1 360 m above sea level on the level plains in the south-east, 1 400 m on the plains with open hills or ridges in the centre of the property, and 1 500 m on the hills and ridges in the west and north. The terrain is indicated by a very gentle slope of <1 % on the plains in the east, but increases slightly from 4 % on the ridges to 10 % on the hills.

Land types found on the property include Fc6, Ae217 and Ib271 (Figure 5). The majority of the property is characterised by Red and yellow, well drained sandy soils, with high base status. These soils are less than 300 mm deep, without dunes and are typically associated with the Ae217 landtype. These soils typically have poor suitability for arable agriculture, but it is possible in areas where the climate permits it. Soils associated with the Fc6 landtype in the south-east are primarily soils with minimal development (Glenrosa/Mispah), usually shallow, on hard or weathering rock, with or without intermittent diverse soils. Lime is generally present in the landscape. These soils are not suitable for arable agriculture, but are suitable for grazing if the climate permits it. The hills in the north and west are characterised by rocky areas with limited, miscellaneous soils (Ib271 landtype). These soils are not suitable for agriculture and mainly suitable for conservation, recreation or water catchments.

The soils of the study site have low to very high erodibility to water and wind erosion, but the majority of soils on site (associated with Ae217) have high potential to regenerate, if badly eroded. However, soils associated with landtypes Fc6 and Ib271 have very low potential to regenerate if badly eroded.

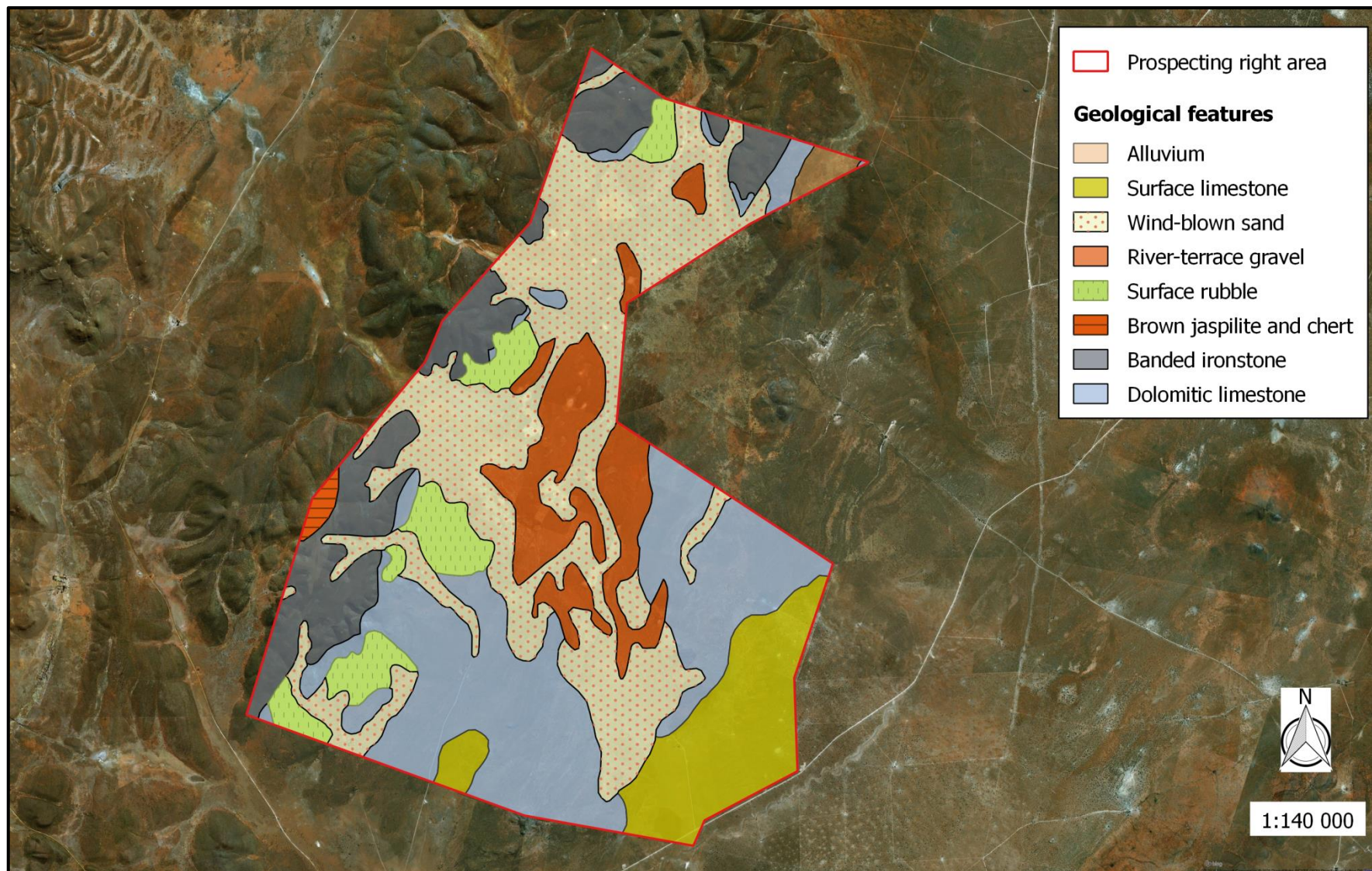


Figure 4. The distribution of geological features in the study area.

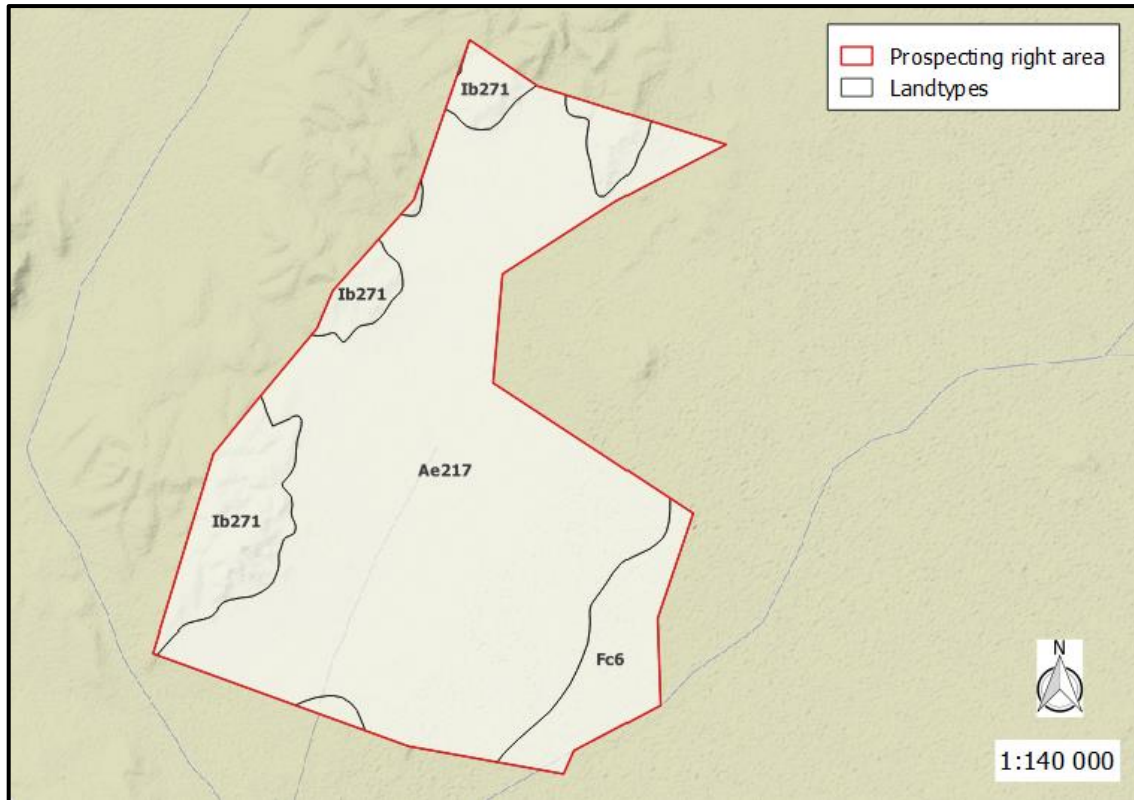


Figure 5. The distribution of land types in the study area.

3.3. Vegetation

3.3.1. Broad-scale vegetation patterns

The study area falls within the Savanna Biome (Mucina and Rutherford 2006). According to the vegetation map of Mucina and Rutherford (2012), the site is represented by three broad-scale vegetation units from the Eastern Kalahari Bushveld Bioregion, i.e. Ghaap Plateau Vaalbosveld, Olifantshoek Plains Thornveld and Kuruman Mountain Bushveld (Figure 6).

Olifantshoek Plains Thornveld is found in the Northern Cape at altitudes between 1 000 and 1 500 m. It is mostly restricted to the pediments of the Korannaberg, Langeberg and Asbestos Mountains. The plains are typically represented by an open tree and shrub layer, with a usually sparse grass layer. The unit occurs on red aeolian sand of the Kalahari Groups with silcrete and calcrete and some andesitic and basaltic lava of the Griqualand West Supergroup. Soils are deep and the most dominant landtype is Ae, but Ah also occur.

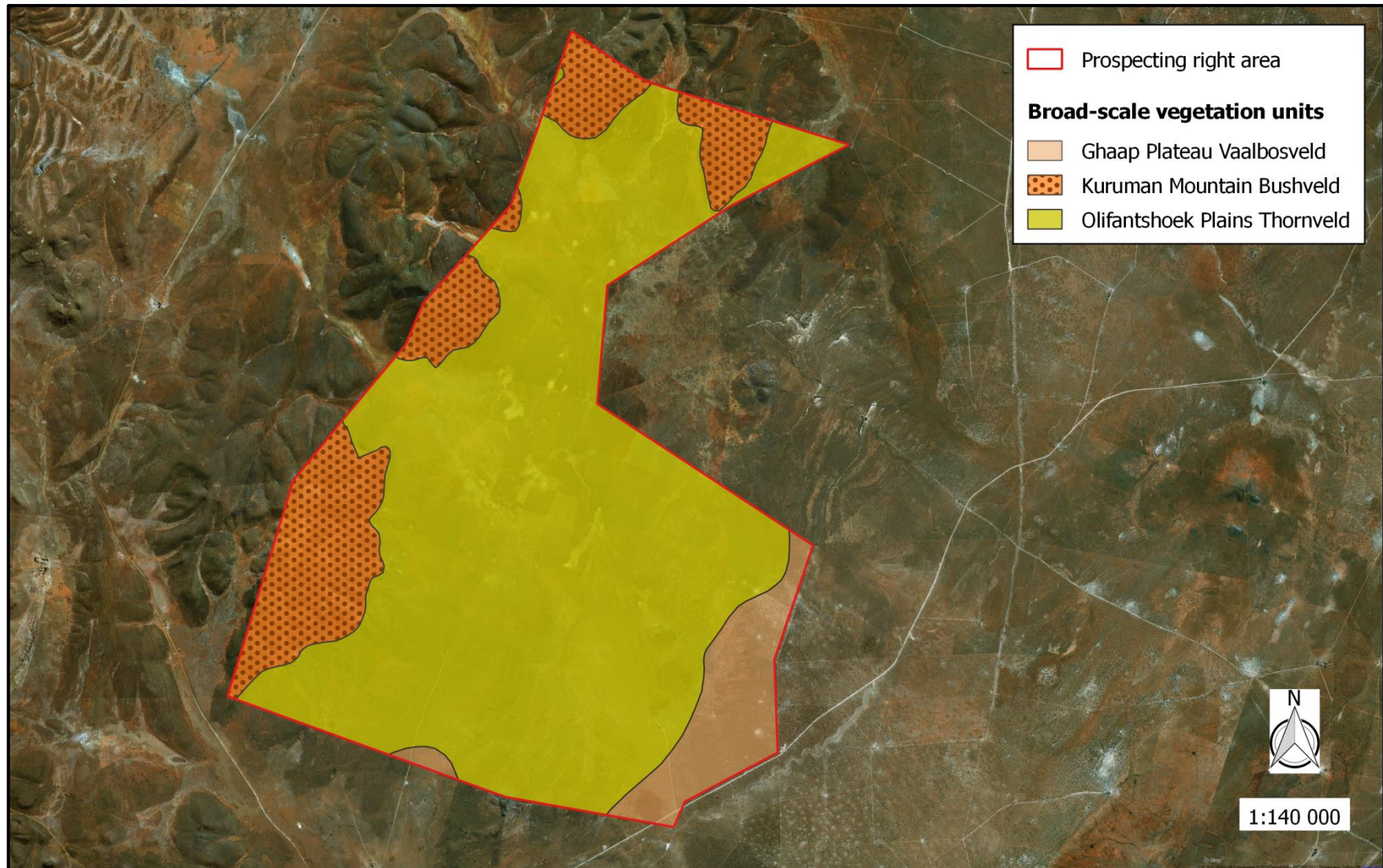


Figure 6. The broad-scale vegetation units (Mucina and Rutherford 2012) present in the study area.

Only 1 % of the Olifantshoek Plains Thornveld has been transformed and erosion is very low. It is classified as being least threatened and a very small proportion is being conserved in the Witsand Nature Reserve. The shrub *Amphiglossa tecta* is the only endemic plant species known from this unit.

Kuruman Mountain Bushveld is distributed in the Northern Cape and North-West Provinces at altitudes between 1 100 and 1 800 m. It stretches from the Asbestos Mountains southwest and northwest of Griekwastad, along the Kuruman Hills north of Danielskuil, passing west of Kuruman and re-emerging as isolated hills. The unit is typically presented as rolling hills with gentle to moderate slopes and hill pediment areas with an open shrubveld. Here, *Calobota cuspidosa* is conspicuous within a well-developed grass layer. The Hills consist of banded iron formation, with jasper, chert and riebeckite-asbestos of the Asbestos Hills Subgroup of the Griqualand West Supergroup. Soils are shallow sandy soils of the Hutton form, with the most common land type being Ib, followed by Ae, Ic and Ag. The unit is classified as being least threatened with very little being transformed and with little erosion being present. It is not currently conserved within any formal conservation areas and the succulent *Euphorbia planiceps* is the only endemic species known from this unit.

Ghaap Plateau Vaalbosveld is distributed in the Northern Cape and North-West Provinces at altitudes between 1 100 and 1 500 m. It occurs on a flat plateau from around Campbell in the south, east of Danielskuil through Reivilo to around Vryburg in the north. The geology includes surface limestone of Tertiary to Recent age, and dolomite and chert of the Campbell Group (Griqualand West Supergroup, Vaalian Erathem). Soils are shallow (0.1 – 0.25 m) and of Mispah and Hutton soil forms. Landtypes mainly represent Fc, but Ae and Ag also occur. The unit is classified as being least threatened with very little (1 %) being transformed and with very low erosion being present. It is not currently conserved within any formal conservation areas and the herb *Rennera stellata* is the only endemic species known from this unit.

3.3.2. Fine-scale vegetation patterns

The proposed finer scale vegetation communities were delineated according to visual variabilities signified on satellite images. These can be divided into at least five units (Figure 7), which are described below. These descriptions include unique characteristics and possible species most likely associated with each unit. A list of plant species likely to occur on site is presented in Appendix 1.

i) Hills

This community is located on the slopes and plateaus of the hill in the west and north of the study site and is associated with banded ironstone rocks (Figure 7). Typically, the community composition between the foot slopes and upper slopes are similar, but the dominant grass species may shift from *Stipagrostis uniplumis* at the bottom, to *Sporobolus fimbriatus* at the top. *Senegalia mellifera* and *Tarchonanthus camphoratus* most likely forms denser stands on the footslopes, whereas the woody layer becomes more diversely dispersed toward the upper slopes.

The tall woody layer is most likely presented by trees and tall shrubs, such as *Searsia tridactyla*, *S. burchellii*, *Senegalia mellifera*, *Tarchonanthus camphoratus*, *Boscia albitrunca*, *Calobota cuspidosa*, *Ziziphus mucronata*, *Gymnosporia buxifolia*, *Ehretia alba*, *Vachellia tortilis*, *Asparagus exuvialis*, *Grewia flava* and *Olea europaea* subsp. *africana*. The lower shrub layer is expected to include *Chrysocoma ciliata*, *Eriocephalus ericoides* subsp. *griquensis*, *Pentzia incana*, *Felicia filifolia* subsp. *filifolia*, *Asparagus* sp., *Lycium horridum*, *Aptosimum marlothii*, *Rosenia humilis*, *Monechma divaricatum*, *Leonotis pentadentata* and *Selago* sp.

Apart from the dominant grasses mentioned above, other common species most likely include *Tragus racemosus*, *Aristida congesta* subsp. *congesta*, *A. vestita*, *Enneapogon scoparius*, *Schmidtia pappophoroides*, *Eragrostis homomalla*, *Fingerhuthia africana*, *Enneapogon cenchroides*, *Heteropogon contortus*, *Digitaria eriantha*, *Brachiaria serrata* and *Eragrostis nindensis*, while herbs expected to be found here include *Hermannia comosa*, *Sesamum triphyllum* and *Phyllanthus parvulus*.

Species of conservation concern most likely associated with the hills include *Boscia albitrunca*, which is nationally (NFA) and provincially (NCNCA) protected, while *Gymnosporia buxifolia* and *Olea europaea* subsp. *africana* are also protected according to NCNCA.

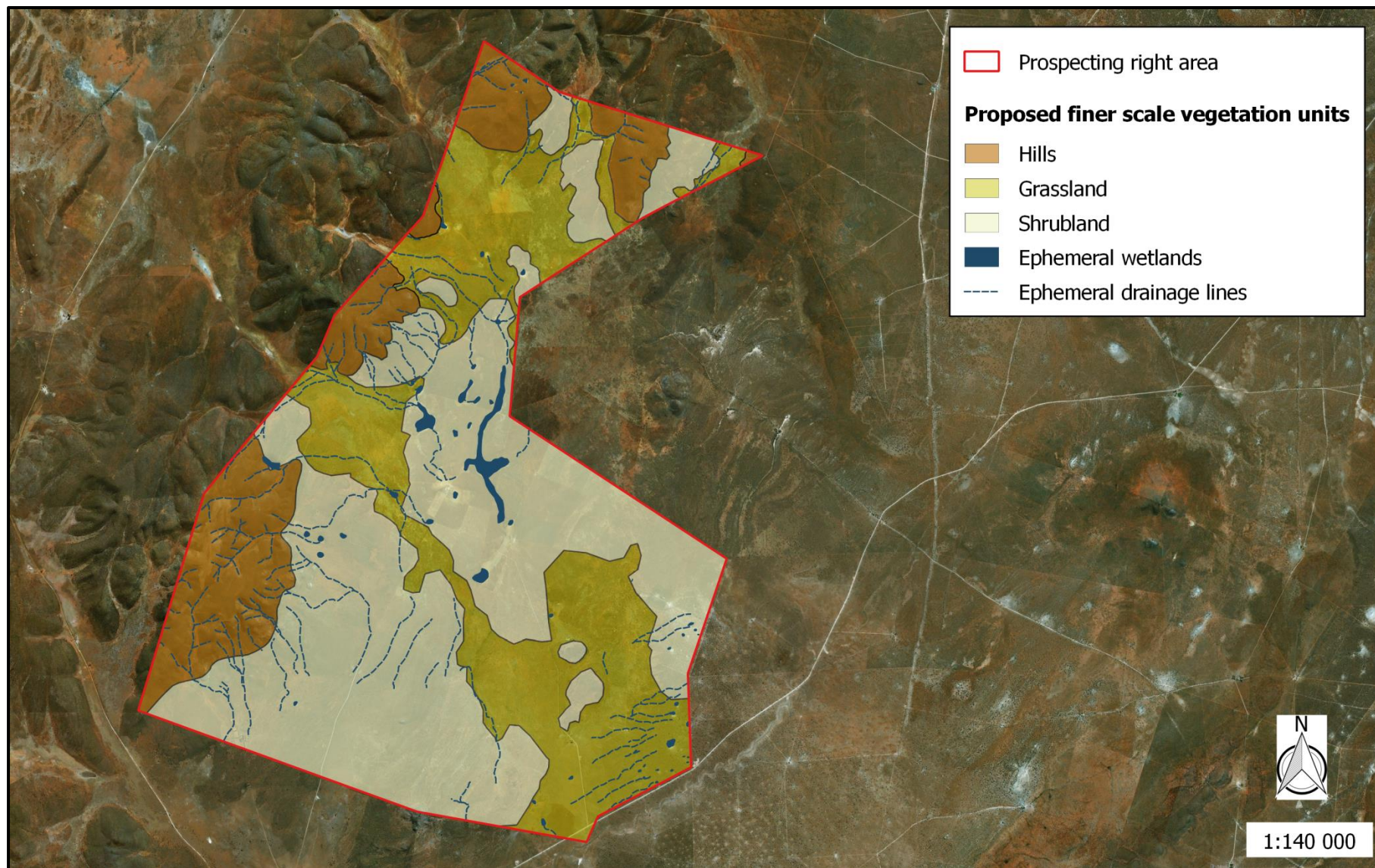


Figure 7. The distribution of fine-scale plant communities in the study area.

ii) Grassland

This community occurs along the sandy valley plain of the historic Daniel Alluvial channel (Figure 7). Grasses that will most likely occur here include *Aristida congesta* subsp. *congesta*, *A. congesta* subsp. *barbicollis*, *Enneapogon desvauxii*, *Eragrostis lehmanniana*, *E. truncata*, *E. trichophora*, *Stipagrostis uniplumis*, *Themeda triandra*, *Brachiaria marlothii*, *Sporobolus fimbriatus*, *Tragus racemosus*, *Antheophora pubescens*, , *Cynodon dactylon* and *Schmidtia pappophoroides*.

The low shrubs in this unit may include *Eriocephalus ericoides* subsp. *griquensis*, *Pentzia incana*, *P. calcarea*, *Rosenia humilis*, *Gnidia polycephala*, *Aptosimum albomarginatum*, *A. marlothii*, *Lycium horridum*, *Osteospermum microphyllum*, *Thesium lacinulatum*, *Wahlenbergia nodosa*, *Chrysocoma ciliata*, *Melolobium microphyllum*, *Ruschia griquensis*, *R. hamata*, *Amphiglossa triflora*, *Hertia pallens*, *Solanum namaquense*, *Berkheya sp.* and *Selago sp.* Taller shrubs and trees, such as *Olea europaea* subsp. *africana*, *Searsia lancea*, *S. tridactyla*, *Vachellia tortilis*, *V. erioloba*, *Tarchonanthus camphoratus*, *Ziziphus mucronata*, *Lycium hirsutum*, *Diospyros austro-africana* var. *microphylla* and *Asparagus exuvialis* are most likely widely scattered across this unit.

Herbs may include *Senna italica* subsp. *arachoides*, *Sesamum triphyllum*, *Harpagophytum procumbens*, *Helichrysum cerastioides* var. *cerastioides*, *Hermannia comosa* and *Osteospermum scariosum* var. *scariosum*.

Species of conservation concern that might be associated with this unit include the nationally (NFA) protected tree *Vachellia erioloba*, and the provincially (NCNCA) protected *Ruschia griquensis*, *R. hamata* and *Olea europaea* subsp. *africana*.

iii) Shrubland

This community is mainly expected to be associated with red sandy soil mixed with surface rubble as well as shallow red sandy soil on dolomitic limestone outcrops which surrounds the Daniel Alluvial channel (Figure 7). The vegetation most likely to be present here typically resembles an open shrubland where *Tarchonanthus camphoratus* shrubs are scattered in a shrubby grassland matrix.

Other shrubs expected to be found here include *Calobota cuspidosa*, *Grewia flava*, *Olea europaea* subsp. *africana*, *Searsia tridactyla*, *S. lancea*, *Diospyros austro-africana* var. *microphylla*, *Ehretia alba*, *Gymnosporia buxifolia*, *Vachellia tortilis*, *V. hebeclada* subsp. *hebeclada*, *Ziziphus mucronata* and *Asparagus exuvialis*.

The low shrub stratum most likely includes *Eriocephalus ericoides* subsp. *griquensis*, *Gnidia polycephala*, *Amphiglossa triflora*, *Rosenia humilis*, *Wahlenbergia nodosa*, *Chrysocoma ciliata*, *Pentzia incana*, *Felicia filifolia* subsp. *filifolia*, *Melolobium microphyllum*, *Aptosimum albomarginatum*, *A. marlothii*, *Lycium horridum*, *Leonotis pentadentata*, *Euryops dregeanus*, *Thesium lacinulatum*, *Peliostomum leucorrhizum*, *Euphorbia duseimata*, *Deverra burchellii*, *Asparagus* sp. and *Berkheya* sp.

The grass layer is expected to include *Stipagrostis uniplumis*, *Enneapogon scoparius* *E. cenchroides*, *Aristida congesta* subsp. *congesta*, *A. congesta* subsp. *barbicollis*, *A. stipitata*, *A. vestita*, *Eragrostis lehmanniana*, *E. trichophora*, *Fingerhuthia africana*, *Heteropogon contortus*, *Digitaria eriantha*, *Sporobolus fimbriatus*, *Schmidtia pappophoroides* and *Tragus racemosus*.

Protected species that most likely occur here include those protected under the NCNCA, such as *Olea europaea* subsp. *africana*, *Gymnosporia buxifolia*, *Deverra burchellii* and *Euphorbia duseimata*.

iv) Ephemeral wetlands

Numerous wetlands occur on Turksvypan (Figure 7). All of them are ephemeral and most are endorheic. Due to the high variation in the characteristics of pans in the region it is not possible to describe their associated vegetation communities without a field investigation. However, the surfaces of pans in this region are typically dominated by *Leptochloa fusca*, but other grasses that have been found to occur mostly towards the periphery of the pans include *Aristida congesta* subsp. *barbicollis*, *A. congesta* subsp. *congesta*, *Eragrostis bicolor*, *E. truncata*, *E. trichophora*, *Themeda triandra* and *Enneapogon desvauxii*. *Platycarphella parvifolia* and *Cullen tomentosum* are common herbs on pans, while *Ziziphus mucronatus*, *Olea europaea* subsp. *africana*, *Diospyros lycioides* and *Tarchonanthus camphoratus* typically comprise the woody fringes. Species of conservation concern include *Olea europaea* subsp. *africana*.

v) Ephemeral drainage lines

The drainage lines occur along the hills and ridges, where they drain towards the plains and wetlands of the study area (Figure 7). Drainage channels are not always well defined, but usually consist of a higher cover of rocks on the surface. They are often distinguishable by woody riparian canopies that form along the channels, with species that include *Boscia albitrunca* (protected under NFA and NCNCA), *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, two species, i.e. *Herniaria erckertii* subsp. *pulvinata* (**Data Deficient - Taxonomically Problematic**) and *Antimima lawsonii* (**Rare**), are listed under the National Environmental: Biodiversity Act (Act No. 10 of 2004) (NEMBA) (Table 2). Of these, *Antimima lawsonii* is likely to be found on those areas in the study area associated with limestone soils.

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

FAMILY	Scientific name	Status	NFA	NCNCA
AMARYLLIDACEAE	<i>Haemanthus humilis</i> subsp. <i>humilis</i>	LC		S2
APIACEAE	<i>Deverra burchellii</i>	LC		S2
APOCYNACEAE	<i>Orbea knobelii</i>	LC		S2
	<i>Pachypodium succulentum</i>	LC		S2
	<i>Pentarrhinum insipidum</i>	LC		S2
BRASSICACEAE	<i>Boscia albitrunca</i>	LC	X	S2
CARYOPHYLLACEAE	<i>Dianthus micropetalus</i>	LC		S2
	<i>Dianthus namaensis</i> var. <i>dinteri</i>	LC		S2
	<i>Herniaria erckertii</i> subsp. <i>pulvinata</i>	DDT		
CELASTRACEAE	<i>Gymnosporia buxifolia</i>	LC		S2
EUPHORBIACEAE	<i>Euphorbia duseimata</i>	LC		S2
	<i>Euphorbia mauritanica</i> var. <i>mauritanica</i>	LC		S2
FABACEAE	<i>Lessertia affinis</i>	LC		S1
	<i>Vachellia erioloba</i>	LC	X	
	<i>Vachellia haematoxylon</i>	LC	X	
GERANIACEAE	<i>Pelargonium multicaule</i> subsp. <i>multicaule</i>	LC		S1
IRIDACEAE	<i>Gladiolus permeabilis</i> subsp. <i>edulis</i>	LC		S2
MESEMBRYANTHEMACEAE	<i>Antimima lawsonii</i>	Rare		S2
	<i>Lithops hookeri</i>	LC		S2
	<i>Prepodesma orpenii</i>	LC		S2
	<i>Ruschia griquensis</i>	LC		S2
	<i>Ruschia hamata</i>	LC		S2
	<i>Trichodiadema densum</i>	LC		S2
	<i>Trichodiadema setuliferum</i>	LC		S2
	<i>Olea europaea</i> subsp. <i>africana</i>	LC		S2
OXALIDACEAE	<i>Oxalis depressa</i>	LC		S2
	<i>Oxalis lawsonii</i>	LC		S2
PEDALIACEAE	<i>Harpagophytum procumbens</i>	LC		S1
SCROPHULARIACEAE	<i>Jamesbrittenia atropurpurea</i> subsp. <i>atropurpurea</i>	LC		S2
	<i>Jamesbrittenia aurantiaca</i>	LC		S2
	<i>Jamesbrittenia tysonii</i>	LC		S2
	<i>Nemesia lilacina</i>	LC		S2

Species from the study area that are protected in terms of the National Forests (NFA) Act No 84 of 1998 (Table 2) include *Vachellia haematoxylon*, *V.erioloba* and *Boscia albitrunca*. The latter species is also protected according the NCNCA. It is expected to be most abundant in the hills and rocky ridges of the site, while *V. haematoxylon* and *V.erioloba* is expected to occur on the sandy plains. 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.

Specially protected species (Schedule 1) and Protected species (Schedule 2) of the Northern Cape Nature Conservation (NCNCA) Act No. 9 of 2009 with a likelihood to occur on site 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
1a Listed invasive species that must be combatted or eradicated.	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.
1b Listed invasive species that must be controlled.	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.
2 Listed invasive species that require a permit to carry out a restricted activity within an area.	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.
3 Listed invasive species that are subject to exemptions and prohibitions	

Table 4. A list of declared weeds and invasive species recorded in the study area.

Scientific name	Common name	CARA	NEMBA	NCNCA
<i>Acer negundo</i>	Chinese maple	-	3	
<i>Caesalpinia gilliesii</i>	Bird-of-paradise flower	-	1b	
<i>Cirsium vulgare</i>	Scotch thistle	1	1b	S6
<i>Datura innoxia</i>	Downy thorn apple	1	1b	S6
<i>Eucalyptus camaldulensis</i>	Red river gum	2	1b	S6
<i>Mirabilis jalapa</i>	Marvel-of -Peru	-	1b	
<i>Opuntia ficus-indica</i>	Mission prickly pear	1	1b	S6
<i>Parkinsonia aculeata</i>	Jerusalem thorn	-	1b	
<i>Prosopis velutina</i>	Velvet mesquite	2	3	S6
<i>Prosopis glandulosa</i> var. <i>glandulosa</i>	Honey mesquite	2	3	S6
<i>Tecoma stans</i> var. <i>stans</i>	Yellow bells	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 recorded in the study area.

Scientific name	Common name
<i>Euclea undulata</i>	Common guarri
<i>Euclea crispa</i> subsp. <i>ovata</i>	Blue guarri
<i>Grewia flava</i>	Wild raisin
<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 Turksvypan 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 50 terrestrial mammals and nine bat species have been recorded in the region (see Appendix 2). Virtually all mammals of the study area are protected; either according to Schedule 1, 2 or 3 of NCNCA (see Appendix 2). Eighteen mammal species of conservation concern potentially occur in the area (Table 6), of which 12 are listed either in the IUCN or South African Red Data Book. Those that are specially protected are also indicated in Table 6.

The protected bat species, Aardvark, Bushveld Gerbil, Aardwolf, Cape Fox, Bat-eared Fox, African Striped Weasel, African Wild Cat, Honey Badger and Striped Polecat all have a high chance of occurring across the site, given their wide habitat tolerances and preference for the habitat found on site.

Ground Pangolin, South African Hedgehog and Black-footed cat may potentially occur on site on account of their preferences for arid areas. They are however rather skittish and therefore they will most likely occur very seldomly. The Brown Hyaena might be present, but 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.

The core prospecting activities are associated with the alluvial channel, which include the grassland and shrubland on the plains. Listed mammals that are most likely to be impacted in the form of species- and/or habitat loss resulting from the prospecting activities include those that are associated with these habitats.

Table 6. Mammal species of conservation concern that are likely to occur in the region Conservation values are indicated in terms of the international (IUCN) Red List, the South African Red Data Book (SA RDB) and Schedule 1 of the Northern Cape Nature Conservation Act (NCNCA).

Scientific name	Common name	IUCN	SA RDB	NCNCA
<i>Eidolon helvum</i>	African Straw-coloured Fruit-bat	NT		
<i>Rhinolophus denti</i>	Dent's Horseshoe Bat		NT	
<i>Rhinolophus clivosus</i>	Geoffroy's Horseshoe Bat		NT	
<i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat		NT	
<i>Orycteropus afer</i>	Aardvark			X
<i>Gerbilliscus leucogaster</i>	Bushveld Gerbil		DD	
<i>Manis temminckii</i>	Ground Pangolin	VU	VU	X
<i>Suncus varilla</i>	Lesser Dwarf Shrew		DD	
<i>Atelerix frontalis</i>	South African Hedgehog		NT	
<i>Proteles cristata</i>	Aardwolf			X
<i>Felis silvestris</i>	African Wild Cat			X
<i>Felis nigripes</i>	Black-footed Cat	VU		X
<i>Vulpes chama</i>	Cape Fox			X
<i>Hyaena brunnea</i>	Brown Hyena	NT		X
<i>Otocyon megalotis</i>	Bat-eared Fox			X
<i>Poecilogale albinucha</i>	African Striped Weasel		DD	X
<i>Ictonyx striatus</i>	Striped Polecat			X
<i>Mellivora capensis</i>	Honey Badger		NT	X

3.4.2. Reptiles

The Turksvypan prospecting area lies within the distribution range of at least 36 reptile species (see Appendix 2). No listed species are known to occur in the area, but most reptiles of the study area are protected either according to Schedule 1 or 2 of NCNCA (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 hills and ridge slopes are considered to be the most important habitat for reptile diversity at the site, while the ephemeral pans could potentially 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 wetland ecosystems of the ephemeral wetlands. As a result, higher amphibian diversity is most likely to be found in these habitats during periods of inundation, 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 ephemeral pans 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 or near; i.e. within 100 km, of any of the Important Bird Areas (IBA) defined by Birdlife South Africa. 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). Those that are specially protected (Schedule 1) are also listed in Table 7.

The ephemeral wetlands could potentially attract protected water birds when inundated, 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

Apart from general disturbances and habitat loss, other potential impacts would come from electrocution and collisions with power lines and the accidental or intentional killing of birds. Not all species are vulnerable to powerlines, but flamingos, bustards and storks are highly vulnerable to collisions, while many of the raptors, including vultures, are susceptible to electrocution and collision. Furthermore, owls and vultures are often killed due to cultural believes and practises.

3.4.5. 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 8, 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 8. 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	ORTHOPTERA	<i>Lepidochrysops penningtoni</i>	Pennington's Blue	DD
			<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	VU			
ONYCHOPHORA			Velvet worms	S1	

Two 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. Ephemeral wetlands

Ephemeral wetlands host species specifically adapted to ephemerality. Crustaceans in particular are specialists of these pans and dominate them. Their eggs lie dormant in the soil until the pans are inundated. 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 pan on Turksvypan include Notostraca, Anostraca, Spinicaudata, Cladocera, Ostracoda and Copepoda. Within a few days after the wetlands are inundated these species will hatch out and 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.

ii. 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 in general are widely distributed and extremely diverse. Therefore, it is not possible to list specialised communities that occur here without a dedicated study. However, those species of conservation concern listed in Table 8 are most likely to be associated with this invertebrate habitat and also comprises the majority of the earmarked area for the Turksvypan operation.

3.5. Critical biodiversity areas and broad-scale processes

The proposed prospecting site falls within critical biodiversity areas (Figure 8), as defined by the Northern Cape Critical Biodiversity Areas Map (Holness and Oosthuysen 2016). This map identifies biodiversity priority areas, called 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 as a whole.

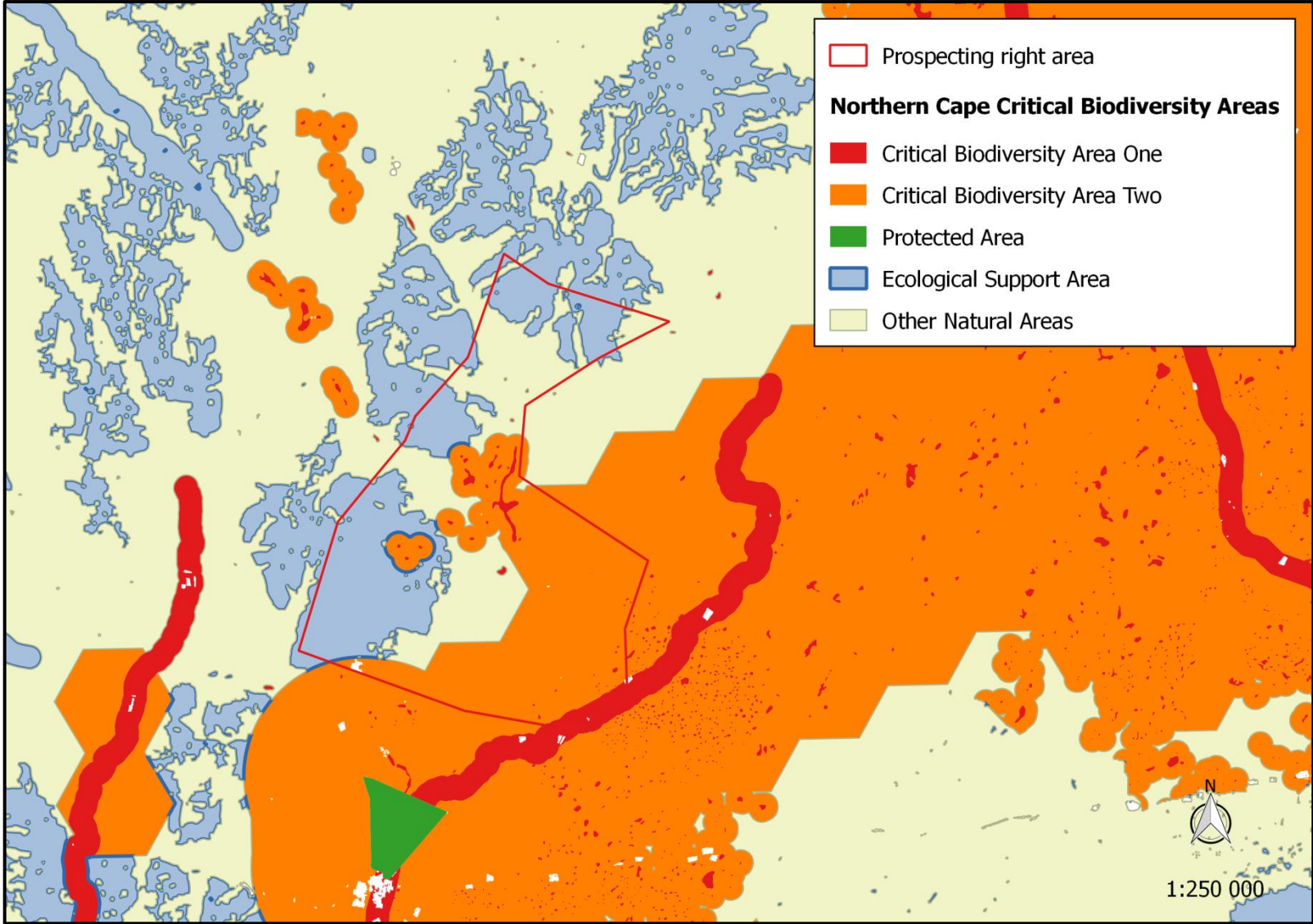


Figure 8. The study area in relation to the Northern Cape Critical Biodiversity Areas.

The ephemeral wetlands of the study area are classified as *Critical Biodiversity Area One*, with their associated buffer- and catchment areas classified as *Critical Biodiversity Area Two*. The hills in the north and west are classified as *Ecological Support Areas*, while a large portion of the Daniel Alluvial channel that is earmarked for core prospecting activities, is classified as *Other Natural Areas* (Figure 8). No protected areas occur in the study site.

Similarly, the Mining and Biodiversity Guidelines (DENC et al. 2013) recognises those areas where the most pronounced occurrence of wetlands on site are found as *Highest Biodiversity Importance* (Figure 9), which constitute a high risk for mining. These guidelines were developed to identify and categorize biodiversity priority areas sensitive to the impacts of mining in order to support mainstreaming of biodiversity issues in decision making in the mining sector.

According to the Wetland Freshwater Priority Areas project, all of the ephemeral wetlands in the study area are poorly protected. Although the majority have been classified with a Present Ecological State of *Natural or Good Condition*, those associated with historical cultivation practises have been classified as *Largely Modified*. 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.

The broad-scale vegetation units of the study area (Kuruman Mountain Bushveld, Olifantshoek Plains Thornveld and Ghaap Plateau Vaalbosveld) are classified as least threatened and therefore no formal fine-scale conservation planning has been conducted. The Kuruman Mountain Bushveld and Olifantshoek Plains Thornveld vegetation units have however been identified as a medium conservation priority area within the Siyanda Environmental Management Framework, but the study area does not fall within a proposed conservation area for the District Municipality. Neither are any of the features on site prioritised for ecological importance in the Pixley Ka Seme District Municipality (Rumboll 2014).

Furthermore, the study area falls within the Griqualand West Centre (GWC) of Endemism (Van Wyk and Smith 2001). A centre of plant endemism is an area with high concentrations of plant species with very restricted distributions, known as endemics. They are extremely vulnerable; relatively small disturbances in a centre of endemism may easily pose a serious threat to its many range restricted species. The GWC (Figure 10) is considered a priority in the Northern Cape, because the number of threats to the area is increasing rapidly. This is a cause of concern, because the GWC is still greatly misunderstood and under researched.

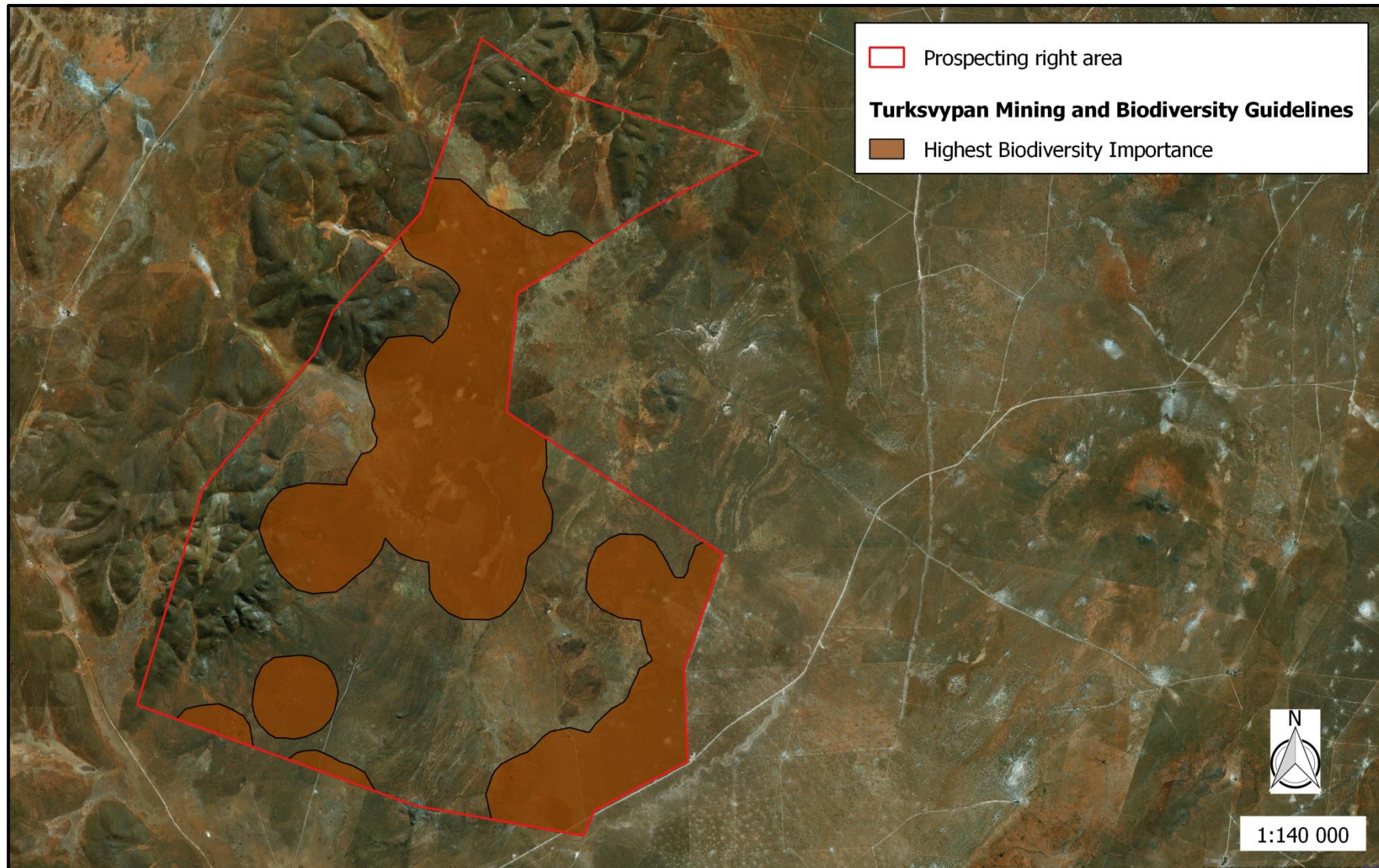


Figure 9. The study area in relation to the Mining and Biodiversity Guidelines.

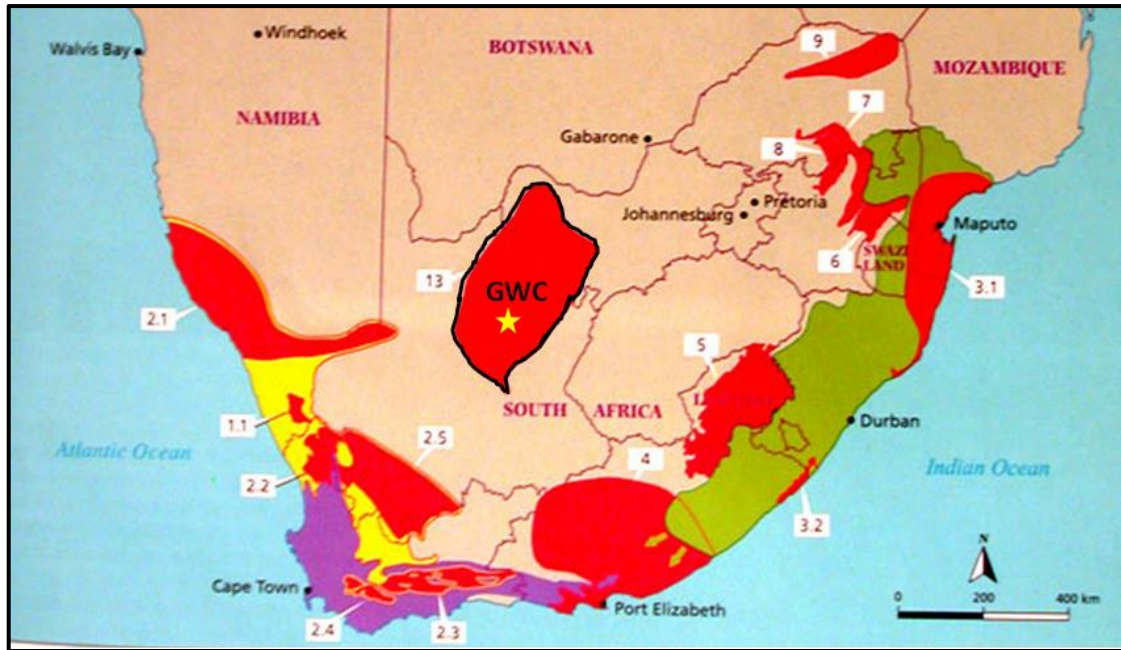


Figure 10. A map indicating the regions of floristic endemism (in red) in southern Africa, according to (Van Wyk and Smith 2001). The location of the study area is presented by the yellow star.

3.6. Site sensitivity

The sensitivity map for the Turksvypan prospecting operation is illustrated in Figure 11. The ephemeral wetlands and drainage lines are considered to be of **very high** sensitivity due to their vital ecological and hydrological functionality and significance. 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 hills 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. These units are not regarded as no-go areas, but activities should only proceed with caution as it may not be possible to mitigate all impacts appropriately. The remainder of the study site is 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.

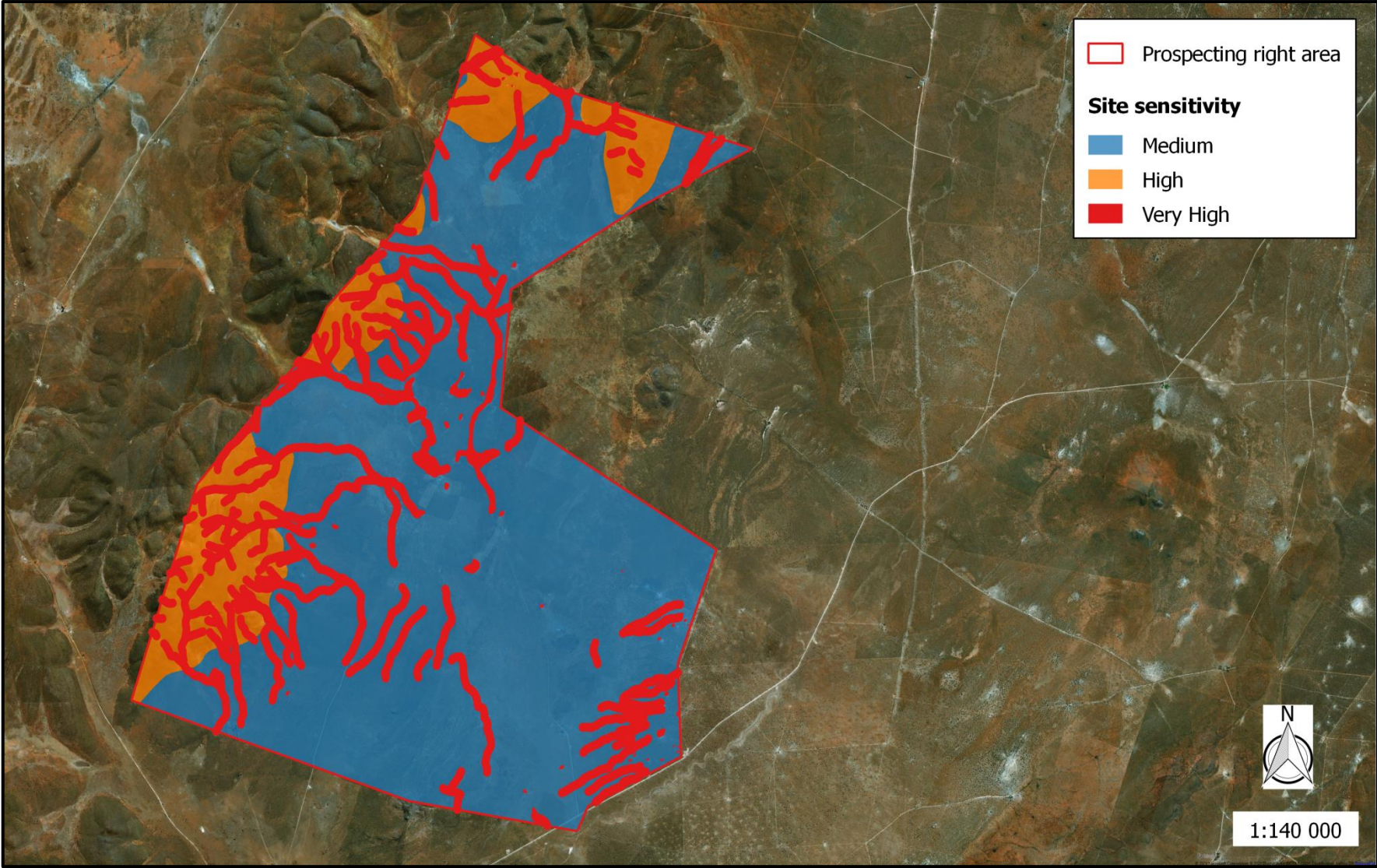


Figure 11. A sensitivity map for the Turksvypan prospecting area.

4. ECOLOGICAL IMPACT ASSESSMENT

In this section, the potential impacts and associated risk factors that may be generated by the Turksvypan prospecting operation are identified and described. A detailed analysis of each impact is provided in Table 9. 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 9. A detailed analysis of ecological impacts identified for the Turksvypan 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 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 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. Seeds can be acquired from renukaroo@gmail.com.
- 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 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 and pans 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 and the intactness of natural vegetation in the region, 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

Five plant communities potentially occur on site of which the ephemeral drainage lines and ephemeral pans are considered to be of very high sensitivity. The plant community associated with the hills are considered to be of high sensitivity, while the plains of the study area are considered to be of medium sensitivity. No profound impacts are expected to be related to the proposed prospecting operation due to the low invasive nature of drilling activities. However, the most likely impacts are expected to be related to the disruption of the hydrological regime if any of the ephemeral pans or pan catchments are modified through road creation or drill pad establishment.

Species of conservation concern that are likely to be found in the prospecting area include *Olea europaea* subsp. *africana*, *Gymnosporia buxifolia*, *Deverra burchellii*, *Euphorbia duseimata*, *Vachellia erioloba*, *Ruschia griquensis*, *R. hamata* and *Boscia albitrunca*. The prospecting operation might result in the large-scale clearance of indigenous vegetation. 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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A decorative graphic consisting of several overlapping arcs in grey and red, spanning across the middle of the page. The arcs are semi-circular and overlap each other, creating a layered effect. A solid grey horizontal band is positioned below the arcs, containing the text "APPENDICES".

APPENDICES

APPENDIX 1

Plant species list

FAMILY	SPECIES	STATUS	NFA	NCNCA
ACANTHACEAE	<i>Barleria bechuanensis</i>	LC		
	<i>Blepharis integrifolia</i>	LC		
	<i>Glossochilus burchellii</i>	LC		
	<i>Justicia puberula</i>	LC		
	<i>Monechma divaricatum</i>	LC		
AIZOACEAE	<i>Galenia sarcophylla</i>	LC		
AMARANTHACEAE	<i>Alternanthera pungens</i>	Nat Exot		
	<i>Atriplex semibaccata</i>	Nat Exot		
	<i>Hermbstaedtia fleckii</i>	LC		
	<i>Hermbstaedtia odorata</i> var. <i>aurantiaca</i>	LC		
	<i>Kyphocarpa angustifolia</i>	LC		
	<i>Sericorema remotiflora</i>	LC		
	<i>Sericorema sericea</i>	LC		
AMARYLLIDACEAE	<i>Haemanthus humilis</i> subsp. <i>humilis</i>	LC		S2
	<i>Anacampseros filamentosa</i> subsp. <i>filamentosa</i>	LC		
ANACAMPSEROTACEAE				
ANACARDIACEAE	<i>Searsia burchellii</i>	LC		
	<i>Searsia ciliata</i>	LC		
	<i>Searsia lancea</i>	LC		
	<i>Searsia pendulina</i>	LC		
	<i>Searsia pyroides</i> var. <i>pyroides</i>	LC		
	<i>Searsia tridactyla</i>	LC		
APIACEAE	<i>Deverra burchellii</i>	LC		S2
APOCYNACEAE	<i>Orbea knobelii</i>	LC		S2
	<i>Pachypodium succulentum</i>	LC		S2
	<i>Pentarrhinum insipidum</i>	LC		S2
ASPARAGACEAE	<i>Asparagus bechuanicus</i>	LC		
	<i>Asparagus exuvialis</i>	LC		
	<i>Asparagus suaveolens</i>	LC		
ASPLENIACEAE	<i>Asplenium cordatum</i>	LC		
ASTERACEAE	<i>Amphiglossa triflora</i>	LC		
	<i>Arctotis arctotoides</i>	LC		
	<i>Chrysocoma ciliata</i>	LC		
	<i>Cirsium vulgare</i>			S6
	<i>Cotula microglossa</i>	LC		
	<i>Eriocephalus ericoides</i> subsp. <i>griquensis</i>	LC		
	<i>Euryops dregeanus</i>	LC		
	<i>Felicia fascicularis</i>	LC		
	<i>Felicia filifolia</i> subsp. <i>filifolia</i>	LC		
	<i>Garuleum schinzii</i>	LC		
	<i>Gazania krebsiana</i> subsp. <i>arctotoides</i>	LC		
	<i>Geigeria filifolia</i>	LC		
	<i>Helichrysum caespitium</i>	LC		
	<i>Helichrysum cerastioides</i> var. <i>cerastioides</i>	LC		
	<i>Helichrysum lucilioides</i>	LC		
<i>Helichrysum zeyheri</i>	LC			

FAMILY	SPECIES	STATUS	NFA	NCNCA
ASTERACEAE	<i>Hertia ciliata</i>	LC		
	<i>Hertia pallens</i>	LC		
	<i>Inulanthera dregeana</i>	LC		
	<i>Lactuca inermis</i>	LC		
	<i>Laggera decurrens</i>	LC		
	<i>Lopholaena cneorifolia</i>	LC		
	<i>Nidorella resedifolia</i> subsp. <i>resedifolia</i>	LC		
	<i>Osteospermum crassifolium</i>	LC		
	<i>Osteospermum dentatum</i>	LC		
	<i>Osteospermum microphyllum</i>	LC		
	<i>Osteospermum muricatum</i> subsp. <i>muricatum</i>	LC		
	<i>Osteospermum scariosum</i> var. <i>scariosum</i>	LC		
	<i>Osteospermum spinescens</i>	LC		
	<i>Pentzia calcarea</i>	LC		
	<i>Pentzia globosa</i>	LC		
	<i>Pentzia incana</i>	LC		
	<i>Pentzia quinquefida</i>	LC		
	<i>Pentzia viridis</i>	LC		
	<i>Platycarphella parvifolia</i>	LC		
	<i>Pteronia cylindracea</i>	LC		
	<i>Rosenia humilis</i>	LC		
	<i>Schkuhria pinnata</i>	Nat Exot		
	<i>Senecio carnosus</i>	LC		
	<i>Senecio reptans</i>	LC		
	<i>Senecio sisymbriifolius</i>	LC		
	<i>Sonchus asper</i> subsp. <i>asper</i>	Nat Exot		
	<i>Tarchonanthus camphoratus</i>	Decl Encl		
<i>Zinnia peruviana</i>	Nat Exot			
BIGNONIACEAE	<i>Tecoma stans</i> var. <i>stans</i>			S6
BORAGINACEAE	<i>Buglossoides arvensis</i>	Nat Exot		
	<i>Ehretia alba</i>	LC		
	<i>Heliotropium ciliatum</i>	LC		
	<i>Heliotropium lineare</i>	LC		
	<i>Lithospermum cinereum</i>	LC		
BRASSICACEAE	<i>Boscia albitrunca</i>	LC	X	S2
	<i>Erucastrum austroafricanum</i>	LC		
	<i>Erucastrum strigosum</i>	LC		
	<i>Heliophila suavissima</i>	LC		
	<i>Sisymbrium burchellii</i> var. <i>burchellii</i>	LC		
CACTACEAE	<i>Opuntia ficus-indica</i>			S6
CAMPANULACEAE	<i>Wahlenbergia androsacea</i>	LC		
	<i>Wahlenbergia nodosa</i>	LC		
CAPPARACEAE	<i>Cleome angustifolia</i> subsp. <i>diandra</i>	LC		
CARYOPHYLLACEAE	<i>Dianthus micropetalus</i>	LC		S2

FAMILY	SPECIES	STATUS	NFA	NCNCA
CARYOPHYLLACEAE	<i>Dianthus namaensis</i> var. <i>dinteri</i>	LC		S2
	<i>Herniaria erckertii</i> subsp. <i>pulvinata</i>	DDT		
	<i>Pollichia campestris</i>	LC		
	<i>Spergularia media</i>	Nat Exot		
CELASTRACEAE	<i>Gymnosporia buxifolia</i>	LC		S2
	<i>Maytenus undata</i>	LC		
CHENOPODIACEAE	<i>Atriplex semibaccata</i> var. <i>appendiculata</i>	LC		
	<i>Chenopodium hederiforme</i> var. <i>dentatum</i>	LC		
	<i>Colchicum melanthoides</i> subsp. <i>melanthoides</i>	LC		
COLCHICACEAE	<i>Ornithoglossum dinteri</i>	LC		
	<i>Commelina africana</i> var. <i>lancispatha</i>	LC		
COMMELINACEAE	<i>Convolvulus boedeckerianus</i>	LC		
	<i>Convolvulus ocellatus</i> var. <i>ocellatus</i>	LC		
	<i>Ipomoea oenotheroides</i>	LC		
	<i>Seddera suffruticosa</i>	LC		
CUCURBITACEAE	<i>Coccinia sessilifolia</i>	LC		
	<i>Cucumis heptadactylus</i>	LC		
	<i>Cucumis myriocarpus</i> subsp. <i>leptodermis</i>	LC		
	<i>Kedrostis foetidissima</i>	LC		
	<i>Schoenoplectus tabernaemontani</i>	Nat Exot		
EBENACEAE	<i>Diospyros austro-africana</i> var. <i>microphylla</i>	LC		
	<i>Diospyros lycioides</i> subsp. <i>guerkei</i>	LC		
	<i>Diospyros lycioides</i> subsp. <i>lycioides</i>	LC		
	<i>Euclea crispa</i> subsp. <i>ovata</i>	Decl Encr		
	<i>Euclea undulata</i>	Decl Encr		
	<i>Euphorbia duseimata</i>	LC		S2
EUPHORBIACEAE	<i>Euphorbia mauritanica</i> var. <i>mauritanica</i>	LC		S2
	<i>Argyrolobium pauciflorum</i>	LC		
FABACEAE	<i>Caesalpinia gilliesii</i>			
	<i>Caesalpinia pulcherrima</i>	Nat Exot		
	<i>Calobota cuspidosa</i>	LC		
	<i>Cullen tomentosum</i>	LC		
	<i>Indigofera alternans</i> var. <i>alternans</i>	LC		
	<i>Indigofera denudata</i>	LC		
	<i>Indigofera vicioides</i> var. <i>vicioides</i>	LC		
	<i>Lessertia affinis</i>	LC		S1
	<i>Melolobium microphyllum</i>	LC		
	<i>Parkinsonia aculeata</i>			
	<i>Prosopis glandulosa</i>			S6

FAMILY	SPECIES	STATUS	NFA	NCNCA
FABACEAE	<i>Prosopis velutina</i>			S6
	<i>Rhynchosia totta</i> var. <i>totta</i>	LC		
	<i>Senegalia mellifera</i>	LC		
	<i>Senna italica</i> subsp. <i>arachoides</i>	LC		
	<i>Styphnolobium japonicum</i>	Nat Exot		
	<i>Vachellia erioloba</i>	LC	X	
	<i>Vachellia haematoxylon</i>	LC	X	
	<i>Vachellia hebeclada</i> subsp. <i>hebeclada</i>	LC		
	<i>Vachellia karroo</i>	Decl Enchr		
	<i>Vachellia tortilis</i> subsp. <i>heteracantha</i>	Decl Enchr		
GENTIANACEAE	<i>Sebaea compacta</i>	LC		
GERANIACEAE	<i>Pelargonium multicaule</i> subsp. <i>multicaule</i>	LC		S1
HYACINTHACEAE	<i>Albuca collina</i>	LC		
	<i>Albuca dyeri</i>	LC		
	<i>Albuca namaquensis</i>	LC		
	<i>Albuca seineri</i>	LC		
	<i>Drimia intricata</i>	LC		
	<i>Ledebouria glauca</i>	LC		
	<i>Ledebouria minima</i>	LC		
	<i>Ledebouria undulata</i>	LC		
IRIDACEAE	<i>Gladiolus permeabilis</i> subsp. <i>edulis</i>	LC		S2
JUNCACEAE	<i>Juncus exsertus</i>	LC		
	<i>Juncus rigidus</i>	LC		
LAMIACEAE	<i>Leonotis pentadentata</i>	LC		
	<i>Salvia disermas</i>	LC		
	<i>Salvia stenophylla</i>	-		
	<i>Salvia verbenaca</i>	LC		
	<i>Stachys spathulata</i>	LC		
LOBELIACEAE	<i>Lobelia thermalis</i>	LC		
LOPHIOCARPACEAE	<i>Lophiocarpus polystachyus</i>	LC		
MALVACEAE	<i>Corchorus pinnatipartitus</i>	LC		
	<i>Grewia flava</i>	Decl Enchr		
	<i>Hermannia abrotanoides</i>	LC		
	<i>Hermannia comosa</i>	LC		
	<i>Hermannia eenii</i>	LC		
	<i>Hermannia erodioides</i>	LC		
	<i>Hermannia jacobefolia</i>	LC		
	<i>Hermannia linearifolia</i>	LC		
	<i>Hermannia linnaeoides</i>	LC		
	<i>Hibiscus trionum</i>	Nat Exot		
	<i>Melhaniantha prostrata</i>	LC		
	<i>Pavonia burchellii</i>	LC		
	<i>Sida chrysantha</i>	LC		
MENISPERMACEAE	<i>Antizoma angustifolia</i>	LC		
MESEMBRYANTHEMACEAE	<i>Antimima lawsonii</i>	Rare		S2

FAMILY	SPECIES	STATUS	NFA	NCNCA
MESEMBRYANTHEMACEAE	<i>Lithops hookeri</i>	LC		S2
	<i>Prepodesma orpenii</i>	LC		S2
	<i>Ruschia griquensis</i>	LC		S2
	<i>Ruschia hamata</i>	LC		S2
	<i>Trichodiadema densum</i>	LC		S2
	<i>Trichodiadema setuliferum</i>	LC		S2
MOLLUGINACEAE	<i>Hypertelis salsoloides</i> var. <i>salsoloides</i>	LC		
	<i>Limeum argute-carinatum</i> var. <i>argute-carinatum</i>	LC		
MYRTACEAE	<i>Eucalyptus camaldulensis</i>			S6
NYCTAGINACEAE	<i>Commicarpus pentandrus</i>	LC		
	<i>Mirabilis jalapa</i>			
OLEACEAE	<i>Menodora africana</i>	LC		
	<i>Olea europaea</i> subsp. <i>africana</i>	LC		S2
ONAGRACEAE	<i>Oenothera indecora</i>	Nat Exot		
OXALIDACEAE	<i>Oxalis depressa</i>	LC		S2
	<i>Oxalis lawsonii</i>	LC		S2
PASSIFLORACEAE	<i>Adenia repanda</i>	LC		
PEDALIACEAE	<i>Harpagophytum procumbens</i>	LC		S1
	<i>Sesamum triphyllum</i> var. <i>triphyllum</i>	LC		
PHYLLANTHACEAE	<i>Phyllanthus parvulus</i>	LC		
PLANTAGINACEAE	<i>Plantago lanceolata</i>	LC		
POACEAE	<i>Andropogon schirensis</i>	LC		
	<i>Anthephora pubescens</i>	LC		
	<i>Aristida adscensionis</i>	LC		
	<i>Aristida congesta</i> subsp. <i>barbicollis</i>	LC		
	<i>Aristida congesta</i> subsp. <i>congesta</i>	LC		
	<i>Aristida meridionalis</i>	LC		
	<i>Aristida stipitata</i>	LC		
	<i>Aristida vestita</i>	LC		
	<i>Brachiaria marlothii</i>	LC		
	<i>Brachiaria serrata</i>	LC		
	<i>Chloris virgata</i>	LC		
	<i>Cymbopogon pospischilii</i>	Nat Exot		
	<i>Cynodon dactylon</i>	LC		
	<i>Cynodon incompletus</i>	LC		
	<i>Digitaria eriantha</i>	LC		
	<i>Digitaria polyphylla</i>	LC		
	<i>Enneapogon cenchroides</i>	LC		
	<i>Enneapogon desvauxii</i>	LC		
	<i>Enneapogon scoparius</i>	LC		
	<i>Eragrostis bicolor</i>	LC		
<i>Eragrostis chloromelas</i>	LC			
<i>Eragrostis curvula</i>	LC			
<i>Eragrostis echinchoidea</i>	LC			

FAMILY	SPECIES	STATUS	NFA	NCNCA
POACEAE	<i>Eragrostis homomalla</i>	LC		
	<i>Eragrostis lehmanniana</i> var. <i>lehmanniana</i>	LC		
	<i>Eragrostis macrochlamys</i> var. <i>wilmaniae</i>	-		
	<i>Eragrostis mexicana</i> subsp. <i>virescens</i>	Nat Exot		
	<i>Eragrostis micrantha</i>	LC		
	<i>Eragrostis nindensis</i>	LC		
	<i>Eragrostis pallens</i>	LC		
	<i>Eragrostis pilgeriana</i>	LC		
	<i>Eragrostis porosa</i>	LC		
	<i>Eragrostis procumbens</i>	LC		
	<i>Eragrostis pseudobtusa</i>	LC		
	<i>Eragrostis trichophora</i>	LC		
	<i>Eragrostis truncata</i>	LC		
	<i>Fingerhuthia africana</i>	LC		
	<i>Heteropogon contortus</i>	LC		
	<i>Hyparrhenia hirta</i>	LC		
	<i>Leptochloa fusca</i>	LC		
	<i>Melinis nerviglumis</i>	LC		
	<i>Melinis repens</i> subsp. <i>grandiflora</i>	LC		
	<i>Melinis repens</i> subsp. <i>repens</i>	LC		
	<i>Oropetium capense</i>	LC		
	<i>Panicum impeditum</i>	LC		
	<i>Panicum stapfianum</i>	LC		
	<i>Pogonarthria squarrosa</i>	LC		
	<i>Schmidtia kalahariensis</i>	LC		
	<i>Schmidtia pappophoroides</i>	LC		
	<i>Setaria verticillata</i>	LC		
	<i>Sporobolus fimbriatus</i>	LC		
	<i>Stipagrostis ciliata</i> var. <i>capensis</i>	LC		
	<i>Stipagrostis uniplumis</i> var. <i>neesii</i>	LC		
	<i>Stipagrostis uniplumis</i> var. <i>uniplumis</i>	LC		
	<i>Themeda triandra</i>	LC		
	<i>Tragus racemosus</i>	LC		
<i>Triraphis purpurea</i>	LC			
<i>Urochloa panicoides</i>	LC			
POLYGONACEAE	<i>Polygonum bellardii</i>	Nat Exot		
	<i>Rumex lanceolatus</i>	LC		
PORTULACACEAE	<i>Portulaca kermesina</i>	LC		
RHAMNACEAE	<i>Ziziphus mucronata</i>	LC		
RUBIACEAE	<i>Kohautia cynanchica</i>	LC		
SANTALACEAE	<i>Thesium lacinulatum</i>	LC		
	<i>Viscum rotundifolium</i>	LC		
SAPINDACEAE	<i>Acer negundo</i>			
SCROPHULARIACEAE	<i>Aptosimum albomarginatum</i>	LC		
	<i>Aptosimum marlothii</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
SCROPHULARIACEAE	<i>Chaenostoma rotundifolium</i>	LC		
	<i>Jamesbrittenia atropurpurea</i> subsp. <i>atropurpurea</i>	LC		S2
	<i>Jamesbrittenia aurantiaca</i>	LC		S2
	<i>Jamesbrittenia tysonii</i>	LC		S2
	<i>Nemesia lilacina</i>	LC		S2
	<i>Peliostomum leucorrhizum</i>	LC		
	<i>Selago albida</i>	LC		
	<i>Selago albomarginata</i>	LC		
	<i>Selago mixta</i>	LC		
	<i>Selago paniculata</i>	LC		
	SINOPTERIDACEAE	<i>Cheilanthes eckloniana</i>	LC	
<i>Cheilanthes hirta</i> var. <i>hirta</i>		LC		
SOLANACEAE	<i>Datura innoxia</i>			S6
	<i>Lycium hirsutum</i>	LC		
	<i>Lycium horridum</i>	LC		
	<i>Lycium pilifolium</i>	LC		
	<i>Solanum capense</i>	LC		
	<i>Solanum lichtensteinii</i>	LC		
	<i>Solanum namaquense</i>	LC		
	<i>Solanum nigrum</i>	Nat Exot		
	<i>Withania somnifera</i>	LC		
STILBACEAE	<i>Nuxia gracilis</i>	LC		
THYMELAEACEAE	<i>Gnidia polycephala</i>	LC		
	<i>Lasiosiphon burchellii</i>	LC		
	<i>Lasiosiphon polycephalus</i>	LC		
TYPHACEAE	<i>Typha capensis</i>	LC		
VERBENACEAE	<i>Chascanum pinnatifidum</i> var. <i>pinnatifidum</i>	LC		
	<i>Lantana rugosa</i>	LC		
VISCACEAE	<i>Viscum rotundifolium</i>	LC		
ZYGOPHYLLACEAE	<i>Roepera pubescens</i>	LC		
	<i>Tribulus zeyheri</i> subsp. <i>zeyheri</i>	LC		
	<i>Zygophyllum pubescens</i>	LC		

APPENDIX 2

Fauna species list

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
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.	Low
	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.	High
	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.	Medium
	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.	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.	Medium
	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.	Medium

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>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.	Medium
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.	Medium

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.	Medium
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.	Medium
	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
	¹ <i>Hyaena 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
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

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>Alcelaphus caama</i>	Red Hartebeest	LC	LC	Open savanna country and open woodland.	Low
	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

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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

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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	

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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

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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>Dendropicus 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

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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

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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

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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

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

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	