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## **Appendix A**

The following table describes the socio-economic and environmental variables used in Chapter 6. References to sources are also provided.

## Sources

Central Statistical Services, 1998. *The 1996 South African population census*. Stats SA, Pretoria, South Africa.

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Table A-1: Variable names and descriptions for socio-economic and environmental variables.

Acronym	Description
<i>1996 Census data</i>	
POPTOTAL	Population census
POPDEN	Population density
MALE96	Male population
FEMALE96	Female population
RATIO_MF	Ratio of males to females
AGE_0_4	Total number of children in the 0 - 4 years of age class
AGE_0_5	Total number of children in the 0 - 5 years of age class
AGE_5_14	Total number of school age children in the 5 - 14 years of age class
AGE_15_44	Total number of people in the 15 - 44 years prime working age class
AG_15_64	Total number of people in the 15 - 64 years complete working age class
AG_65_99	Total number of people in the 65 - 99 years retirement age class
NO_SCHL	Total number of children (5 - 14 years) not in school
IN_SCHL	Total number of children (5 - 14 years) in school
NO_DEGRE	Total number of people with no highschool diploma
YES_DEGR	Total number of people with a highschool diploma
CHLDNWRK	Total number of children (5 - 14 years) working
EMPLOYED	Total number of people (15 - 64 years) formally employed
UNEMPLOY	Total number of people (15 - 64 years) not employed
DEP_RAT	Dependency ratio (children 0 - 14 years / total number employed)
POVERTY	Total number of people living in poverty (less than R18 000 per annum)
ABV_POVR	Total number of people living above poverty line (greater than R 18 000 per annum)
POV_RAT	Ratio of those in poverty to those living above poverty line
RR_INDST	Total number of people employed in renewable resource industries (e.g., agriculture, forestry, etc.)
NR_INDST	Total number of people employed in non-renewable resource industries (e.g., mining and quarrying)
MANUFAC	Total number of people employed in the commercial manufacturing sector
ENERGY	Total number of people employed in the energy production sector
CONSTRUC	Total number of people employed in the building construction sector
TRADE	Total number of people employed in the wholesale and retail trade sector
TRAN_COM	Total number of people employed in the transport and communications sector
BUS_SERV	Total number of people employed in the business services sector (e.g., insurance, banks, real estate)
SOC_SERV	Total number of people employed in the social services sector
PRIVATE	Total number of people employed in private households
EXT_ORG	Total number of people employed in extraterritorial organizations
REP_FORG	Total number of people employed in representative foreign governments (e.g., diplomatic, NGO)
IND_NEC	Total number of people employed in industry NEC or unspecified
NO_APP	Total number of people employed in non-applicable industries by definition in census
NA_INST	Total number of people employed in non-applicable institutions by definition in census
HOUSE	Total number of people living in a formal Western style modern house
TRADHOME	Total number of people living in a African traditional house (e.g., made from natural materials)
FLAT	Total number of people living in flats in blocks (e.g., apartments)
TOWN	Total number of people living in townhouses or duplexes (e.g., condominiums)
RETIRE	Total number of people living in retirement villages or holiday retirement homes
ROOM	Total number of people living in a room of a shared house or flat
SHCK_BCK	Total number of people living in a informal dwelling/shack on private property (e.g., backyard or farm)
SHCK_EW	Total number of people living in a informal dwelling/shack illegally or on town council land

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FLATLET	Total number of people living in a room or flatlet on shared property
CARAVAN	Total number of people living in a caravan or tent
HOMELESS	Total number of people living homeless
HOSTEL	Total number of people living in a workers hostel or institution (e.g., mining, mental hospital, prison)
<i>1996-97 HSRC data</i>	
SERVE_I	Service index is a composite index based on the following variables: ratio of population to police stations, post offices and hospital beds; ratio of road length to district area; ratio of 6 - 17 year olds to school; the percentage of dwellings that are fully serviced, informal, electrified formal, electrified informal, and number of telephone shares
SE_INDEX	Socio-economic index is a composite index based on the following variables: poverty gap, pupil:teacher ratio, dependency ratio, total number of households, and the population density
SAT_ENV	Satisfaction with the general environment and attractiveness of the area (%)
SAT_HOUSE	Satisfaction with the household's position (especially in a community context) (%)
SAT_ECON	Satisfaction with the economic situation (%)
SAT_SERVICE	Satisfaction with local facilities and services (%)
BASICS	Access to or possession of basic items (running water, electricity, flush toilet, and fridge in home) (%)
DEVELOP	Need for improving the general development situation (%)
BNEEDS	Need for addressing people's basic needs (provide clean water, healthy environment, health care, nutrition and job creation) (%)
UPGRADE	Need for upgrading of infrastructure (%)
SAT_LIFE	Satisfaction with life on the whole (%)
DEPEND	Need for improving administrative dependability and equity (%)
PROXH2O	Proximity to safe water (%)
ELECTRIC	Availability of electricity in homes (%)
REFUSE	Access to refuse removal and waste disposal services (%)
FTOILET	Proportion of households with access to a flush toilet (measure of sanitation) (%)
A_LITERACY	Adult literacy rate (total number of people with a minimum of five years schooling) (%)
F_LITERACY	Functional literacy rate (ability to read or write, but ability may not have been attained formally) (%)
PERCAPINC	Total per capita income
TOTPOLSTA	Total number of police stations
TOTPOSTOF	Total number of post offices
BEDSTOT	Total number of hospital beds
TELSHAREPR	Total telephone shares
<i>Fairbanks et al. 2000</i>	
FOR_PER	Percentage of land covered by forest and woodland
GRS_PER	Percentage of land covered by grassland
WET_PER	Percentage of land covered by waterbodies and wetlands
LOWI_PER	Percentage of land covered by subsistence agriculture
PLNT_PER	Percentage of land covered by exotic woodlots and commercial plantations
DRY_PER	Percentage of land covered by commercial dryland agriculture
IRR_PER	Percentage of land covered by commercial irrigated agriculture
URB_PER	Percentage of land covered by urban-residential or industrial land-use
UT_PER	Percentage land untransformed (e.g., "natural" state)
M_PER	Percentage land under low intensity transformation
T_PER	Percentage land under high intensity transformation
<i>1998 KZNNCS<sup>†</sup></i>	
PARK_PER	Percentage land under conservation protection

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<sup>†</sup> KwaZulu-Natal Nature Conservation Services



## **Appendix B**

The following manuscript is in revision for *Diversity and Distributions*. This small study outlines the method used to rank vegetation priority areas used in Chapter 3.

## South African Vegetation Priority Conservation Areas: A Coarse Filter Approach

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## **Abstract**

South Africa has an important responsibility to global biodiversity conservation, but a largely inadequate conservation area network for addressing this responsibility. This study employs a coarse-filter approach based on 68 potential vegetation units to identify areas that are largely transformed, degraded or underrepresented in formal national and provincial protected areas. The assessment highlights broad vegetation types that are currently threatened by human impacts or a lack of protection. Most vegetation types contain large tracts of natural vegetation, with little degradation and transformation. Regions in the grasslands, fynbos and forest biomes are worst affected. Very few of the vegetation types are adequately protected according to the IUCN's 10% protected area conservation target, with the fynbos and savanna biomes containing a few vegetation types that do achieve this goal. In addition to this current vulnerability assessment the ecological effect of the national road network is also evaluated. This provides an indication of the remaining untransformed area threatened by the road-effect zones in each vegetation type and can be used as a measure of potential threat facing that vegetation type due to future impacts and land use changes. An average of 5.5% of the area of each vegetation type is exposed to road-effects. Many of the grasslands, fynbos and thicket vegetation types face not only current land use threats, but may also be exposed to future threats due to a large road-effect zone. This investigation identifies areas where limited conservation resources should be concentrated by identifying vegetation types with high levels of current and potential anthropogenic land use and inadequate conservation efforts.

**Keywords:** Coarse-filter, biodiversity conservation, land-cover, vegetation types, road-effects

## (A) INTRODUCTION

South Africa contains a wealth of biodiversity within its borders, unequalled by other temperate regions. With almost 50% of the world's biodiversity falling within tropical forests (Myers, 1997), of which South Africa has none (Midgley *et al.*, 1997), the country's contribution to global biodiversity is unexpectedly large. Inventoried species total over 250 mammals, 790 birds, 303 reptiles, 95 amphibians, 94 freshwater fish and 23420 flowering plants (Cowling, 1989; Groombridge, 1994; WRI, 1994; van Jaarsveld, 2000). Thus one begins to understand how South Africa earned its place in the top 25 most biodiverse nations in the world (WCMC, 1992; Conservation International, 1998). In addition to this ranking South Africa harbours the fifth highest number of plant species in the world, with the Cape Floristic Region being recognised as one of the six floral kingdoms of the world, and one of the 25 hotspots of global biodiversity (Myers *et al.*, 2000). These hotspots are areas of importance to conservation because of high levels of species richness, endemism and threat (Myers *et al.*, 1990; 2000). The Cape Floristic Region is one of the few hotspots to fall entirely within one country. It contains 8200 plant species of which 5682 are endemic and has already lost approximately 30.3% of its primary vegetation (Fairbanks *et al.*, 2000; Myers *et al.*, 2000). The Succulent Karoo is another hotspot falling partly within the boundaries of South Africa (Lombard *et al.*, 1999; Myers *et al.*, 2000).

Although its responsibility towards global biodiversity conservation is large, South Africa with only 4.8% (DEAT, 1996) (Figure 1a) of its land surface under formal protection falls far short of the IUCN's nominal recommendation of 10% protected area coverage. This coverage also lags behind the 10% average attained by the rest of sub-Saharan Africa, with Botswana reaching 18.5%, Mozambique 12.7% and Namibia 12.4% (WRI, 1994; McNeely 1994; Siegfried *et al.*, 1998). A moderately expanding human population (Central Statistical Survey, 1998) and associated land transformation in South Africa (mainly urbanisation, cultivation and afforestation (Hoffmann, 1997)) leaves 79% of the country covered with natural woody and grassland vegetation communities (Figure 1b) (Fairbanks *et al.*, 2000). Waterbodies and wetlands cover less than one percent of the land surface area, with human land uses making up the remaining 20% (Fairbanks *et al.* 2000). Fairbanks *et al.* (2000) demonstrate that along with the approximately 30% transformation in the fynbos biome, the savanna and grassland biomes are about 10% and 26% transformed and degraded by human land uses respectively (Figure 1c) (see also Thompson *et al.*, In Review). In addition to this there are a total of 1176 species presently recognised as threatened (WRI, 1994; van Jaarsveld, 2000). Thus with these valuable and often endemic biodiversity resources, facing ever-increasing threats from human-induced land transformation, and mostly inadequate conservation efforts to stem these threats, South Africa has an obvious responsibility to do more towards the conservation of biodiversity (van Jaarsveld, 2000).

Most of South Africa's existing protected areas were proclaimed in an *ad hoc* fashion, usually because they contained areas with high scenic or tourism potential, contained endemic diseases and did not conflict with other forms of land use (Pringle, 1982; Freitag *et al.*, 1996; Pressey *et al.*, 1993). Because this form of land allocation to conservation is highly inefficient and fails to effectively conserve biodiversity, several techniques have been developed for the systematic selection of land with a high conservation value, i.e. with high levels of biodiversity and large anthropogenic threats facing that biodiversity (for reviews see Williams, 1998; Margules & Pressey, 2000). However, these techniques require data on the distribution of biodiversity and threats facing biodiversity in order to identify areas important to conservation. Because the biodiversity of a region can never be fully observed and inventoried, species distribution data are often used as a surrogate or substitute measure of biodiversity. This form of data however, has a large number of shortcomings associated with it. These include inadequate taxonomical knowledge of the groups employed, biased sampling efforts and lack of congruency between taxa (van Jaarsveld *et al.*, 1998; Maddock & du Plessis, 1999, Fairbanks & Benn, 2000; Reyers *et al.*, 2000).

#### **(B) Broad-scale biodiversity surrogates**

In recent years, the focus for conservation has shifted, with recommendations towards a more holistic approach of protecting biodiversity in the aggregate, the so-called 'coarse-filter' approach (Noss, 1987; Noss, 1990). The goal of coarse-filter conservation is to preserve all or most species in a region by protecting sufficient (>20000 ha) samples of every plant community type (see Scott *et al.*, 1993). Other hierarchical methods have included species assemblages, land facets, or landscapes (Pressey, 1994; Pressey & Logan, 1994; Wessels *et al.*, 1999; Fairbanks & Benn, 2000). At a national scale South Africa has a few databases of broader surrogates for biodiversity, including Acocks' Veld Types (Acocks, 1988) and the more recent Vegetation of South Africa, Lesotho and Swaziland (Low & Rebelo, 1996; McDonald, 1997). Acocks (1988) defined biological resources from a purely agricultural potential perspective, while Low and Rebelo (1996) looked at the definition of these resources from a management and potential use angle. These vegetation units were defined as having, "... similar vegetation structure, sharing important plant species, and having similar ecological processes." Thus, these are units that would have potentially occurred today, were it not for all the major human-made transformations e.g. agriculture and urbanisation. Therefore the Low and Rebelo (1996) vegetation map contains significant potential for acting as a broad scale surrogate of South African biodiversity and for identifying land important to biodiversity conservation.

## (A) METHODS

### (B) Current land-cover data

Before the Low and Rebelo (1996) map can be used one has to differentiate between the potential vegetation cover of regions (as defined by Low & Rebelo, 1996) and that which is in reality found in the region. In other words one needs an indication of current natural vegetation pattern, degree of transformation, and amount of protection afforded each vegetation type before one can decide if it constitutes a conservation priority (Rebelo, 1997). As Low and Rebelo (1996) point out “there is little point in setting aside more of a vegetation type with vast expanses in pristine condition, while ignoring the last patches of a type which is not yet conserved.” Low and Rebelo (1996) provide some estimates of protection and transformation data, however as they admit, “these are woefully incomplete”. Thus, some indication of current land-cover (the suite of natural and human-made features that cover the earth’s immediate surface) at a national scale is required for effective land-use planning, sustainable resource management, environmental research and in this instance conservation planning (Rebelo, 1997; Fairbanks *et al.*, 2000).

To this end the advent of the National Land-cover (NLC) database is of extreme relevance. This national database was derived using manual photo-interpretation techniques from a series of 1:250,000 scale geo-rectified hardcopy satellite imagery maps, based on seasonally standardised, single date Landsat Thematic Mapper (TM) satellite imagery captured principally during the period 1994-95 (Fairbanks & Thompson, 1996). It provides the first single standardised database of current land-cover information for the whole of South Africa, Lesotho and Swaziland (Fairbanks *et al.*, 2000). For the purpose of the present study the 31 land-cover classes were reclassified into three categories: natural, degraded and transformed land-cover (Table 1). Natural land-cover included all untransformed vegetation, e.g. forest, woodland, thicket and grassland. The degraded land-cover category was dominated by degraded classes of land-cover. These areas have a very low vegetation cover in comparison with the surrounding natural vegetation cover and were typically associated with rural population centres and subsistence level farming, where fuel-wood removal, over-grazing and subsequent soil erosion were excessive (Thompson 1996). The transformed category consisted of areas where the structure and species composition were completely or almost completely altered which includes all areas under crop cultivation, forestry plantations, urbanised areas, and mines/quarries.

The databases of potential vegetation cover and current land-cover, along with a map of protected areas in South Africa, were overlaid in a geographic information system (GIS) to determine the extent of natural, degraded, transformed and protected area within each of the 68 vegetation types identified in Low and Rebelo (1996). In addition to this the NLC database could

be used to identify the major broad categories of current threat (e.g. cultivation, forestry) facing these respective vegetation types.

### **(B) Patterns of roads**

In addition to these current land use threats, one of the most widespread forms of alteration of natural habitats and landscapes over the last century has been the construction and maintenance of roads (Trombulak & Frissell, 2000). Road networks affect landscapes and biodiversity in seven general ways: (1) increased mortality from road construction; (2) increased mortality from vehicle collisions; (3) animal behaviour modification; (4) alteration of the physical environment; (6) alteration of the chemical environment; and (7) increased alteration and use of habitats by humans (from Trombulak & Frissell, 2000). These networks cover 0.9% of Britain and 1.0% of the USA (Forman & Alexander, 1998), however the road-effect zone, the area over which significant ecological effects extend outward from the road, is usually much wider than the road and roadside. Thus while the National Land-cover database provides a reasonable estimate of areas with high current vulnerability to biodiversity loss due to existing anthropogenic land transformation, road-effect zones can be used to provide an estimate of the potential threat to regional biodiversity through changing land uses and increased future human impacts.

Some evidence on the size of the road-effect zone is available from studies in Europe and North America. Reijnen *et al.* (1995) estimated that road-effect zones cover between 12-20% of The Netherlands, while Forman (2000) illustrated that 19% of the USA is affected ecologically by roads and associated traffic. The road-effect zone for South Africa was determined using a similar method to that used by Stoms (2000) in which the spatial extent of road effects can be used as an ecological indicator that directly represents impacts on biodiversity. For this, the road-effect zone was used as a measure of the area potentially affected by roads. The affected distances were estimated from the reviews mentioned above, as well as from local studies (Milton & MacDonald, 1988). Unsolicited data, which demonstrated that more than 80% of the transformed area of KwaZulu-Natal Province occurs within 2 km of a road, with approximately 61% of the untransformed areas occurring within the same distance, was also used (unpublished data D. Fairbanks & G. Benn). Therefore national routes and freeways were assumed to affect biodiversity for a greater distance from the roadway (1 km on each side) than farm roads (100 m, Table 2).

Road segments from the South African Surveyor General 1993 1:500,000 scale map series files (SA Surveyor General, 1993) were buffered in a standard geographic information system operation to the distance related to its class (Figure 1d). The roads in protected areas were excluded from this analysis as the road-effect in national parks is of little concern. A road-effect

zone was calculated for the remaining untransformed areas within each vegetation type by summing the total area within the road effect zone surrounding roads in each vegetation type and converting to a percentage of the total remaining untransformed area in that vegetation type.

## **(A) RESULTS**

### **(B) Current vulnerability assessment of vegetation types**

The majority of vegetation types of South Africa are not largely degraded or transformed (Table 3). Of the 68 vegetation types 61 contain more than 50% natural vegetation cover with an average of 76.7% natural vegetation cover across all vegetation types. The vegetation types contain an average of 5.6% degraded surface area, with all but one (Afro Mountain Grassland) being less than 20% degraded (Table 3). Only five of the vegetation types are more than 50% transformed by anthropogenic land uses, with an average of 17.3% being transformed within vegetation types.

Figure 2 provides a diagrammatic representation of the current levels of transformation, degradation and protection across all vegetation types. Similar to the findings of the coarse-scale species-based approach used by Rebelo (1997), the grasslands and fynbos have experienced the most transformation (see Fairbanks *et al.*, 2000), with the coastal indigenous forests having been subjected to extensive transformation for its size (Figures 2a, b). The grasslands biome as well as a few areas in the savanna biome are moderately degraded (Figure 2c).

The average amount of vegetation type currently under protection is 9.6% with only 18 vegetation types conforming to the IUCN's nominal recommendation of 10% protected area coverage (Table 3). Only a few regions in the savanna and fynbos biomes receive adequate levels of protection (Figure 2d).

Table 4 provides a list of vegetation types ordered according to their current vulnerability status. This was calculated by ranking each vegetation type from one to 68 according to the amount of area that was degraded, transformed and protected. Vegetation types were ranked from one (lowest) to 68 (highest) according to the amount of land degraded or transformed, and from 68 (lowest) to one (highest) according to the amount of protected area coverage. Thus a vegetation type with large amounts of land degraded or transformed and a low level of protection would be ranked high (close to 68) for all three columns in Table 4. The average of these three columns could then be used as an indication of the current vulnerability status of that vegetation type. Types with high average ranks face a high risk of biodiversity loss due to a combination of extensively degraded and transformed areas with a low protection status.

Table 5 provides a list of the land-cover types within each of the top 10 priority



conservation vegetation types drawn from Table 4. The Afro Mountain Grassland, Moist Cold Highveld Grassland, Eastern Thorn Bushveld, Subarid Thorn Bushveld, Moist Upland Grassland and Kalahari Plains Thorn Bushveld all contain large areas of degraded vegetation. These same vegetation types (except the Kalahari Plains Thorn Bushveld) along with the Sand Plain Fynbos, Short Mistbelt Grassland, Laterite Fynbos and Coastal Bushveld-Grassland contain extensive areas of commercial, semi-commercial and subsistence dryland cultivation (Table 5). The Short Mistbelt Grassland and Coastal Bushveld-Grassland contain large areas of exotic forestry plantations and commercial sugarcane cultivation (Table 5). Of all these priority vegetation types only the Coastal Bushveld-Grassland has more than 10% protected area coverage at 13.5%, but high levels of degradation as well as high levels of transformation still make it an area of concern along its entire latitudinal distribution. The rest of these top 10 priority vegetation types all fall below five percent protected area coverage (Table 3).

The Shrubby Kalahari Dune Bushveld, Upland Succulent Karoo, Lebombo Arid Mountain Bushveld, Thorny Kalahari Dune Bushveld and Mopane Shrubveld are all areas of less concern to biodiversity conservation due to a combination of low levels of land transformation and degradation within these vegetation types and high levels of protection (Table 3). The majority of these vegetation types fall above the IUCN's recommended 10% protected area coverage, with the exception of the Upland Succulent Karoo at 4.2% (Table 3). The Mopane Shrubveld and Thorny Kalahari Dune Bushveld include 100 and 99.6% protected area, respectively. These areas also contain extensive tracts of natural vegetation ranging from 83.5% for the Thorny Kalahari Dune Bushveld to 100% for the Mopane Shrubveld (Table 3).

### **(B) Comparison of vulnerability status**

Low and Rebelo (1996) also provided an estimate of threat status of the vegetation types. This included a measure of land transformed by agriculture and other uses, based on "scant information for some of the Acocks Veld Types and should be cautiously interpreted as a rough index of habitat loss" (Low & Rebelo, 1996). They also include an estimate of the proportion of each vegetation type falling within conserved areas, based on an approximation of conservation area boundaries which still require confirmation (Low & Rebelo, 1996). Following a similar methodology to Thompson *et al.* (in review), we evaluate these estimates from Low and Rebelo (1996) as well as the calculations of protected and transformed land obtained from this study using the National Land-cover database (Table 3). Top conservation priority vegetation types identified based on Low and Rebelo's (1996) estimates in Table 3 highlight the Moist Clay Highveld Grassland, Dry Clay Highveld Grassland, Moist Cool Highveld Grassland, Kalahari Plateau Bushveld, Dry Sandy Highveld Grassland, Karroid Kalahari Bushveld, Moist Cold Highveld Grassland, West Coast Renosterveld, Natal Central Bushveld and Clay Thorn Bushveld

as areas of conservation concern due to high land transformation and low levels of protection. The Mountain Fynbos, Mopane Bushveld, Lebombo Arid Mountain Bushveld, Mopane Shrubveld and Thorny Kalahari Dune Bushveld are estimated to be areas of low priority for conservation as they are well protected and little transformed (Table 3).

As found in Thompson *et al.* (in review), there is some degree of similarity in the rank orders of vegetation types according to threat status found in this study and in Low and Rebelo's (1996) estimates, Table 3 illustrates the differences found between them. The Low and Rebelo (1996) estimates for land transformation and protection being consistently and significantly higher (paired t-test for levels of transformation,  $t = 9.00$ , degrees of freedom = 49,  $p < 0.0001$ ; paired t-test for levels of protection,  $t = 3.8$ , degrees of freedom = 67,  $p < 0.01$ ). It must however be noted that the estimates of transformation in Low and Rebelo (1996) included grazed areas, while the NLC transformation category does not (Thompson *et al.* in review).

### **(B) Road-effect zones**

The road-effect zone impacts on an average of 5.5% of the remaining natural land-cover in all vegetation types (Table 3), with 5 vegetation types (Mesic Succulent Thicket, Moist Clay Highveld Grassland, Dune Thicket, Eastern Thorn Bushveld, Rocky Highveld Grassland) containing between 10 and 14.2% road-effect zones (Table 3). The rest of the vegetation types lie under this 10% level, with the Mopane Shrubveld containing no road-effect due to the fact that it all falls entirely within the boundaries of the Kruger National Park (Table 3).

### **(B) Potential vulnerability of vegetation types**

Figure 3 is a graphic representation of the current vulnerability status of the vegetation types (Table 4), as well as their potential vulnerability status, measured as the ranked potential threat facing the vegetation types due to the sizes of their road-effect zones (Table 3). This figure demonstrates the fact that many of the grasslands, fynbos and thicket vegetation types face not only current land use threats, but also may be exposed to future threats due to a large road-effect zones. However, the road-effect zone used here does not consider the spatial pattern of roads. So, although roads clearly have a significant impact on many species, meaningful indicators of road-effects on landscapes await the attention of landscape ecologists and other scientists (Forman, 1998). As articulated by Stoms (2000), many aspects of roads affect biodiversity: road width, traffic volume, traffic speed, vehicle miles travelled, road network structure or its spatial configuration, management of the right-of-way, noise levels, light disturbance, and chemical pollution. Most of these factors also vary over daily, weekly, and annual cycles, which may interfere with critical behavioural periods such as breeding or migration. As such, the road-effect

zone can represent only a first order approximation attempt to capture more of the multi-dimensional nature of road network effects.

## **(A) CONCLUSION**

South Africa, with its large biodiversity conservation responsibility, faces the additional problems of limited resources for conservation as well as pressing land reform initiatives. The land tenure system is a problem for conservation throughout Africa and is now becoming an increasingly demanding problem in South Africa. The almost total transfer of land in most regions of South Africa, from government to private ownership, is possibly unique in the annals of European colonisation. The state by the mid 1930's had lost control over resources which in countries such as Australia or the USA were retained by the authorities because of their unsuitability for agriculture (Christopher, 1982). In effect the absence of state interest in land through a leasehold system has led to a strong demand for land and an attempt to make a living in areas highly unsuitable for the purposes of farming. Demand for land has further driven land prices to levels far in excess of its value as an agricultural commodity.

Therefore the limited resources of available government land and funding need to be efficiently applied in order to ensure effective conservation as well as development opportunities. This investigation provides an important first approximation towards identifying areas where these limited resources should be concentrated by identifying vegetation types with high levels of current and potential anthropogenic land use and inadequate conservation efforts in order to constrain future spreading of transformation. As Rebelo (1997) points out, few vegetation units are spatially uniform in terms of species composition and ecosystem processes, thus further study within these priority areas is required to identify representative conservation sites within these types. Although Low and Rebelo (1996) provided rough estimates of areas considered to be facing high threats, the value of timely land-cover information on the decision making ability for planning is evident from the present study. The advent of the National Land-cover database has provided a much-needed standardised dataset of current land-cover to significantly improve South African land use and conservation planning.

Further issues relevant to the identification of priority conservation areas are the scale of conservation priority setting, and the effects of global climate change on southern African vegetation. Rebelo (1997) points out that generally vegetation types shared with other neighbouring nations are more adequately conserved than vegetation endemic to South Africa. Thus a classification of vegetation types across political boundaries, as well as international co-operation are urgent requirements for future priority setting. In addition to this, future conservation strategies will have to consider the effects of climate change on biodiversity

(Rutherford *et al.*, 2000). Not much is known on what these climate changes or their biological impacts will be, but recent work has highlighted a general eastward shift in South African species distributions as areas in South Africa dry out and warm up (Rutherford *et al.*, 2000; van Jaarsveld *et al.*, 2000). It has also been shown that premier flagship conservation areas in South Africa are not likely to meet their conservation goals (van Jaarsveld *et al.*, 2000). This is of obvious importance in any conservation-planning scenario.

In many respects “lines conquer”, and the South African landscape is a testament to their power. Compasses and plumbines, more than a force of arms, subdue landscapes, and henceforth demarcate control and change. If current development policies (i.e. Spatial Development Initiatives, unstructured land reform) continue without proper equity towards conserving the most threatened vegetation communities, in a few decades not only will the remaining “natural” areas be gone, but the people will be even poorer for it.

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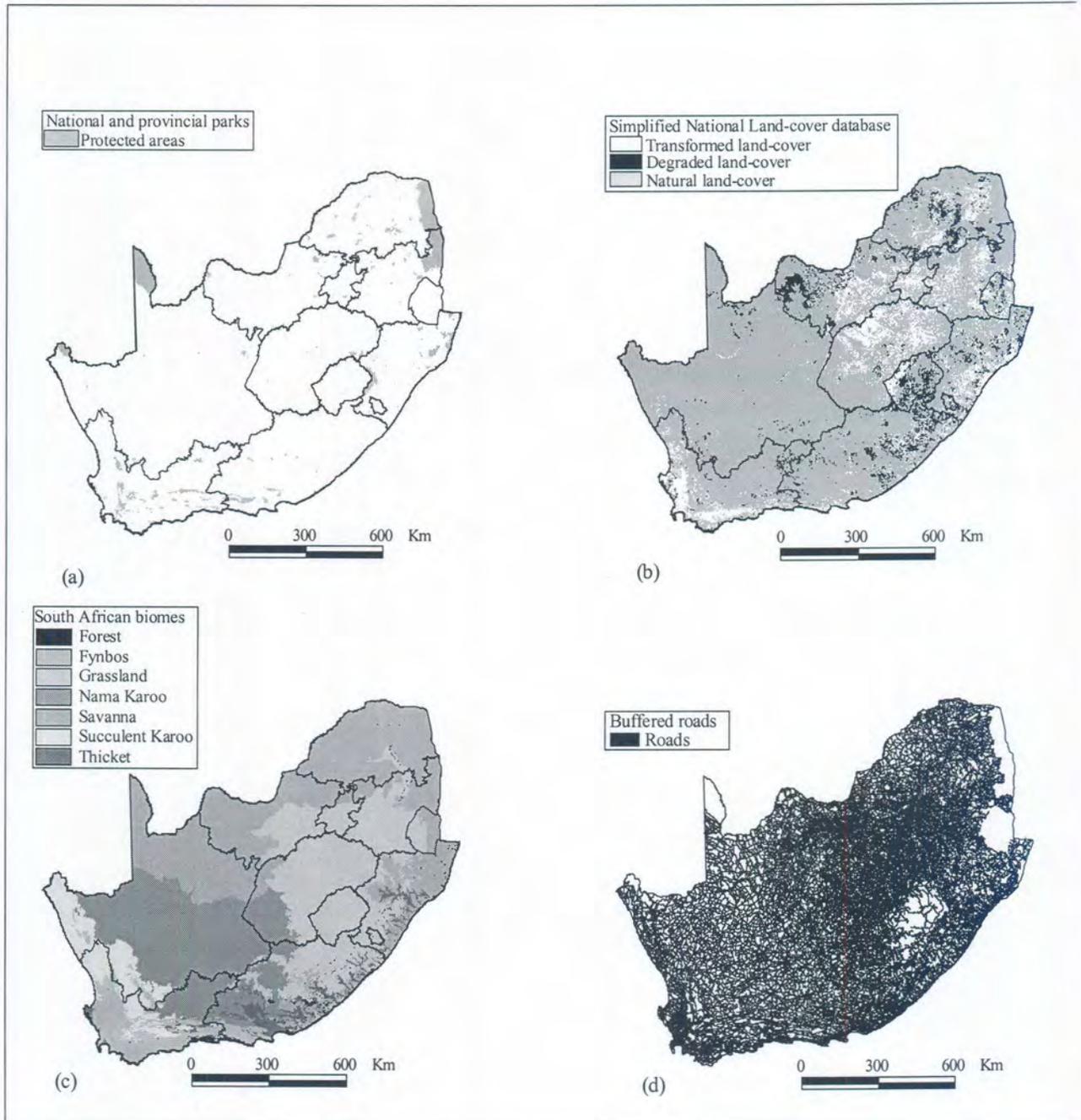


Figure 1: Maps of: (a) South African national and provincial protected areas (DEAT, 1996); (b) transformed, degraded and natural land-cover; (c) biomes (Low & Rebelo, 1996); and (d) road network buffered according to Stoms (2000).



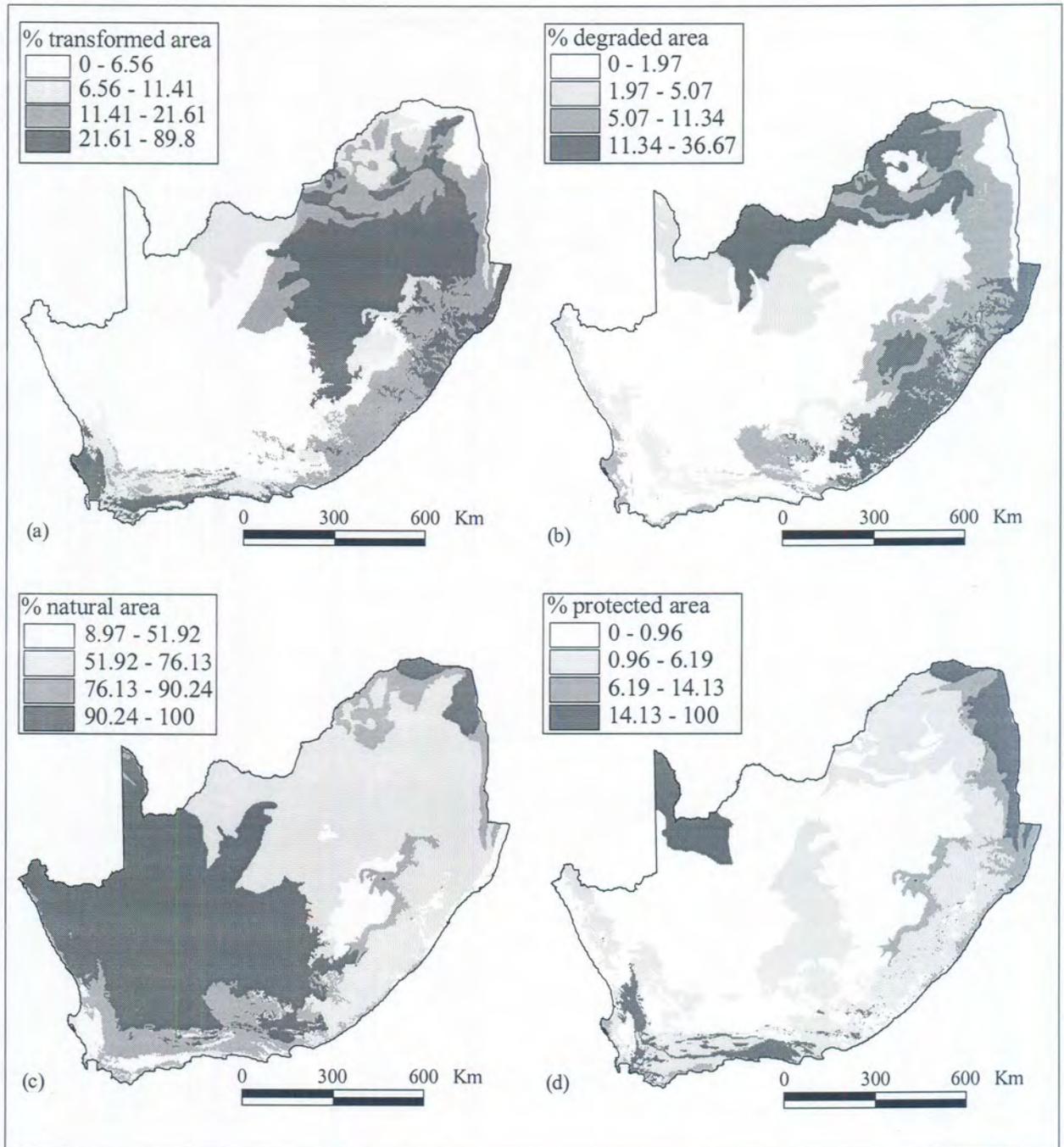


Figure 2: Diagrammatic representation of levels of percentage (a) transformed, (b) degraded, (c) natural and (d) protected vegetation cover within each of Low and Rebelo's (1996) vegetation types.

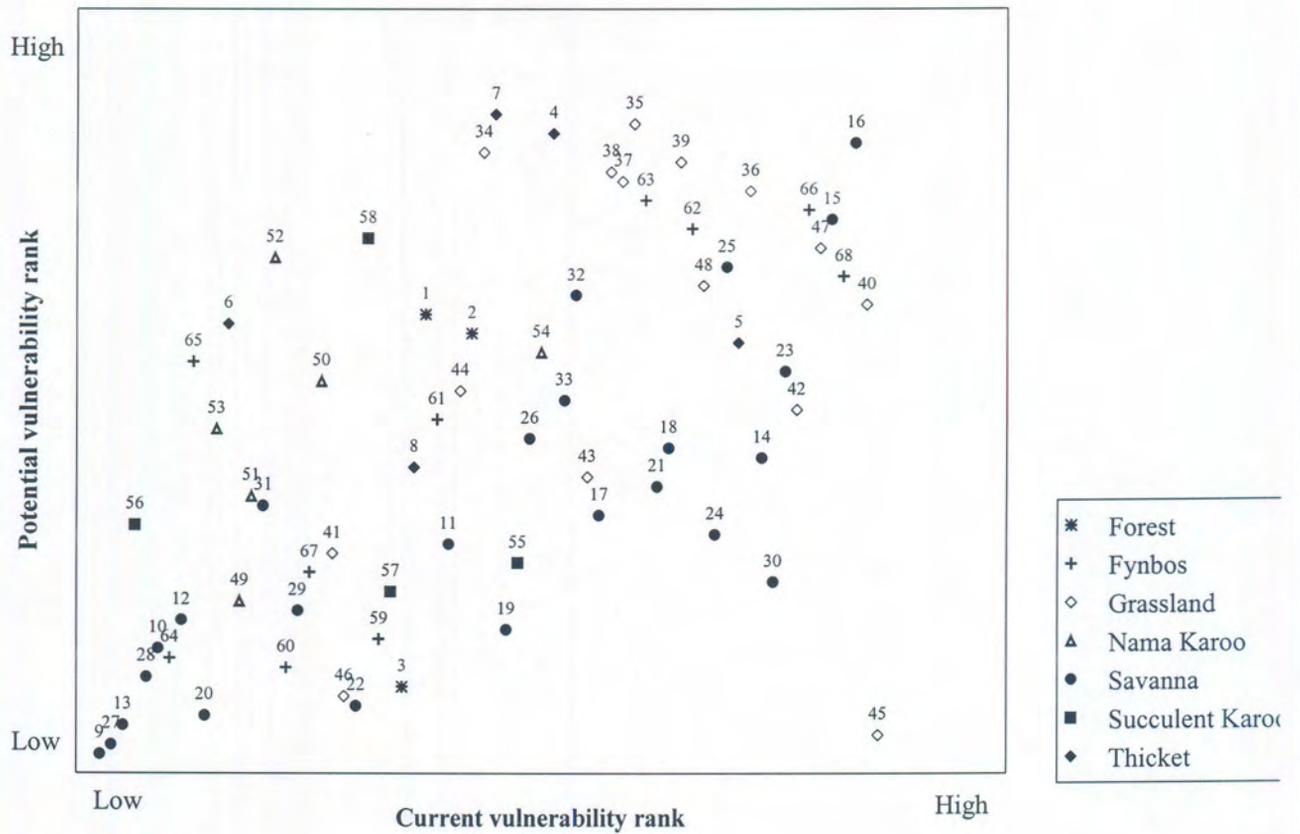


Figure 3: Graph of current and potential vulnerabilities of Low and Rebelo's (1996) vegetation types per biome. Current vulnerability measured as vulnerability rank in Table 4, potential vulnerability measured as ranked road-effect zone per vegetation type (Table 3). The vegetation codes are available in Table 3.

Table 1: Land-cover classes reclassified into broad categories

Transformation category	% area	Land-cover class
Natural land-cover	73.4%	Wetlands, grassland, shrubland, bushland, thicket, woodland, forest
Degraded land-cover	10.1%	Degraded land, erosion scars, waterbodies
Transformed land-cover	16.5%	Cultivated lands, urban/built-up areas, mines and quarries, forestry plantations

Table 2: Buffer widths assigned to road classes for calculating road effect zone (after Stoms 2000).

South African Surveyor General Description	Buffer width (m)
National route	1000
Freeway	1000
Arterial	500
Main	250
Secondary (connecting and magisterial roads)	100
Other (rural road)	50
Vehicular trail (4 wheel drive route)	25

Table 3: Percentage natural, degraded, transformed and protected area of each of the vegetation types, as well as the percentage of each vegetation type exposed to road-effect zones.  
(Values in brackets indicate estimates from Low and Rebelo (1996))  
(Vegetation types with more than 10% protected area coverage are indicated in bold)

Code	Vegetation type	% natural	% degraded	% transformed	% protected	% road-effect
1	Coastal Forest	89.3	1.2	9.3 (43)	1.3 (9.5)	6.5
2	Afromontane Forest	67.9	2.9	29.2 (44)	<b>16.1</b> (17.6)	6.4
3	Sand Forest	72.3	15.6	5.8 (45)	<b>46.7</b> (44.6)	1.7
4	Dune Thicket	62.2	8.5	27.6 (25)	<b>10.6</b> (14.5)	11.2
5	Valley Thicket	72.1	13.0	14.8 (51)	1.5 (2.1)	6.1
6	Xeric Succulent Thicket	95.0	2.0	3.0 (51)	4.6 (8.0)	6.4
7	Mesic Succulent Thicket	78.5	7.0	14.5 (51)	4.0 (5.3)	14.2
8	Spekboom Succulent Thicket	93.1	4.2	2.6 (unknown)	1.2 (1.8)	4.9
9	Mopane Shrubveld	100.0	0.0	0.0 (0)	<b>100.0</b> (100.0)	0.0
10	Mopane Bushveld	92.4	0.9	6.6 (8)	<b>34.0</b> (38.3)	3.0
11	Soutpansberg Arid Mountain Bushveld	83.8	10.2	6.0 (65)	<b>10.1</b> (12.6)	4.3
12	Waterberg Moist Mountain Bushveld	90.2	0.8	9.0 (28)	6.2 (8.6)	3.2
13	Lebombo Arid Mountain Bushveld	90.2	0.1	9.1 (unknown)	<b>37.1</b> (38.0)	1.0
14	Clay Thorn Bushveld	58.7	7.1	34.1 (60)	1.0 (0.9)	5.1
15	Subarid Thorn Bushveld	78.7	12.6	8.7 (unknown)	0.0 (0.2)	8.2
16	Eastern Thorn Bushveld	69.7	13.8	16.5 (unknown)	0.2 (0.5)	11.1
17	Sweet Bushveld	78.3	12.0	9.5 (27)	1.8 (2.3)	4.5
18	Mixed Bushveld	69.3	14.1	16.6 (60)	3.6 (3.1)	5.3
19	Mixed Lowveld Bushveld	70.4	9.9	19.8 (30)	<b>22.5</b> (28.3)	3.1
20	Sweet Lowveld Bushveld	85.1	1.4	13.5 (30)	<b>62.2</b> (67.3)	1.1
21	Sour Lowveld Bushveld	54.4	9.6	36.0 (76)	7.0 (9.7)	4.7
22	Subhumid Lowveld Bushveld	84.1	12.3	3.6 (36)	<b>20.9</b> (21.5)	1.1
23	Coastal Bushveld-Grassland	43.5	15.9	39.8 (unknown)	<b>13.5</b> (14.0)	5.9
24	Coast-Hinterland Bushveld	56.7	8.2	35.0 (87)	2.1 (3.6)	4.4
25	Natal Central Bushveld	72.2	9.9	18.0 (80)	1.3 (1.6)	7.2
26	Natal Lowveld Bushveld	72.5	11.9	15.6 (35)	<b>14.1</b> (17.8)	5.3
27	Thorny Kalahari Dune Bushveld	83.5	0.0	0.0 (unknown)	<b>99.6</b> (99.8)	0.0
28	Shrubby Kalahari Dune Bushveld	96.0	3.1	0.0 (55)	<b>19.4</b> (19.5)	2.2
29	Karrooid Kalahari Bushveld	98.8	1.2	0.0 (55)	0.1 (0.1)	3.3
30	Kalahari Plains Thorn Bushveld	73.6	18.9	7.1 (55)	0.5 (0.5)	3.9
31	Kalahari Mountain Bushveld	99.5	0.2	0.3 (25)	0.0 (0.0)	4.6
32	Kimberley Thorn Bushveld	76.1	4.4	19.5 (55)	1.8 (3.1)	6.8
33	Kalahari Plateau Bushveld	92.7	3.0	4.2 (55)	0.0 (0.0)	5.5
34	Rocky Highveld Grassland	66.3	0.1	33.6 (65)	0.8 (1.4)	10.2
35	Moist Clay Highveld Grassland	68.2	0.4	31.4 (79)	0.0 (0.0)	11.3
36	Dry Clay Highveld Grassland	34.9	0.1	65.1 (67)	0.0 (0.0)	9.0
37	Dry Sandy Highveld Grassland	63.5	0.8	35.8 (65)	0.3 (0.3)	9.1
38	Moist Sandy Highveld Grassland	67.6	0.7	31.6 (55)	0.0 (0.7)	9.4
39	Moist Cool Highveld Grassland	60.4	1.6	38.0 (72)	0.7 (0.3)	9.6
40	Moist Cold Highveld Grassland	46.8	11.3	41.8 (70)	0.8 (0.6)	6.7
41	Wet Cold Highveld Grassland	88.0	2.4	9.7 (60)	9.4 (6.7)	4.1
42	Moist Upland Grassland	61.4	17.0	21.6 (60)	2.3 (2.5)	5.5
43	North-eastern Mountain Grassland	67.6	7.1	25.3 (45)	3.3 (7.4)	4.8
44	South-eastern Mountain Grassland	94.5	4.0	1.5 (32)	0.6 (0.3)	5.7
45	Afro Mountain Grassland	51.9	36.7	11.4 (32)	0.0 (0.0)	0.8
46	Alti Mountain Grassland	87.5	8.8	3.6 (32)	<b>11.7</b> (12.5)	1.2



47	Short Mistbelt Grassland	38.5	4.6	56.9 (89)	0.9 (2.4)	7.6
48	Coastal Grassland	81.7	5.1	12.9 (unknown)	0.1 (1.1)	7.0
49	Bushmanland Nama Karoo	99.7	0.2	0.1 (unknown)	0.0 (0.0)	3.4
50	Upper Nama Karoo	99.0	0.9	0.1 (unknown)	0.0 (0.0)	5.8
51	Orange River Nama Karoo	98.1	0.1	1.6 (unknown)	0.1 (1.5)	4.6
52	Eastern Mixed Nama Karoo	94.9	1.8	3.3 (unknown)	1.6 (1.1)	7.4
53	Great Nama Karoo	99.1	0.8	0.2 (unknown)	0.7 (0.2)	5.4
54	Central Lower Nama Karoo	90.2	9.0	0.8 (unknown)	0.1 (0.0)	6.0
55	Strandveld Succulent Karoo	86.3	2.0	9.5 (24)	0.4 (0.4)	4.0
56	Upland Succulent Karoo	97.1	0.7	1.7 (unknown)	4.2 (4.4)	4.4
57	Lowland Succulent Karoo	94.2	2.6	3.2 (unknown)	0.9 (1.3)	3.9
58	Little Succulent Karoo	89.0	2.6	8.4 (unknown)	3.2 (2.3)	7.7
59	North-western Mountain Renosterveld	94.0	0.0	6.0 (unknown)	0.0 (0.0)	3.0
60	Escarpment Mountain Renosterveld	98.9	0.3	0.8 (unknown)	0.0 (0.1)	2.4
61	Central Mountain Renosterveld	80.4	1.8	17.8 (11)	5.1 (3.6)	5.4
62	West Coast Renosterveld	9.0	1.1	89.8 (97)	0.7 (1.8)	8.1
63	South & South-west Coast Renosterveld	39.4	1.9	58.7 (32)	1.5 (1.4)	8.8
64	Mountain Fynbos	88.5	0.7	10.8 (11)	<b>26.4 (26.1)</b>	2.9
65	Grassy Fynbos	88.7	0.8	10.3 (3)	<b>15.5 (16.1)</b>	6.0
66	Laterite Fynbos	64.8	1.1	34.1 (50)	0.0 (0.5)	8.6
67	Limestone Fynbos	87.2	7.6	5.2 (40)	<b>13.6 (13.8)</b>	4.0
68	Sand Plain Fynbos	34.4	8.5	57.1 (50)	1.2 (1.1)	7.1

Table 4: Vulnerability ranks of vegetation types according to percentage degraded, transformed and protected area.

Rank	Vegetation type	Degraded rank	Transformed rank	Protected rank	Average rank
1	Afro Mountain Grassland	68	37	65	56.67
2	Moist Cold Highveld Grassland	56	63	43	54.00
3	Eastern Thorn Bushveld	62	43	52	52.33
4	Sand Plain Fynbos	49	65	38	50.67
5	Subarid Thorn Bushveld	60	28	64	50.67
6	Short Mistbelt Grassland	41	64	42	49.00
7	Laterite Fynbos	22	56	67	48.33
8	Moist Upland Grassland	66	49	29	48.00
9	Coastal Bushveld-Grassland	65	62	15	47.33
10	Kalahari Plains Thorn Bushveld	67	26	49	47.33
11	Clay Thorn Bushveld	44	57	40	47.00
12	Dry Clay Highveld Grassland	4	67	68	46.33
13	Valley Thicket	61	41	34	45.33
14	Natal Central Bushveld	54	46	36	45.33
15	Coast-Hinterland Bushveld	47	58	30	45.00
16	Coastal Grassland	42	38	55	45.00
17	West Coast Renosterveld	21	68	45	44.67
18	Moist Cool Highveld Grassland	26	61	47	44.67
19	Mixed Bushveld	63	44	26	44.33
20	Sour Lowveld Bushveld	52	60	20	44.00
21	South & South-west Coast Renosterveld	29	66	35	43.33
22	Moist Clay Highveld Grassland	11	53	66	43.33
23	Dry Sandy Highveld Grassland	17	59	51	42.33
24	Moist Sandy Highveld Grassland	14	54	58	42.00
25	Sweet Bushveld	58	33	32	41.00
26	North-eastern Mountain Grassland	45	50	27	40.67
27	Kimberley Thorn Bushveld	40	47	31	39.33
28	Kalahari Plateau Bushveld	36	20	62	39.33
29	Dune Thicket	48	51	17	38.67
30	Central Lower Nama Karoo	51	10	53	38.00
31	Natal Lowveld Bushveld	57	42	13	37.33
32	Strandveld Succulent Karoo	30	32	50	37.33
33	Mixed Lowveld Bushveld	53	48	8	36.33
34	Mesic Succulent Thicket	43	40	25	36.00
35	Rocky Highveld Grassland	6	55	44	35.00
36	Afromontane Forest	35	52	11	32.67
37	South-eastern Mountain Grassland	38	11	48	32.33
38	Soutpansberg Arid Mountain Bushveld	55	23	18	32.00
39	Central Mountain Renosterveld	28	45	22	31.67
40	Coastal Forest	24	31	37	30.67
41	Spekboom Succulent Thicket	39	14	39	30.67
42	Sand Forest	64	22	4	30.00
43	Lowland Succulent Karoo	33	16	41	30.00
44	North-western Mountain Renosterveld	3	24	63	30.00
45	Little Succulent Karoo	34	27	28	29.67
46	Subhumid Lowveld Bushveld	59	18	9	28.67
47	Alti Mountain Grassland	50	19	16	28.33
48	Wet Cold Highveld Grassland	32	34	19	28.33
49	Upper Nama Karoo	20	6	59	28.33



50	Limestone Fynbos	46	21	14	27.00
51	Karroid Kalahari Bushveld	23	4	54	27.00
52	Escarpment Mountain Renosterveld	10	9	61	26.67
53	Eastern Mixed Nama Karoo	27	17	33	25.67
54	Kalahari Mountain Bushveld	8	8	60	25.33
55	Orange River Nama Karoo	5	12	56	24.33
56	Bushmanland Nama Karoo	9	5	57	23.67
57	Xeric Succulent Thicket	31	15	23	23.00
58	Great Nama Karoo	16	7	46	23.00
59	Sweet Lowveld Bushveld	25	39	3	22.33
60	Grassy Fynbos	18	35	12	21.67
61	Waterberg Moist Mountain Bushveld	15	29	21	21.67
62	Mountain Fynbos	12	36	7	18.33
63	Mopane Bushveld	19	25	6	16.67
64	Shrubby Kalahari Dune Bushveld	37	3	10	16.67
65	Upland Succulent Karoo	13	13	24	16.67
66	Lebombo Arid Mountain Bushveld	7	30	5	14.00
67	Thorny Kalahari Dune Bushveld	2	2	2	2.00
68	Mopane Shrubveld	1	1	1	1.00

*Vegetation types were ranked from 1 = lowest to 68 = highest for area degraded and transformed and from 1 = highest and 68 = lowest for protected area coverage*

Table 5: Description and percentage area coverage of land-cover threats facing conservation priority vegetation types.

Description	Afro Mountain	Moist Cold	Eastern Thorn	Sand Plain	Subarid Thorn	Short Mistbelt
	Grassland	Highveld Grassland	Bushveld	Fynbos	Bushveld	Grassland
	Rank (1)	Rank (2)	Rank (3)	Rank (4)	Rank (5)	Rank (6)
<i>Natural land-cover</i>	51.9	46.5	69.8	34.5	78.6	39.3
Forest plantations		0.1	0.5	0.4	0.5	<b>30.9</b>
Waterbodies	0.0	0.2	0.0	0.1	0.3	0.2
Dongas and sheet erosion scars	0.0	0.1	0.0	0.1	0.7	0.0
Degraded: forest and woodland	0.0	0.0	0.0	0.0	0.0	0.0
Degraded: thicket and bushland (etc)	0.0	0.0	2.3	0.6	1.3	0.6
Degraded: unimproved grassland	<b>36.7</b>	<b>11.0</b>	<b>11.5</b>	0.0	<b>10.1</b>	3.7
Degraded: shrubland and low fynbos	0.0	0.0	0.0	7.7	0.3	0.0
Cultivated: permanent - commercial irrigated	0.0	0.0	0.1	5.2	0.1	0.0
Cultivated: permanent - commercial dryland	0.0	0.0	0.7	0.1	0.0	0.0
Cultivated: permanent - commercial sugarcane	0.0	0.0	0.1	0.0	0.0	<b>10.8</b>
Cultivated: temporary - commercial irrigated	0.0	0.1	0.3	2.8	0.3	1.7
Cultivated: temporary - commercial dryland	0.0	<b>19.6</b>	2.2	<b>39.5</b>	0.1	4.7
Cultivated: temporary - semi-commercial / subsistence dryland	<b>11.4</b>	<b>21.3</b>	<b>9.2</b>	0.0	6.3	<b>7.0</b>
Urban / built-up land: residential	0.0	0.8	3.2	7.1	1.5	0.8
Urban / built-up land: residential (small holdings: woodland)	0.0	0.0	0.0	0.0	0.0	0.0
Urban / built-up land: residential (small holdings: bushland)	0.0	0.0	0.0	0.0	0.0	0.1
Urban / built-up land: residential (small holdings: shrubland)	0.0	0.0	0.0	1.0	0.0	0.0
Urban / built-up land: residential (small holdings: grassland)	0.0	0.0	0.0	0.0	0.0	0.0
Urban / built-up land: commercial	0.0	0.0	0.1	0.2	0.0	0.0
Urban / built-up land: industrial / transport	0.0	0.0	0.1	0.6	0.0	0.0
Mines & quarries	0.0	0.0	0.0	0.0	0.0	0.0



Table 5: Continued.

Description	Laterite	Moist Upland	Coastal Bushveld	Kalahari Plains
	Fynbos <i>Rank (7)</i>	Grassland <i>Rank (8)</i>	-Grassland <i>Rank (9)</i>	Thorn Bushveld <i>Rank (10)</i>
<i>Natural land-cover</i>	67.7	61.4	43.5	73.7
Forest plantations	0.1	3.9	9.3	0.0
Waterbodies	0.0	0.1	4.7	0.0
Dongas and sheet erosion scars	0.0	0.0	0.0	0.0
Degraded: forest and woodland	0.0	0.0	0.9	0.0
Degraded: thicket and bushland (etc)	0.0	0.2	7.5	18.8
Degraded: unimproved grassland	0.0	16.7	2.8	0.0
Degraded: shrubland and low fynbos	1.1	0.0	0.0	0.0
Cultivated: permanent - commercial irrigated	0.0	0.0	0.0	0.0
Cultivated: permanent - commercial dryland	0.0	0.0	0.4	0.0
Cultivated: permanent - commercial sugarcane	0.0	0.2	15.4	0.0
Cultivated: temporary - commercial irrigated	0.2	1.3	0.0	0.0
Cultivated: temporary - commercial dryland	29.9	1.4	0.0	3.5
Cultivated: temporary - semi-commercial / subsistence dryland	0.0	12.7	10.2	2.7
Urban / built-up land: residential	0.3	2.0	3.1	0.7
Urban / built-up land: residential (small holdings: woodland)	0.0	0.0	0.0	0.0
Urban / built-up land: residential (small holdings: bushland)	0.0	0.0	0.9	0.0
Urban / built-up land: residential (small holdings: shrubland)	0.0	0.0	0.0	0.0
Urban / built-up land: residential (small holdings: grassland)	0.0	0.0	0.0	0.0
Urban / built-up land: commercial	0.0	0.0	0.1	0.0
Urban / built-up land: industrial / transport	0.0	0.0	0.3	0.0
Mines & quarries	0.0	0.0	0.1	0.1

## **Appendix C**

The following tables describe the CR and ADU species that scored highest and lowest in stepwise canonical correspondence analyses on axes 1 and 2 each for bird assemblage. Associated ecological information for each species is also provided.

Table C-1: CR species that scored highest and lowest in stepwise canonical correspondence analyses on axis 1 for bird assemblages. Associated ecological information is also provided.

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4	
<b>Axis 1</b>										
<b>All</b>										
low	Olivetree Warbler	<i>Hippolais olivetorum</i>	Uncommon	Non-breeding endemic		Woodland	Degraded woodland			
	<b>Pinkthroated Longclaw</b>	<i>Macronyx ameliae</i>	Uncommon		Vulnerable	Grassland	Waterbodies			
	<b>Woodards' Batis</b>	<i>Batis fratrum</i>	Locally common	Endemic	Indeterminate	Coastal forest				
	Blackheaded Apalis	<i>Apalis melanocephala</i>	Locally common			Forest (A/C)	Thicket			
	Black Coucal	<i>Centropus bengalensis</i>	Uncommon		Monitoring	Waterbodies	Grassland			
	Chestnutfronted Helmetshrike	<i>Prionops scopifrons</i>	Uncommon		Vulnerable	Woodland	Thicket	Forest		
	Bennett's Woodpecker	<i>Campethera bennettii</i>	Locally common			Woodland				
	Yellowbellied Sunbird	<i>Nectarinia venusta</i>	Locally common			Forest (A/C)	Woodland	Urban-residential		
	Yellow White-eye	<i>Zosterops senegalensis</i>	Rare			Coastal forest	Woodland			
	Greyhooded Kingfisher	<i>Halcyon leucocephala</i>	Uncommon		Indeterminate	Woodland				
	high	<b>Drakensberg Siskin</b>	<i>Pseudochloroptila symonsi</i>	Common	Endemic	near-threatened	Shrubland	Grassland		
		<b>Sicklewinged Chat</b>	<i>Cercomela sinuata</i>	Common	Endemic		Shrubland	Grassland	Degraded grassland	Degraded shrubland
		Pearlbreasted Swallow	<i>Hirundo dimidiata</i>	Common			Woodland	Thicket	Shrubland	Dryland agriculture
Orangebreasted Rockjumper		<i>Chaetops aurantius</i>	Common	Endemic	Near-threatened	Grassland				
Larklike Bunting		<i>Emberiza impetuani</i>	Common	Near-endemic		Shrubland	Grassland	Thicket	Waterbodies	
<b>Thickbilled Lark</b>		<i>Galerida magnirostris</i>	Common	Endemic		Shrubland	Grassland	Dryland agriculture		
Yellowbreasted Pipit		<i>Hemimacronyx chloris</i>	Uncommon	Endemic		Grassland				
Greywing Francolin		<i>Francolinus africanus</i>	Common	Endemic		Grassland	Shrubland			
Blackwinged Pratincole		<i>Glareola nordmanni</i>	Locally common			Grassland	Dryland agriculture	Waterbodies		
Bearded Vulture		<i>Gypaetus barbatus</i>	Rare		Monitoring	Grassland				
<b>Summer</b>										
low	<b>Broadbilled Prion</b>	<i>Pachyptila vittata</i>	Uncommon			Ocean				
	Greatwinged Petrel	<i>Pterodroma macroptera</i>	Common		Vulnerable	Ocean				
	<b>Pinkthroated Longclaw</b>	<i>Macronyx ameliae</i>	Uncommon		Vulnerable	Grassland	Waterbodies			
	Lesser Gallinule	<i>Porphyryla alleni</i>	Locally common			Waterbodies	Woodland			
	<b>Yellow White-eye</b>	<i>Zosterops senegalensis</i>	Rare			Coastal forest	Woodland			
	Greater Frigatebird	<i>Fregata minor</i>	Rare			Coastal				
	<b>Woodards' Batis</b>	<i>Batis fratrum</i>	Locally common	Endemic	Indeterminate	Coastal forest				
	Stierling's Barred Warbler	<i>Calamonastes stierlingi</i>	Common			Woodland				

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4	
<b>Axis 1</b>										
high	Bluecheeked Bee-eater	<i>Merops persicus</i>	Locally common			Grassland	Woodland	Waterbodies		
	<b>Natal Nightjar</b>	<i>Caprimulgus natalensis</i>	Rare		Vulnerable	Grassland	Waterbodies	Plantations		
	<b>Drakensberg Siskin</b>	<i>Pseudochloroptila symonsi</i>	Common	Endemic	Near-threatened	Shrubland	Grassland			
	<b>Sicklewinged Chat</b>	<i>Cercomela sinuata</i>	Common	Endemic		Shrubland	Grassland	Degraded grassland	Degraded shrubland	
	Orangebreasted Rockjumper	<i>Chaetops aurantius</i>	Common	Endemic	Near-threatened	Grassland				
	Yellowbreasted Pipit	<i>Hemimacronyx chloris</i>	Uncommon	Endemic		Grassland				
	Whitethroated Canary	<i>Serinus albogularis</i>	Common	Near endemic		Shrubland	Grassland			
	Greywing Francolin	<i>Francolinus africanus</i>	Common	Endemic		Grassland	Shrubland			
	Bearded Vulture	<i>Gypaetus barbatus</i>	Rare		Monitoring	Grassland				
	Cape Eagle Owl	<i>Bubo capensis</i>	Locally common		Monitoring	Grassland	Shrubland	Urban-residential		
	Black Harrier	<i>Circus maurus</i>	Locally common	Endemic	Near-threatened	Grassland	Shrubland	Dryland agriculture		
	Montagu's Harrier	<i>Circus pygargus</i>	Rare			Grassland	Dryland agriculture	Woodland		
Winter										
low	Rufousbellied Heron	<i>Buitorides rufiventris</i>	Rare	Endemic		Waterbodies				
	<b>Natal Nightjar</b>	<i>Caprimulgus natalensis</i>	Rare		Vulnerable	Grassland	Waterbodies	Plantations		
	Blackheaded Apalis	<i>Apalis melanocephala</i>	Locally common			Forest (A/C)	Thicket			
	Swallowtailed Bee-eater	<i>Merops hirundineus</i>	Rare			Woodland				
	Lesser Gallinule	<i>Porphyryla alleni</i>	Locally common			Waterbodies	Woodland			
	Arctic Tern	<i>Sterna paradisaea</i>	Uncommon			Coastal				
	Greyrumped Swallow	<i>Pseudhirundo griseopyga</i>	Common			Woodland	Waterbodies	Dryland agriculture		
	<b>Woodards' Batis</b>	<i>Batis fratrum</i>	Locally common	Endemic	Indeterminate	Coastal forest				
	<b>Pinkthroated Longclaw</b>	<i>Macronyx ameliae</i>	Uncommon		Vulnerable	Grassland	Waterbodies			
	Ayres' Eagle	<i>Hieraetus ayresii</i>	Rare			Woodland	Plantations			
	high	<b>Drakensberg Siskin</b>	<i>Pseudochloroptila symonsi</i>	Common	Endemic	Near-threatened	Shrubland	Grassland		
		<b>Sicklewinged Chat</b>	<i>Cercomela sinuata</i>	Common	Endemic		Shrubland	Grassland	Degraded grassland	Degraded shrubland
Blackwinged Pratincole		<i>Glareola nordmanni</i>	Locally common			Grassland	Dryland agriculture	Waterbodies		
Rock Pipit		<i>Anthus crenatus</i>	Common	Endemic		Grassland	Shrubland			
Greywing Francolin		<i>Francolinus africanus</i>	Common	Endemic		Grassland	Shrubland			
Pearlbreasted Swallow		<i>Hirundo dimidiata</i>	Common			Woodland	Thicket	Shrubland	Dryland agriculture	
<b>Thickbilled Lark</b>		<i>Galerida magnirostris</i>	Common	Endemic		Shrubland	Grassland	Dryland agriculture		
Larklike Bunting		<i>Emberiza impetuani</i>	Common	Near-endemic		Shrubland	Grassland	Thicket	Waterbodies	
Bearded Vulture		<i>Gypaetus barbatus</i>	Rare		Monitoring	Grassland				
Orangebreasted Rockjumper		<i>Chaetops aurantius</i>	Common	Endemic	Near-threatened	Grassland				

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
<b>Axis 1</b>									
Passerine									
low	Blackheaded Apalis	<i>Apalis melanocephala</i>	Locally common			Forest (A/C)	Thicket		
	<b>Stierling's Barred Warbler</b>	<i>Calamonastes stierlingi</i>	Common			Woodland			
	<b>Yellow White-eye</b>	<i>Zosterops senegalensis</i>	Rare			Coastal forest	Woodland		
	<b>Pinkthroated Twinspot</b>	<i>Hypargos margaritatus</i>	Rare	Endemic	Monitoring	Thicket	Woodland		
	<b>Woodards' Batis</b>	<i>Batis fratrum</i>	Locally common	Endemic	Indeterminate	Coastal forest			
	Greyrumped Swallow	<i>Pseudhirundo griseopyga</i>	Common			Woodland	Waterbodies	Dryland agriculture	
	<b>Pinkthroated Longclaw</b>	<i>Macronyx ameliae</i>	Uncommon		Vulnerable	Grassland	Waterbodies		
	Yellowbellied Sunbird	<i>Nectarinia venusta</i>	Locally common			Forest (A/C)	Woodland	Urban-residential	
	Chestnutfronted Helmetshrike	<i>Prionops scopifrons</i>	Uncommon		Vulnerable	Woodland	Thicket	Forest	
	Olivetree Warbler	<i>Hippolais olivetorum</i>	Uncommon	Non-breeding endemic		Woodland	Degraded woodland		
high	<b>Sickdwinged Chat</b>	<i>Cercomela sinuata</i>	Common	Endemic		Shrubland	Grassland	Degraded grassland	Degraded shrubland
	<b>Drakensberg Siskin</b>	<i>Pseudochloroptila symonsi</i>	Common	Endemic	Near-threatened	Shrubland	Grassland		
	Pearlbreasted Swallow	<i>Hirundo dimidiata</i>	Common			Woodland	Thicket	Shrubland	Dryland agriculture
	Larklike Bunting	<i>Emberiza impetuani</i>	Common	Near-endemic		Shrubland	Grassland	Thicket	Waterbodies
	<b>Thickbilled Lark</b>	<i>Galerida magnirostris</i>	Common	Endemic		Shrubland	Grassland	Dryland agriculture	
	<b>Orangebreasted Rockjumper</b>	<i>Chaetops aurantius</i>	Common	Endemic	Near-threatened	Grassland			
	Yellowbreasted Pipit	<i>Hemimacronyx chloris</i>	Uncommon	Endemic		Grassland			
	Whitethroated Canary	<i>Serinus albogularis</i>	Common	Near endemic		Shrubland	Grassland		
	<b>Redeyed Bulbul</b>	<i>Pycnonotus nigricans</i>	Common	Near endemic		Grassland	Shrubland	Woodland	Urban-residential
	<b>Yellow Canary</b>	<i>Serinus flaviventris</i>	Common	Near endemic		Shrubland	Grassland		
Non-passerine									
low	<b>Black Coucal</b>	<i>Centropus bengalensis</i>	Uncommon		Monitoring	Waterbodies	Grassland		
	Roseate Tern	<i>Sterna dougallii</i>	Locally common		Endangered	Coastal			
	Sabine's Gull	<i>Larus sabini</i>	Rare			Coastal			
	Bluecheeked Bee-eater	<i>Merops persicus</i>	Locally common			Grassland	Woodland	Waterbodies	
	Sand Plover	<i>Charadrius leschenaultii</i>	Locally common			Coastal	Waterbodies		
	<b>Greater Frigatebird</b>	<i>Fregata minor</i>	Rare			Coastal			
	Slenderbilled Prion	<i>Pachyptila belcheri</i>	Uncommon			Ocean			
	<b>Natal Nightjar</b>	<i>Caprimulgus natalensis</i>	Rare		Vulnerable	Grassland	Waterbodies	Plantations	
	Greatwinged Petrel	<i>Pterodroma macroptera</i>	Common		Vulnerable	Ocean			
	Curlew	<i>Numenius arquata</i>	Common			Coastal			
high	<b>Greywing Francolin</b>	<i>Francolinus africanus</i>	Common	Endemic		Grassland	Shrubland		

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
<b>Axis 1</b>									
	<b>Blackwinged Pratincole</b>	<i>Glareola nordmanni</i>	Locally common			Grassland	Dryland agriculture	Waterbodies	
	<b>Bearded Vulture</b>	<i>Gypaetus barbatus</i>	Rare		Monitoring	Grassland			
	Montagu's Harrier	<i>Circus pygargus</i>	Rare			Grassland	Dryland agriculture	Woodland	
	<b>Pale Chanting Goshawk</b>	<i>Melierax canorus</i>	Common	Near endemic		Shrubland	Woodland		
	Ground Woodpecker	<i>Geocolaptes olivaceus</i>	Common	Endemic	Near-threatened	Grassland	Shrubland		
	Black Harrier	<i>Circus maurus</i>	Locally common	Endemic	Near-threatened	Grassland	Shrubland	Dryland agriculture	
	Cape Eagle Owl	<i>Bubo capensis</i>	Locally common		Monitoring	Grassland	Shrubland	Urban-residential	
	Redbreasted Sparrowhawk	<i>Accipiter rufiventris</i>	Locally common			Forest	Plantations	Grassland	
	Pennantwinged Nightjar	<i>Macrodipteryx vexillaria</i>	Locally common		Indeterminate	Woodland			
<b>Breeding</b>									
low	Blackheaded Apalis	<i>Apalis melanocephala</i>	Locally common			Forest (A/C)	Thicket		
	<b>Pinkthroated Longclaw</b>	<i>Macronyx ameliae</i>	Uncommon		Vulnerable	Grassland	Waterbodies		
	<b>Woodards' Batis</b>	<i>Batis fratrum</i>	Locally common	Endemic	Indeterminate	Coastal forest			
	<b>Yellow White-eye</b>	<i>Zosterops senegalensis</i>	Rare			Coastal forest	Woodland		
	<b>Stierling's Barred Warbler</b>	<i>Calamonastes stierlingi</i>	Common			Woodland			
	Pinkthroated Twinspot	<i>Hypargos margaritatus</i>	Rare	Endemic	Monitoring	Thicket	Woodland		
	Greyrumped Swallow	<i>Pseudhirundo griseopyga</i>	Common			Woodland	Waterbodies	Dryland agriculture	
	Southern Banded Snake Eagle	<i>Circeatus fasciolatus</i>	Rare		Near-threatened	Coastal forest	Woodland	Thicket	
	<b>Black Coucal</b>	<i>Centropus bengalensis</i>	Uncommon		Monitoring	Waterbodies	Grassland		
	Bennett's Woodpecker	<i>Campethera bennettii</i>	Locally common			Woodland			
high	Pearlbreasted Swallow	<i>Hirundo dimidiata</i>	Common			Woodland	Thicket	Shrubland	Dryland agriculture
	<b>Sickdwinged Chat</b>	<i>Cercomela sinuata</i>	Common	Endemic		Shrubland	Grassland	Degraded grassland	Degraded shrubland
	<b>Drakensberg Siskin</b>	<i>Pseudochloroptila symonsi</i>	Common	Endemic	Near-threatened	Shrubland	Grassland		
	<b>Pale Chanting Goshawk</b>	<i>Melierax canorus</i>	Common	Near endemic		Shrubland	Woodland		
	Orangebreasted Rockjumper	<i>Chaetops aurantius</i>	Common	Endemic	Near-threatened	Grassland			
	<b>Redeyed Bulbul</b>	<i>Pycnonotus nigricans</i>	Common	Near endemic		Grassland	Shrubland	Woodland	Urban-residential
	Yellowbreasted Pipit	<i>Hemimacronyx chloris</i>	Uncommon	Endemic		Grassland			
	Larklike Bunting	<i>Emberiza impetuani</i>	Common	Near-endemic		Shrubland	Grassland	Thicket	Waterbodies
	<b>Thickbilled Lark</b>	<i>Galerida magnirostris</i>	Common	Endemic		Shrubland	Grassland	Dryland agriculture	
	Greywing Francolin	<i>Francolinus africanus</i>	Common	Endemic		Grassland	Shrubland		
<b>Non-breeding</b>									
low	Cory's Shearwater	<i>Calonectris diomedea</i>	Common			Ocean			
	Fleshfooted Shearwater	<i>Puffinus carneipes</i>	Common			Ocean			

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4	
high	Axis 1									
		Sooty Shearwater	<i>Puffinus griseus</i>	Common			Ocean			
		Wilson's Storm Petrel	<i>Oceanites oceanicus</i>	Common			Ocean			
		Whitebellied Storm Petrel	<i>Fregetta grallaria</i>	Rare			Ocean			
		Blackbellied Storm Petrel	<i>Fregetta tropica</i>	Common			Ocean			
		Collared Flycatcher	<i>Ficedula albicollis</i>	Rare			Woodland			
		Bridled Tern	<i>Sterna anaethetus</i>	Rare			Coastal			
		European Storm Petrel	<i>Hydrobates pelagicus</i>	Common			Coastal			
		Slenderbilled Prion	<i>Pachyptila belcheri</i>	Uncommon			Ocean			
		African Hobby Falcon	<i>Falco cuvierii</i>	Uncommon			Woodland			
		Pennantwinged Nightjar	<i>Macrodipteryx vexillaria</i>	Locally common		Indeterminate	Woodland			
		Black Tern	<i>Chlidonias niger</i>	Rare			Coastal			
		<b>Lesser Kestrel</b>	<i>Falco naumanni</i>	Common		Monitoring	Grassland	Dryland agriculture	Thicket	Urban-residential
		<b>Blackwinged Pratincole</b>	<i>Glareola nordmanni</i>	Locally common			Grassland	Dryland agriculture	Waterbodies	
		Pectoral Sandpiper	<i>Calidris melanotos</i>	Rare			Coastal			
		Montagu's Harrier	<i>Circus pygargus</i>	Rare			Grassland	Dryland agriculture	Woodland	
		<b>Western Redfooted Kestrel</b>	<i>Falco vespertinus</i>	Uncommon			Grassland	Woodland		
	<b>Abdim's Stork</b>	<i>Ciconia abdimii</i>	Common			Grassland	Dryland agriculture	Pasture		
	<b>Eastern Redfooted Kestrel</b>	<i>Falco amurensis</i>	Common		Monitoring	Grassland	Dryland agriculture	Urban-residential		
Human										
low		Greatwinged Petrel	<i>Pterodroma macroptera</i>	Common		Vulnerable	Ocean			
		<b>Greyrumped Swallow</b>	<i>Pseudhirundo griseopyga</i>	Common			Woodland	Waterbodies	Dryland agriculture	
		Pintado Petrel	<i>Daption capense</i>	Common			Ocean			
		<b>Ayres' Eagle</b>	<i>Hieraetus ayresii</i>	Rare			Woodland	Plantations		
		Caspian Tern	<i>Hydroprogne caspia</i>	Common		Rare	Coastal	Waterbodies		
		Yellowbellied Sunbird	<i>Nectarinia venusta</i>	Locally common			Forest (A/C)	Woodland	Urban-residential	
		Olivetree Warbler	<i>Hippolais olivetorum</i>	Uncommon	Non-breeding endemic		Woodland	Degraded woodland		
		Whitewinged Tern	<i>Chlidonias leucopterus</i>	Common			Waterbodies			
		Southern Giant Petrel	<i>Macronectes giganteus</i>	Common			Ocean			
		<b>Lesser Flamingo</b>	<i>Phoeniconaias minor</i>	Locally common		Near-threatened	Waterbodies			
		<b>Sicklewinged Chat</b>	<i>Cercomela sinuata</i>	Common	Endemic		Shrubland	Grassland	Degraded grassland	Degraded shrubland
		Pearlbreasted Swallow	<i>Hirundo dimidiata</i>	Common			Woodland	Thicket	Shrubland	Dryland agriculture
		<b>Larklike Bunting</b>	<i>Emberiza impetuani</i>	Common	Near-endemic		Shrubland	Grassland	Thicket	Waterbodies
		<b>Thickbilled Lark</b>	<i>Galerida magnirostris</i>	Common	Endemic		Shrubland	Grassland	Dryland agriculture	

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
Axis 1	<b>Redeyed Bulbul</b>	<i>Pycnonotus nigricans</i>	Common	Near endemic		Grassland	Shrubland	Woodland	Urban-residential
	Montagu's Harrier	<i>Circus pygargus</i>	Rare			Grassland	Dryland agriculture	Woodland	
	Black Harrier	<i>Circus maurus</i>	Locally common	Endemic	Near-threatened	Grassland	Shrubland	Dryland agriculture	
	Cape Eagle Owl	<i>Bubo capensis</i>	Locally common		Monitoring	Grassland	Shrubland	Urban-residential	
	Yellowrumped Widow	<i>Euplectes capensis</i>	Common			Grassland	Shrubland	Dryland agriculture	
	South African Shelduck	<i>Tadorna cana</i>	Locally common	Endemic		Waterbodies	Shrubland	Grassland	
Non-human low	<b>Black Coucal</b>	<i>Centropus bengalensis</i>	Uncommon		Monitoring	Waterbodies	Grassland		
	Blackheaded Apalis	<i>Apalis melanocephala</i>	Locally common			Forest (A/C)	Thicket		
	<b>Pinkthroated Longclaw</b>	<i>Macronyx ameliae</i>	Uncommon		Vulnerable	Grassland	Waterbodies		
	<b>Woodards' Batis</b>	<i>Batis fratrum</i>	Locally common	Endemic	Indeterminate	Coastal forest			
	Bluecheeked Bee-eater	<i>Merops persicus</i>	Locally common			Grassland	Woodland	Waterbodies	
	<b>Broadbilled Roller</b>	<i>Eurystomus glaucurus</i>	Locally common			Woodland	Thicket		
	Yellow White-eye	<i>Zosterops senegalensis</i>	Rare			Coastal forest	Woodland		
	Sand Plover	<i>Charadrius leschenaultii</i>	Locally common			Coastal	Waterbodies		
	Greater Frigatebird	<i>Fregata minor</i>	Rare			Coastal			
	Southern Banded Snake Eagle	<i>Circeatus fasciolatus</i>	Rare		Near-threatened	Coastal forest	Woodland	Thicket	
high	<b>Drakensberg Siskin</b>	<i>Pseudochloroptila symonsi</i>	Common	Endemic	Near-threatened	Shrubland	Grassland		
	<b>Orangebreasted Rockjumper</b>	<i>Chaetops aurantius</i>	Common	Endemic	Near-threatened	Grassland			
	Yellowbreasted Pipit	<i>Hemimacronyx chloris</i>	Uncommon	Endemic		Grassland			
	Blackwinged Pratincole	<i>Glareola nordmanni</i>	Locally common			Grassland	Dryland agriculture	Waterbodies	
	Greywing Francolin	<i>Francolinus africanus</i>	Common	Endemic		Grassland	Shrubland		
	Bearded Vulture	<i>Gypaetus barbatus</i>	Rare		Monitoring	Grassland			
	<b>Pale Chanting Goshawk</b>	<i>Melierax canorus</i>	Common	Near endemic		Shrubland	Woodland		
	Whitethroated Canary	<i>Serinus albogularis</i>	Common	Near endemic		Shrubland	Grassland		
	<b>Yellow Canary</b>	<i>Serinus flaviventris</i>	Common	Near endemic		Shrubland	Grassland		
	Ground Woodpecker	<i>Geocolaptes olivaceus</i>	Common	Endemic	Near-threatened	Grassland	Shrubland		



Table B-2: CR species that scored highest and lowest in stepwise canonical correspondence analyses on axis 2 for bird assemblages. Associated ecological information is also provided.

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
<b>Axis 2</b>									
<b>All</b>									
low	<b>Redbilled Buffalo Weaver</b>	<i>Bubalornis niger</i>	Nomadic			Woodland	Thicket		
	Dickinson's Kestrel	<i>Falco dickinsoni</i>	Rare			Woodland			
	Carmine Bee-eater	<i>Merops nubicoides</i>	Common			Woodland			
	<b>Thickbilled Cuckoo</b>	<i>Pachycoccyx audeberti</i>	Rare		Monitoring	Thicket	Woodland		
	Rackettailed Roller	<i>Coracias spatulata</i>	Uncommon		Vulnerable	Woodland			
	<b>Purple Widowfinch</b>	<i>Vidua purpurascens</i>	Locally common		Monitoring	Woodland	Thicket		
	Whitecrowned Shrike	<i>Eurocephalus anguittimens</i>	Common	Endemic		Woodland	Thicket		
	Dusky Lark	<i>Pinarocorys nigricans</i>	Uncommon			Woodland	Urban-residential		
	Black Tern	<i>Chlidonias niger</i>	Rare			Coastal			
	Greyhooded Kingfisher	<i>Halcyon leucocephala</i>	Uncommon		Indeterminate	Woodland			
high	Fleshfooted Shearwater	<i>Puffinus carneipes</i>	Common			Ocean			
	<b>Cory's Shearwater</b>	<i>Calonectris diomedea</i>	Common			Ocean			
	<b>Wilson's Storm Petrel</b>	<i>Oceanites oceanicus</i>	Common			Ocean			
	Roseate Tern	<i>Sterna dougallii</i>	Locally common		Endangered	Coastal			
	Sabine's Gull	<i>Larus sabini</i>	Rare			Coastal			
	European Storm Petrel	<i>Hydrobates pelagicus</i>	Common			Coastal			
	Whitebellied Storm Petrel	<i>Fregetta grallaria</i>	Rare			Ocean			
	European Starling	<i>Sturnus vulgaris</i>	Common	Alien		Urban-residential	Dryland agriculture		
	Bridled Tern	<i>Sterna anaethetus</i>	Rare			Coastal			
	Blackbellied Storm Petrel	<i>Fregetta tropica</i>	Common			Ocean			
<b>Summer</b>									
low	Rock Pipit	<i>Anthus crenatus</i>	Common	Endemic		Grassland	Shrubland		
	<b>Purple Widowfinch</b>	<i>Vidua purpurascens</i>	Locally common		Monitoring	Woodland	Thicket		
	<b>Pearlspotted Owl</b>	<i>Glaucidium perlatus</i>	Common			Woodland	Thicket		
	<b>Thickbilled Cuckoo</b>	<i>Pachycoccyx audeberti</i>	Rare		Monitoring	Thicket	Woodland		
	Rackettailed Roller	<i>Coracias spatulata</i>	Uncommon		Vulnerable	Woodland			
	Dickinson's Kestrel	<i>Falco dickinsoni</i>	Rare			Woodland			
	Dark Chanting Goshawk	<i>Melierax metabates</i>	Locally common			Woodland	Thicket		
	Greyhooded Kingfisher	<i>Halcyon leucocephala</i>	Uncommon		Indeterminate	Woodland			

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
Axis 2									
high	Steelblue Widowfinch	<i>Vidua chalybeata</i>	Common		Monitoring	Woodland	Dryland agriculture	Urban-residential	
	Grey Hornbill	<i>Tockus nasutus</i>	Common			Woodland	Thicket		
	Grey Wagtail	<i>Motacilla cinerea</i>	Rare			Forest	Waterbodies		
	<b>Fleshfooted Shearwater</b>	<i>Puffinus carneipes</i>	Common			Ocean			
	Wilson's Storm Petrel	<i>Oceanites oceanicus</i>	Common			Ocean			
	Broadbilled Prion	<i>Pachyptila vittata</i>	Uncommon			Ocean			
	European Storm Petrel	<i>Hydrobates pelagicus</i>	Common			Coastal			
	<b>Softplumaged Petrel</b>	<i>Pterodroma mollis</i>	Common			Ocean			
	Sooty Shearwater	<i>Puffinus griseus</i>	Common			Ocean			
	Wandering Albatross	<i>Diomedea exulans</i>	Uncommon			Ocean			
	Roseate Tern	<i>Sterna dougallii</i>	Locally common			Endangered	Coastal		
	Cory's Shearwater	<i>Calonectris diomedea</i>	Common				Ocean		
Winter									
low	Redbilled Buffalo Weaver	<i>Bubalornis niger</i>	Nomadic			Woodland	Thicket		
	Purple Widowfinch	<i>Vidua purpurascens</i>	Locally common		Monitoring	Woodland	Thicket		
	Whitecrowned Shrike	<i>Eurocephalus anguitimens</i>	Common	Endemic		Woodland	Thicket		
	Dusky Lark	<i>Pinarocorys nigricans</i>	Uncommon			Woodland	Urban-residential		
	Carmine Bee-eater	<i>Merops nubicoides</i>	Common			Woodland			
	Greyhooded Kingfisher	<i>Halcyon leucocephala</i>	Uncommon		Indeterminate	Woodland			
	Dickinson's Kestrel	<i>Falco dickinsoni</i>	Rare			Woodland			
	Redbilled Helmetshrike	<i>Prionops retzii</i>	Common		Threatened	Woodland			
	<b>Purple Roller</b>	<i>Coracias naevia</i>	Common			Woodland	Thicket		
	<b>Redcrested Korhaan</b>	<i>Eupodotis ruficrista</i>	Common	Near endemic	Monitoring	Grassland	Woodland	Shrubland	
	Cory's Shearwater	<i>Calonectris diomedea</i>	Common			Ocean			
	high	Roseate Tern	<i>Sterna dougallii</i>	Locally common		Endangered	Coastal		
Sabine's Gull		<i>Larus sabini</i>	Rare			Coastal			
Southern Giant Petrel		<i>Macronectes giganteus</i>	Common			Ocean			
Jackass Penguin		<i>Spheniscus demersus</i>	Locally common	Endemic	Near-threatened	Coastal			
Broadbilled Sandpiper		<i>Limicola falcinellus</i>	Rare			Coastal			
<b>Curlew</b>		<i>Numenius arquata</i>	Common			Coastal			
Sand Plover		<i>Charadrius leschenaultii</i>	Locally common			Coastal	Waterbodies		
Subantarctic Skua		<i>Catharacta antarctica</i>	Common			Coastal			
<b>Wilson's Storm Petrel</b>		<i>Oceanites oceanicus</i>	Common			Ocean			

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
<b>Axis 2</b>									
Passerine									
low	<b>Redbilled Buffalo Weaver</b>	<i>Bubalornis niger</i>	Nomadic			Woodland	Thicket		
	Yellowbellied Sunbird	<i>Nectarinia venusta</i>	Locally common			Forest (A/C)	Woodland	Urban-residential	
	Chestnutfronted Helmetshrike	<i>Prionops scopifrons</i>	Uncommon		Vulnerable	Woodland	Thicket	Forest	
	Dusky Lark	<i>Pinarocorys nigricans</i>	Uncommon			Woodland	Urban-residential		
	<b>Purple Widowfinch</b>	<i>Vidua purpurascens</i>	Locally common		Monitoring	Woodland	Thicket		
	Whitecrowned Shrike	<i>Eurocephalus anguittimens</i>	Common	Endemic		Woodland	Thicket		
	<b>Redbilled Helmetshrike</b>	<i>Prionops retzii</i>	Common		Threatened	Woodland			
	Steelblue Widowfinch	<i>Vidua chalybeata</i>	Common		Monitoring	Woodland	Dryland agriculture	Urban-residential	
	Yellowbellied Eremomela	<i>Eremomela icteropygialis</i>	Common			Shrubland	Woodland		
	Marico Sunbird	<i>Nectarinia mariquensis</i>	Common			Woodland			
high	Collared Flycatcher	<i>Ficedula albicollis</i>	Rare			Woodland			
	<b>European Starling</b>	<i>Sturnus vulgaris</i>	Common	Alien		Urban-residential	Dryland agriculture		
	Thrush Nightingale	<i>Luscinia luscinia</i>	Uncommon			Thicket	Urban-residential		
	Whinchat	<i>Saxicola rubetra</i>	Rare			Grassland	Woodland	Thicket	
	Tree Pipit	<i>Anthus trivialis</i>	Rare			Woodland	Forest	Plantations	
	<b>Pied Mannikin</b>	<i>Spermestes fringilloides</i>	Rare		Indeterminate	Coastal forest	Urban-residential	Dryland agriculture	
	Spotted Thrush	<i>Zoothera guttata</i>	Uncommon		Endangered	Coastal forest			
	<b>House Crow</b>	<i>Corvus splendens</i>	Locally common	Alien		Urban-residential			
	Whitethroated Canary	<i>Serinus albogularis</i>	Common	Near endemic		Shrubland	Grassland		
	Thickbilled Lark	<i>Galerida magnirostris</i>	Common	Endemic		Shrubland	Grassland	Dryland agriculture	
Non-passerine									
low	Black Tern	<i>Chlidonias niger</i>	Rare			Coastal			
	<b>Thickbilled Cuckoo</b>	<i>Pachycoccyx audeberti</i>	Rare		Monitoring	Thicket	Woodland		
	Dickinson's Kestrel	<i>Falco dickinsoni</i>	Rare			Woodland			
	Carmine Bee-eater	<i>Merops nubicoides</i>	Common			Woodland			
	Rackettailed Roller	<i>Coracias spatulata</i>	Uncommon		Vulnerable	Woodland			
	Greyhooded Kingfisher	<i>Halcyon leucocephala</i>	Uncommon		Indeterminate	Woodland			
	<b>Pearlspotted Owl</b>	<i>Glaucidium perlatum</i>	Common			Woodland	Thicket		
	<b>Purple Roller</b>	<i>Coracias naevia</i>	Common			Woodland	Thicket		
	Redbilled Hornbill	<i>Tockus erythrorhynchus</i>	Common			Woodland	Thicket		
	Grey Hornbill	<i>Tockus nasutus</i>	Common			Woodland	Thicket		
high	Fleshfooted Shearwater	<i>Puffinus carneipes</i>	Common			Ocean			

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
<b>Axis 2</b>									
	Cory's Shearwater	<i>Calonectris diomedea</i>	Common			Ocean			
	<b>Wilson's Storm Petrel</b>	<i>Oceanites oceanicus</i>	Common			Ocean			
	European Storm Petrel	<i>Hydrobates pelagicus</i>	Common			Coastal			
	Sabine's Gull	<i>Larus sabini</i>	Rare			Coastal			
	Roseate Tern	<i>Sterna dougallii</i>	Locally common		Endangered	Coastal			
	<b>Blackbellied Storm Petrel</b>	<i>Fregetta tropica</i>	Common			Ocean			
	<b>Whitebellied Storm Petrel</b>	<i>Fregetta grallaria</i>	Rare			Ocean			
	Bridled Tern	<i>Sterna anaethetus</i>	Rare			Coastal			
	Sooty Shearwater	<i>Puffinus griseus</i>	Common			Ocean			
<b>Breeding</b>									
low	<b>Redbilled Buffalo Weaver</b>	<i>Bubalornis niger</i>	Nomadic			Woodland	Thicket		
	<b>Purple Widowfinch</b>	<i>Vidua purpurascens</i>	Locally common		Monitoring	Woodland	Thicket		
	Whitecrowned Shrike	<i>Eurocephalus anguitimens</i>	Common	Endemic		Woodland	Thicket		
	Dickinson's Kestrel	<i>Falco dickinsoni</i>	Rare			Woodland			
	<b>Thickbilled Cuckoo</b>	<i>Pachycoccyx audeberti</i>	Rare		Monitoring	Thicket	Woodland		
	Carmine Bee-eater	<i>Merops nubicoides</i>	Common			Woodland			
	Rackettailed Roller	<i>Coracias spatulata</i>	Uncommon		Vulnerable	Woodland			
	Greyhooded Kingfisher	<i>Halcyon leucocephala</i>	Uncommon		Indeterminate	Woodland			
	Steelblue Widowfinch	<i>Vidua chalybeata</i>	Common		Monitoring	Woodland	Dryland agriculture	Urban-residential	
	Purple Roller	<i>Coracias naevia</i>	Common			Woodland	Thicket		
high	Roseate Tern	<i>Sterna dougallii</i>	Locally common		Endangered	Coastal			
	<b>African Black Oystercatcher</b>	<i>Haematopus moquini</i>	Common			Coastal			
	European Starling	<i>Sturnus vulgaris</i>	Common	Alien		Urban-residential	Dryland agriculture		
	Jackass Penguin	<i>Spheniscus demersus</i>	Locally common	Endemic	Near-threatened	Coastal			
	<b>Cape Gannet</b>	<i>Morus capensis</i>	Common	Breeding endemic		Coastal			
	Chestnutbanded Plover	<i>Charadrius pallidus</i>	Uncommon		Monitoring	Coastal			
	<b>Cape Cormorant</b>	<i>Phalacrocorax capensis</i>	Common	Breeding endemic		Ocean			
	<b>Green Barbet</b>	<i>Stactolaema olivacea</i>	Locally common	Endemic	Vulnerable	Forest (A/C)			
	Kelp Gull	<i>Larus dominicanus</i>	Common			Coastal			
	Swift Tern	<i>Sterna bergi</i>	Common			Coastal			
<b>Non-breeding</b>									
low	Black Tern	<i>Chlidonias niger</i>	Rare			Coastal			
	<b>Dusky Lark</b>	<i>Pinarocorys nigricans</i>	Uncommon			Woodland	Urban-residential		

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
	<b>Steppe Eagle</b>	<i>Aquila nipalensis</i>	Uncommon			Woodland			
	<b>Lesser Spotted Eagle</b>	<i>Aquila pomarina</i>	Uncommon		Monitoring	Woodland			
	Green Sandpiper	<i>Tringa ochropus</i>	Rare			Waterbodies			
	<b>European Bee-eater</b>	<i>Merops apiaster</i>	Common			Thicket	Woodland	Shrubland	
	Tree Pipit	<i>Anthus trivialis</i>	Rare			Woodland	Forest	Plantations	
	<b>Grey Wagtail</b>	<i>Motacilla cinerea</i>	Rare			Forest	Waterbodies		
	<b>Olivetree Warbler</b>	<i>Hippolais olivetorum</i>	Uncommon	Non-breeding endemic		Woodland	Degraded woodland		
	European Golden Oriole	<i>Oriolus oriolus</i>	Uncommon			Woodland	Urban-residential	Plantations	
high	Blackwinged Pratincole	<i>Glareola nordmanni</i>	Locally common			Grassland	Dryland agriculture	Waterbodies	
	Montagu's Harrier	<i>Circus pygargus</i>	Rare			Grassland	Dryland agriculture	Woodland	
	Lesser Kestrel	<i>Falco naumanni</i>	Common		Monitoring	Grassland	Dryland agriculture	Thicket	Urban-residential
	Pallid Harrier	<i>Circus macrourus</i>	Rare		Near-threatened	Grassland	Dryland agriculture	Woodland	
	Western Redfooted Kestrel	<i>Falco vespertinus</i>	Uncommon			Grassland	Woodland		
	Pennantwinged Nightjar	<i>Macrodipteryx vexillaria</i>	Locally common		Indeterminate	Woodland			
	Corncrake	<i>Crex crex</i>	Uncommon		Threatened	Grassland	Waterbodies	Dryland agriculture	Pasture
	African Hobby Falcon	<i>Falco cuvierii</i>	Uncommon			Woodland			
	Eastern Redfooted Kestrel	<i>Falco amurensis</i>	Common		Monitoring	Grassland	Dryland agriculture	Urban-residential	
	Ruff	<i>Philomachus pugnax</i>	Common			Waterbodies	Grassland		
Human									
low	Steelblue Widowfinch	<i>Vidua chalybeata</i>	Common		Monitoring	Woodland	Dryland agriculture	Urban-residential	
	<b>Striped Cuckoo</b>	<i>Clamator levaillantii</i>	Locally common			Woodland	Thicket	Urban-residential	
	Yellowbellied Sunbird	<i>Nectarinia venusta</i>	Locally common			Forest (A/C)	Woodland	Urban-residential	
	<b>Chestnutbacked Finchlark</b>	<i>Eremopterix leucotis</i>	Common			Grassland	Woodland	Dryland agriculture	
	<b>Grey Lourie</b>	<i>Corythaixoides concolor</i>	Common			Woodland	Thicket	Urban-residential	
	<b>Heuglin's Robin</b>	<i>Cossypha heuglini</i>	Common			Thicket	Woodland	Urban-residential	
	Lesser Grey Shrike	<i>Lanius minor</i>	Common	Non-breeding endemic		Thicket	Woodland	Shrubland	
	<b>Sabota Lark</b>	<i>Mirafra sabota</i>	Common	Near endemic		Woodland	Shrubland	Degraded woodland	
	Pinkbilled Lark	<i>Spizocorys conirostris</i>	Common	Near endemic		Grassland	Degraded grassland	Dryland agriculture	
	<b>Bushveld Pipit</b>	<i>Anthus caffer</i>	Common			Woodland	Degraded woodland		
high	<b>Fleshfooted Shearwater</b>	<i>Puffinus carneipes</i>	Common			Ocean			
	<b>Wilson's Storm Petrel</b>	<i>Oceanites oceanicus</i>	Common			Ocean			
	European Storm Petrel	<i>Hydrobates pelagicus</i>	Common			Coastal			
	European Starling	<i>Sturnus vulgaris</i>	Common	Alien		Urban-residential	Dryland agriculture		

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
Axis 2									
	<b>Subantarctic Skua</b>	<i>Catharacta antarctica</i>	Common			Coastal			
	Shy Albatross	<i>Diomedea cauta</i>	Common			Ocean			
	Thrush Nightingale	<i>Luscinia luscinia</i>	Uncommon			Thicket	Urban-residential		
	Pearlbreasted Swallow	<i>Hirundo dimidiata</i>	Common			Woodland	Thicket	Shrubland	Dryland agriculture
	<b>Southern Giant Petrel</b>	<i>Macronectes giganteus</i>	Common			Ocean			
	<b>Blackbrowed Albatross</b>	<i>Diomedea melanophris</i>	Common			Ocean			
Non-human									
low	<b>Redbilled Buffalo Weaver</b>	<i>Bubalornis niger</i>	Nomadic			Woodland	Thicket		
	<b>Purple Widowfinch</b>	<i>Vidua purpurascens</i>	Locally common		Monitoring	Woodland	Thicket		
	Dickinson's Kestrel	<i>Falco dickinsoni</i>	Rare			Woodland			
	<b>Thickbilled Cuckoo</b>	<i>Pachycoccyx audeberti</i>	Rare		Monitoring	Thicket	Woodland		
	Carmine Bee-eater	<i>Merops nubicoides</i>	Common			Woodland			
	Rackettailed Roller	<i>Coracias spatulata</i>	Uncommon		Vulnerable	Woodland			
	Whitecrowned Shrike	<i>Eurocephalus anguitimens</i>	Common	Endemic		Woodland	Thicket		
	Black Tern	<i>Chlidonias niger</i>	Rare			Coastal			
	Dusky Lark	<i>Pinarocorys nigricans</i>	Uncommon			Woodland	Urban-residential		
	Greyhooded Kingfisher	<i>Halcyon leucocephala</i>	Uncommon		Indeterminate	Woodland			
high	<b>Cory's Shearwater</b>	<i>Calonectris diomedea</i>	Common			Ocean			
	Roseate Tern	<i>Sterna dougallii</i>	Locally common		Endangered	Coastal			
	Sabine's Gull	<i>Larus sabini</i>	Rare			Coastal			
	Bridled Tern	<i>Sterna anaethetus</i>	Rare			Coastal			
	Collared Flycatcher	<i>Ficedula albicollis</i>	Rare			Woodland			
	Blackbellied Storm Petrel	<i>Fregetta tropica</i>	Common			Ocean			
	<b>Whitebellied Storm Petrel</b>	<i>Fregetta grallaria</i>	Rare			Ocean			
	Sooty Shearwater	<i>Puffinus griseus</i>	Common			Ocean			
	<b>Broadbilled Sandpiper</b>	<i>Limicola falcinellus</i>	Rare			Coastal			
	<b>Softplumaged Petrel</b>	<i>Pterodroma mollis</i>	Common			Ocean			

Table B-3: ADU species that scored highest and lowest in stepwise canonical correspondence analyses on axis 1 for bird assemblages. Associated ecological information is also provided.

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4	
<b>Axis 1</b>										
All										
low	Grey Wagtail	<i>Motacilla cinerea</i>	Rare			Forest	Waterbodies			
	Rufousbellied Heron	<i>Butorides rufiventris</i>	Rare	Endemic		Waterbodies				
	<b>Pinkthroated Longclaw</b>	<i>Macronyx ameliae</i>	Uncommon		Vulnerable	Grassland	Waterbodies			
	Black Coucal	<i>Centropus bengalensis</i>	Uncommon		Monitoring	Waterbodies	Grassland			
	Natal Nightjar	<i>Caprimulgus natalensis</i>	Rare		Vulnerable	Grassland	Waterbodies	Plantations		
	<b>Woodards' Batis</b>	<i>Batis fratrum</i>	Locally common	Endemic	Indeterminate	Coastal forest				
	Crab Plover	<i>Dromas ardeola</i>	Rare			Coastal				
	Broadbilled Roller	<i>Eurystomus glaucurus</i>	Locally common			Woodland	Thicket			
	Gullbilled Tern	<i>Gelochelidon nilotica</i>	Rare			Coastal				
	Broadbilled Sandpiper	<i>Limicola falcinellus</i>	Rare			Coastal				
	high	Pale Chanting Goshawk	<i>Melierax canorus</i>	Common	Near endemic		Shrubland	Woodland		
		Southern Grey Tit	<i>Parus afer</i>	Common	Endemic		Shrubland	Grassland		
		Mountain Pipit	<i>Anthus hoeschi</i>	Common	Breeding endemic		Grassland	Shrubland		
		<b>Thickbilled Lark</b>	<i>Galerida magnirostris</i>	Common	Endemic		Shrubland	Grassland	Dryland agriculture	
Yellow Canary		<i>Serinus flaviventris</i>	Common	Near endemic		Shrubland	Grassland			
<b>Sicklewinged Chat</b>		<i>Cercomela sinuata</i>	Common	Endemic		Shrubland	Grassland	Degraded grassland	Degraded shrubland	
Layard's Titbabbler		<i>Parisoma layardi</i>	Common	Endemic		Shrubland				
<b>Drakensberg Siskin</b>		<i>Pseudochloroptila symonsi</i>	Common	Endemic	Near-threatened	Shrubland	Grassland			
Botha's Lark		<i>Spizocorys fringillaris</i>	Uncommon	Endemic	Indeterminate	Grassland	Degraded grassland			
Blackchested Prinia		<i>Prinia flavicans</i>	Common	Near endemic		Shrubland	Thicket	Urban-residential		
Summer										
low	<b>Broadbilled Prion</b>	<i>Pachyptila vittata</i>	Uncommon			Ocean				
	Rufousbellied Heron	<i>Butorides rufiventris</i>	Rare	Endemic		Waterbodies				
	<b>Pinkthroated Longclaw</b>	<i>Macronyx ameliae</i>	Uncommon		Vulnerable	Grassland	Waterbodies			
	Black Coucal	<i>Centropus bengalensis</i>	Uncommon		Monitoring	Waterbodies	Grassland			
	Natal Nightjar	<i>Caprimulgus natalensis</i>	Rare		Vulnerable	Grassland	Waterbodies	Plantations		
	<b>Woodards' Batis</b>	<i>Batis fratrum</i>	Locally common	Endemic	Indeterminate	Coastal forest				
	Broadbilled Roller	<i>Eurystomus glaucurus</i>	Locally common			Woodland	Thicket			
	Crab Plover	<i>Dromas ardeola</i>	Rare			Coastal				
	<b>Yellow White-eye</b>	<i>Zosterops senegalensis</i>	Rare			Coastal forest	Woodland			
	Southern Banded Snake Eagle	<i>Circeatus fasciolatus</i>	Rare		Near-threatened	Coastal forest	Woodland	Thicket		
high	Thickbilled Lark	<i>Galerida magnirostris</i>	Common	Endemic		Shrubland	Grassland	Dryland agriculture		
	Mountain Pipit	<i>Anthus hoeschi</i>	Common	Breeding endemic		Grassland	Shrubland			

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
<b>Axis 1</b>									
	Yellow Canary	<i>Serinus flaviventris</i>	Common	Near endemic		Shrubland	Grassland		
	<b>Sicklemwinged Chat</b>	<i>Cercomela sinuata</i>	Common	Endemic		Shrubland	Grassland	Degraded grassland	Degraded shrubland
	Layard's Titbabbler	<i>Parisoma layardi</i>	Common	Endemic		Shrubland			
	Southern Grey Tit	<i>Parus afer</i>	Common	Endemic		Shrubland	Grassland		
	<b>Drakensberg Siskin</b>	<i>Pseudochloroptila symonsi</i>	Common	Endemic	Near-threatened	Shrubland	Grassland		
	Pale Chanting Goshawk	<i>Melierax canorus</i>	Common	Near endemic		Shrubland	Woodland		
	Botha's Lark	<i>Spizocorys fringillaris</i>	Uncommon	Endemic	Indeterminate	Grassland	Degraded grassland		
	Blackchested Prinia	<i>Prinia flavicans</i>	Common	Near endemic		Shrubland	Thicket	Urban-residential	
<b>Winter</b>									
low	Grey Wagtail	<i>Motacilla cinerea</i>	Rare			Forest	Waterbodies		
	<b>Pinkthroated Longclaw</b>	<i>Macronyx ameliae</i>	Uncommon		Vulnerable	Grassland	Waterbodies		
	Blackrumped Buttonquail	<i>Turnix hottentotta</i>	Rare		Endangered	Grassland	Waterbodies	Shrubland	
	Saddlebilled Stork	<i>Ephippiorhynchus senegalensis</i>	Uncommon		Rare	Waterbodies			
	<b>Natal Nightjar</b>	<i>Caprimulgus natalensis</i>	Rare		Vulnerable	Grassland	Waterbodies	Plantations	
	European Storm Petrel	<i>Hydrobates pelagicus</i>	Common			Coastal			
	Temminck's Courser	<i>Cursorius temminckii</i>	Locally common			Grassland	Degraded grassland	Degraded woodland	Dryland agriculture
	<b>Woodards' Batis</b>	<i>Batis fratrum</i>	Locally common	Endemic	Indeterminate	Coastal forest			
	Redbilled Helmetshrike	<i>Prionops retzii</i>	Common		Threatened	Woodland			
	Knot	<i>Calidris canutus</i>	Locally common			Waterbodies	Coastal		
high	Pale Chanting Goshawk	<i>Melierax canorus</i>	Common	Near endemic		Shrubland	Woodland		
	Layard's Titbabbler	<i>Parisoma layardi</i>	Common	Endemic		Shrubland			
	Southern Grey Tit	<i>Parus afer</i>	Common	Endemic		Shrubland	Grassland		
	<b>Sicklemwinged Chat</b>	<i>Cercomela sinuata</i>	Common	Endemic		Shrubland	Grassland	Degraded grassland	Degraded shrubland
	<b>Thickbilled Lark</b>	<i>Galerida magnirostris</i>	Common	Endemic		Shrubland	Grassland	Dryland agriculture	
	<b>Drakensberg Siskin</b>	<i>Pseudochloroptila symonsi</i>	Common	Endemic	Near-threatened	Shrubland	Grassland		
	Yellow Canary	<i>Serinus flaviventris</i>	Common	Near endemic		Shrubland	Grassland		
	Mountain Pipit	<i>Anthus hoeschi</i>	Common	Breeding endemic		Grassland	Shrubland		
	Botha's Lark	<i>Spizocorys fringillaris</i>	Uncommon	Endemic	Indeterminate	Grassland	Degraded grassland		
	Blacknecked Grebe	<i>Podiceps nigricollis</i>	Locally common			Waterbodies	Grassland	Shrubland	
<b>Passerine</b>									
low	Grey Wagtail	<i>Motacilla cinerea</i>	Rare			Forest	Waterbodies		
	Redbilled Helmetshrike	<i>Prionops retzii</i>	Common		Threatened	Woodland			
	Whitebreasted Cuckooshrike	<i>Coracina pectoralis</i>	Rare			Woodland			
	<b>Pinkthroated Longclaw</b>	<i>Macronyx ameliae</i>	Uncommon		Vulnerable	Grassland	Waterbodies		
	<b>Woodards' Batis</b>	<i>Batis fratrum</i>	Locally common	Endemic	Indeterminate	Coastal forest			
	<b>Stierling's Barred Warbler</b>	<i>Calamonastes stierlingi</i>	Common			Woodland			
	<b>Yellow White-eye</b>	<i>Zosterops senegalensis</i>	Rare			Coastal forest	Woodland		



SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4	
<b>Axis 1</b>										
high	Neergaard's Sunbird	<i>Nectarinia neergaardi</i>	Rare	Endemic	Near-threatened	Thicket	Coastal forest			
	<b>Pinkthroated Twinspot</b>	<i>Hypargos margaritatus</i>	Rare	Endemic	Monitoring	Thicket	Woodland			
	Lemonbreasted Canary	<i>Serinus citrinipectus</i>	Rare		Monitoring	Woodland	Grassland	Dryland agriculture		
	Southern Grey Tit	<i>Parus afer</i>	Common	Endemic		Shrubland	Grassland			
	Mountain Pipit	<i>Anthus hoeschi</i>	Common	Breeding endemic		Grassland	Shrubland			
	<b>Sicklewinged Chat</b>	<i>Cercomela sinuata</i>	Common	Endemic		Shrubland	Grassland	Degraded grassland	Degraded shrubland	
	<b>Yellow Canary</b>	<i>Serinus flaviventris</i>	Common	Near endemic		Shrubland	Grassland			
	<b>Thickbilled Lark</b>	<i>Galerida magnirostris</i>	Common	Endemic		Shrubland	Grassland	Dryland agriculture		
	Layard's Titbabbler	<i>Parisoma layardi</i>	Common	Endemic		Shrubland				
	<b>Drakensberg Siskin</b>	<i>Pseudochloroptila symonsi</i>	Common	Endemic	Near-threatened	Shrubland	Grassland			
	<b>Redeyed Bulbul</b>	<i>Pycnonotus nigricans</i>	Common	Near endemic		Grassland	Shrubland	Woodland	Urban-residential	
	<b>Orangebreasted Rockjumper</b>	<i>Chaetops aurantius</i>	Common	Endemic	Near-threatened	Grassland				
	Botha's Lark	<i>Spizocorys fringillaris</i>	Uncommon	Endemic	Indeterminate	Grassland	Degraded grassland			
<b>Non-passerine</b>										
low	Gullbilled Tern	<i>Gelochelidon nilotica</i>	Rare			Coastal				
	Broadbilled Sandpiper	<i>Limicola falcinellus</i>	Rare			Coastal				
	Crab Plover	<i>Dromas ardeola</i>	Rare			Coastal				
	<b>Black Coucal</b>	<i>Centropus bengalensis</i>	Uncommon		Monitoring	Waterbodies	Grassland			
	<b>Natal Nightjar</b>	<i>Caprimulgus natalensis</i>	Rare		Vulnerable	Grassland	Waterbodies	Plantations		
	Mongolian Plover	<i>Charadrius mongolus</i>	Common			Coastal				
	Rufousbellied Heron	<i>Butorides rufiventris</i>	Rare	Endemic		Waterbodies				
	Broadbilled Prion	<i>Pachyptila vittata</i>	Uncommon			Ocean				
	<b>Greater Frigatebird</b>	<i>Fregata minor</i>	Rare			Coastal				
	Green Barbet	<i>Stactolaema olivacea</i>	Locally common	Endemic	Vulnerable	Forest (A/C)				
	high	<b>Pale Chanting Goshawk</b>	<i>Melierax canorus</i>	Common	Near endemic		Shrubland	Woodland		
		Whitewinged Black Korhaan	<i>Eupodotis afrooides</i>	Common			Grassland	Thicket		
Burchell's Courser		<i>Cursorius rufus</i>	Uncommon	Endemic	Monitoring	Shrubland	Degraded grassland	Degraded shrubland	Dryland agriculture	
Western Redfooted Kestrel		<i>Falco vespertinus</i>	Uncommon			Grassland	Woodland			
<b>Greywing Francolin</b>		<i>Francolinus africanus</i>	Common	Endemic		Grassland	Shrubland			
<b>Bearded Vulture</b>		<i>Gypaetus barbatus</i>	Rare		Monitoring	Grassland				
Whitewinged Flufftail		<i>Sarothrura ayresi</i>	Rare		Endangered	Waterbodies				
<b>Blackwinged Pratincole</b>		<i>Glareola nordmanni</i>	Locally common			Grassland	Dryland agriculture	Waterbodies		
Greater Kestrel		<i>Falco rupicoloides</i>	Locally common			Grassland	Shrubland	Degraded woodland		
Abdim's Stork		<i>Ciconia abdimii</i>	Common			Grassland	Dryland agriculture	Pasture		
<b>Breeding</b>										
low		Rufousbellied Heron	<i>Butorides rufiventris</i>	Rare	Endemic		Waterbodies			
	<b>Pinkthroated Longclaw</b>	<i>Macronyx ameliae</i>	Uncommon		Vulnerable	Grassland	Waterbodies			

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
Axis 1									
high	Redbilled Helmetshrike	<i>Prionops retzii</i>	Common		Threatened	Woodland			
	<b>Woodards' Batis</b>	<i>Batis fratrum</i>	Locally common	Endemic	Indeterminate	Coastal forest			
	<b>Black Coucal</b>	<i>Centropus bengalensis</i>	Uncommon		Monitoring	Waterbodies	Grassland		
	Broadbilled Roller	<i>Eurystomus glaucurus</i>	Locally common			Woodland	Thicket		
	<b>Yellow White-eye</b>	<i>Zosterops senegalensis</i>	Rare			Coastal forest	Woodland		
	Lesser Blackwinged Plover	<i>Vanellus lugubris</i>	Uncommon		Rare	Woodland	Grassland		
	<b>Stierling's Barred Warbler</b>	<i>Calamonastes stierlingi</i>	Common			Woodland			
	Natal Nightjar	<i>Caprimulgus natalensis</i>	Rare		Vulnerable	Grassland	Waterbodies	Plantations	
	Southern Grey Tit	<i>Parus afer</i>	Common	Endemic		Shrubland	Grassland		
	<b>Pale Chanting Goshawk</b>	<i>Melierax canorus</i>	Common	Near endemic		Shrubland	Woodland		
	Mountain Pipit	<i>Anthus hoeschi</i>	Common	Breeding endemic		Grassland	Shrubland		
	<b>Thickbilled Lark</b>	<i>Galerida magnirostris</i>	Common	Endemic		Shrubland	Grassland	Dryland agriculture	
	Yellow Canary	<i>Serinus flaviventris</i>	Common	Near endemic		Shrubland	Grassland		
	<b>Sickwinged Chat</b>	<i>Cercomela sinuata</i>	Common	Endemic		Shrubland	Grassland	Degraded grassland	Degraded shrubland
	Layard's Titbabbler	<i>Parisoma layardi</i>	Common	Endemic		Shrubland			
	<b>Drakensberg Siskin</b>	<i>Pseudochloroptila symonsi</i>	Common	Endemic	Near-threatened	Shrubland	Grassland		
Botha's Lark	<i>Spizocorys fringillaris</i>	Uncommon	Endemic	Indeterminate	Grassland	Degraded grassland			
<b>Redeyed Bulbul</b>	<i>Pycnonotus nigricans</i>	Common	Near endemic		Grassland	Shrubland	Woodland	Urban-residential	
Non-breeding									
low	<b>Abdim's Stork</b>	<i>Ciconia abdimii</i>	Common			Grassland	Dryland agriculture	Pasture	
	<b>Blackwinged Pratincole</b>	<i>Glareola nordmanni</i>	Locally common			Grassland	Dryland agriculture	Waterbodies	
	<b>Western Redfooted Kestrel</b>	<i>Falco vespertinus</i>	Uncommon			Grassland	Woodland		
	<b>Lesser Kestrel</b>	<i>Falco naumanni</i>	Common		Monitoring	Grassland	Dryland agriculture	Thicket	Urban-residential
	Pallid Harrier	<i>Circus macrourus</i>	Rare		Near-threatened	Grassland	Dryland agriculture	Woodland	
	Whitewinged Flufftail	<i>Sarothrura ayresi</i>	Rare		Endangered	Waterbodies			
	<b>Eastern Redfooted Kestrel</b>	<i>Falco amurensis</i>	Common		Monitoring	Grassland	Dryland agriculture	Urban-residential	
	White Stork	<i>Ciconia ciconia</i>	Common			Grassland	Dryland agriculture	Woodland	Pasture
	Lesser Grey Shrike	<i>Lanius minor</i>	Common	Non-breeding endemic		Thicket	Woodland	Shrubland	
high	European Marsh Harrier	<i>Circus aeruginosus</i>	Rare			Waterbodies			
	Gullbilled Tern	<i>Gelochelidon nilotica</i>	Rare			Coastal			
	Broadbilled Sandpiper	<i>Limicola falcinellus</i>	Rare			Coastal			
	Mongolian Plover	<i>Charadrius mongolus</i>	Common			Coastal			
	Softplumaged Petrel	<i>Pterodroma mollis</i>	Common			Ocean			
	Crab Plover	<i>Dromas ardeola</i>	Rare			Coastal			
	Pintado Petrel	<i>Daption capense</i>	Common			Ocean			
	Subantarctic Skua	<i>Catharacta antarctica</i>	Common			Coastal			

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
<b>Axis 1</b>									
	Wandering Albatross	<i>Diomedea exulans</i>	Uncommon			Ocean			
	Bartailed Godwit	<i>Limosa lapponica</i>	Common			Coastal			
	Blackbrowed Albatross	<i>Diomedea melanophris</i>	Common			Ocean			
Human									
low	Lemonbreasted Canary	<i>Serinus citrinpectus</i>	Rare		Monitoring	Woodland	Grassland	Dryland agriculture	
	<b>Greyrumped Swallow</b>	<i>Pseudhirundo griseopyga</i>	Common			Woodland	Waterbodies	Dryland agriculture	
	European Storm Petrel	<i>Hydrobates pelagicus</i>	Common			Coastal			
	Caspian Tern	<i>Hydroprogne caspia</i>	Common		Rare	Coastal	Waterbodies		
	<b>Ayres' Eagle</b>	<i>Hieraetus ayresii</i>	Rare			Woodland	Plantations		
	Purplebanded Sunbird	<i>Nectarinia bifasciata</i>	Common			Woodland	Thicket	Coastal forest	Urban-residential
	Subantarctic Skua	<i>Catharacta antarctica</i>	Common			Coastal			
	Shy Albatross	<i>Diomedea cauta</i>	Common			Ocean			
	Mangrove Kingfisher	<i>Halcyon senegaloides</i>	Uncommon		Vulnerable	Coastal forest	Rivers	Urban-residential	
	<b>Lesser Flamingo</b>	<i>Phoeniconaias minor</i>	Locally common		Near-threatened	Waterbodies			
high	<b>Thickbilled Lark</b>	<i>Galerida magnirostris</i>	Common	Endemic		Shrubland	Grassland	Dryland agriculture	
	<b>Sicklewinged Chat</b>	<i>Cercomela sinuata</i>	Common	Endemic		Shrubland	Grassland	Degraded grassland	Degraded shrubland
	Blackchested Prinia	<i>Prinia flavicans</i>	Common	Near endemic		Shrubland	Thicket	Urban-residential	
	<b>Redeyed Bulbul</b>	<i>Pycnonotus nigricans</i>	Common	Near endemic		Grassland	Shrubland	Woodland	Urban-residential
	Burchell's Courser	<i>Cursorius rufus</i>	Uncommon	Endemic	Monitoring	Shrubland	Degraded grassland	Degraded shrubland	Dryland agriculture
	Clapper Lark	<i>Mirafra apiata</i>	Common	Endemic		Grassland	Shrubland	Dryland agriculture	
	Greater Kestrel	<i>Falco rupicoloides</i>	Locally common			Grassland	Shrubland	Degraded woodland	
	<b>Larklike Bunting</b>	<i>Emberiza impetuani</i>	Common	Near-endemic		Shrubland	Grassland	Thicket	Waterbodies
	Abdim's Stork	<i>Ciconia abdimii</i>	Common			Grassland	Dryland agriculture	Pasture	
	Fairy Flycatcher	<i>Stenostira scita</i>	Common	Endemic		Grassland	Thicket	Urban-residential	
Non-human									
low	Grey Wagtail	<i>Motacilla cinerea</i>	Rare			Forest	Waterbodies		
	Rufousbellied Heron	<i>Butorides rufiventris</i>	Rare	Endemic		Waterbodies			
	<b>Pinkthroated Longclaw</b>	<i>Macronyx ameliae</i>	Uncommon		Vulnerable	Grassland	Waterbodies		
	<b>Black Coucal</b>	<i>Centropus bengalensis</i>	Uncommon		Monitoring	Waterbodies	Grassland		
	Broadbilled Sandpiper	<i>Limicola falcinellus</i>	Rare			Coastal			
	Gullbilled Tern	<i>Gelochelidon nilotica</i>	Rare			Coastal			
	Natal Nightjar	<i>Caprimulgus natalensis</i>	Rare		Vulnerable	Grassland	Waterbodies	Plantations	
	Crab Plover	<i>Dromas ardeola</i>	Rare			Coastal			
	<b>Woodards' Batis</b>	<i>Batis fratrum</i>	Locally common	Endemic	Indeterminate	Coastal forest			
	<b>Broadbilled Roller</b>	<i>Eurystomus glaucurus</i>	Locally common			Woodland	Thicket		
high	<b>Pale Chanting Goshawk</b>	<i>Melierax canorus</i>	Common	Near endemic		Shrubland	Woodland		
	Southern Grey Tit	<i>Parus afer</i>	Common	Endemic		Shrubland	Grassland		

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
<b>Axis 1</b>									
	Mountain Pipit	<i>Anthus hoeschi</i>	Common	Breeding endemic		Grassland	Shrubland		
	Yellow Canary	<i>Serinus flaviventris</i>	Common	Near endemic		Shrubland	Grassland		
	Layard's Titbabbler	<i>Parisoma layardi</i>	Common	Endemic		Shrubland			
	<b>Drakensberg Siskin</b>	<i>Pseudochloroptila symonsi</i>	Common	Endemic	Near-threatened	Shrubland	Grassland		
	Botha's Lark	<i>Spizocorys fringillaris</i>	Uncommon	Endemic	Indeterminate	Grassland	Degraded grassland		
	Rock Pipit	<i>Anthus crenatus</i>	Common	Endemic		Grassland	Shrubland		
	<b>Orangebreasted Rockjumper</b>	<i>Chaetops aurantius</i>	Common	Endemic	Near-threatened	Grassland			
	Whitewinged Black Korhaan	<i>Eupodotis afraoides</i>	Common			Grassland	Thicket		

Table B-4: ADU species that scored highest and lowest in stepwise canonical correspondence analyses on axis 2 for bird assemblages. Associated ecological information is also provided.

SCORE Axis2	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
All									
low	Burchell's Starling	<i>Lamprotornis australis</i>	Common	Endemic		Woodland	Thicket		
	Bennett's Woodpecker	<i>Campethera bennettii</i>	Locally common			Woodland			
	<b>Thickbilled Cuckoo</b>	<i>Pachycoccyx audeberti</i>	Rare		Monitoring	Thicket	Woodland		
	Pearlspotted Owl	<i>Glaucidium perlatum</i>	Common			Woodland	Thicket		
	<b>Redbilled Buffalo Weaver</b>	<i>Bubalornis niger</i>	Nomadic			Woodland	Thicket		
	Barred Owl	<i>Glaucidium capense</i>	Locally common		Rare	Woodland			
	Swallowtailed Bee-eater	<i>Merops hirundineus</i>	Rare			Woodland			
	<b>Purple Widowfinch</b>	<i>Vidua purpurascens</i>	Locally common		Monitoring	Woodland	Thicket		
	Whitebreasted Cuckooshrike	<i>Coracina pectoralis</i>	Rare			Woodland			
	Redcrested Korhaan	<i>Eupodotis ruficrista</i>	Common	Near endemic	Monitoring	Grassland	Woodland	Shrubland	
high	Gullbilled Tern	<i>Gelochelidon nilotica</i>	Rare			Coastal			
	Broadbilled Sandpiper	<i>Limicola falcinellus</i>	Rare			Coastal			
	Pintado Petrel	<i>Daption capense</i>	Common			Ocean			
	Mongolian Plover	<i>Charadrius mongolus</i>	Common			Coastal			
	Whitechinned Petrel	<i>Procellaria aequinoctialis</i>	Common		Monitoring	Ocean			
	Softplumaged Petrel	<i>Pterodroma mollis</i>	Common			Ocean			
	<b>Wilson's Storm Petrel</b>	<i>Oceanites oceanicus</i>	Common			Ocean			
	Blackbrowed Albatross	<i>Diomedea melanophris</i>	Common			Ocean			
	Pomarine Skua	<i>Stercorarius pomarinus</i>	Common			Coastal			
	<b>Cory's Shearwater</b>	<i>Calonectris diomedea</i>	Common			Ocean			
Summer									
low	Bennett's Woodpecker	<i>Campethera bennettii</i>	Locally common			Woodland			
	<b>Pearlspotted Owl</b>	<i>Glaucidium perlatum</i>	Common			Woodland	Thicket		
	Burchell's Starling	<i>Lamprotornis australis</i>	Common	Endemic		Woodland	Thicket		
	Ovambo Sparrowhawk	<i>Accipiter ovampensis</i>	Rare			Woodland	Plantations		
	<b>Thickbilled Cuckoo</b>	<i>Pachycoccyx audeberti</i>	Rare		Monitoring	Thicket	Woodland		
	Redbilled Buffalo Weaver	<i>Bubalornis niger</i>	Nomadic			Woodland	Thicket		
	Longtoed Plover	<i>Vanellus crassirostris</i>	Rare		Monitoring	Waterbodies			
	<b>Purple Widowfinch</b>	<i>Vidua purpurascens</i>	Locally common		Monitoring	Woodland	Thicket		

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4	
	<b>Axis2</b>									
high	Barred Owl	<i>Glaucidium capense</i>	Locally common		Rare	Woodland				
	Redcrested Korhaan	<i>Eupodotis ruficrista</i>	Common	Near endemic	Monitoring	Grassland	Woodland	Shrubland		
	Broadbilled Sandpiper	<i>Limicola falcinellus</i>	Rare			Coastal				
	Gullbilled Tern	<i>Gelochelidon nilotica</i>	Rare			Coastal				
	Pintado Petrel	<i>Daption capense</i>	Common			Ocean				
	Mongolian Plover	<i>Charadrius mongolus</i>	Common			Coastal				
	Pied Mannikin	<i>Spermestes fringilloides</i>	Rare		Indeterminate	Coastal forest	Urban-residential	Dryland agriculture		
	Whitechinned Petrel	<i>Procellaria aequinoctialis</i>	Common		Monitoring	Ocean				
	<b>Softplumaged Petrel</b>	<i>Pterodroma mollis</i>	Common			Ocean				
	African Black Oystercatcher	<i>Haematopus moquini</i>	Common			Coastal				
	Lesser Blackbacked Gull	<i>Larus fuscus</i>	Uncommon			Coastal				
	<b>Fleshfooted Shearwater</b>	<i>Puffinus carneipes</i>	Common			Ocean				
	Winter									
low	Burchell's Starling	<i>Lamprotornis australis</i>	Common	Endemic		Woodland	Thicket			
	Pearlspotted Owl	<i>Glaucidium perlatum</i>	Common			Woodland	Thicket			
	Longtailed Shrike	<i>Corvinella melanoleuca</i>	Common			Thicket	Woodland			
	Swallowtailed Bee-eater	<i>Merops hirundineus</i>	Rare			Woodland				
	<b>Redcrested Korhaan</b>	<i>Eupodotis ruficrista</i>	Common	Near endemic	Monitoring	Grassland	Woodland	Shrubland		
	Lesser Grey Shrike	<i>Lanius minor</i>	Common	Non-breeding endemic		Thicket	Woodland	Shrubland		
	Jameson's Firefinch	<i>Lagonosticta rhodopareia</i>	Locally common			Woodland	Thicket			
	<b>Purple Roller</b>	<i>Coracias naevia</i>	Common			Woodland	Thicket			
	Burntnecked Eremomela	<i>Eremomela usticollis</i>	Common			Woodland				
	Paradise Whydah	<i>Vidua paradisaea</i>	Common			Thicket	Woodland			
	high	Gullbilled Tern	<i>Gelochelidon nilotica</i>	Rare			Coastal			
		Yellow Wagtail	<i>Motacilla flava</i>	Uncommon			Waterbodies	Degraded grassland		
		Pintado Petrel	<i>Daption capense</i>	Common			Ocean			
<b>Wilson's Storm Petrel</b>		<i>Oceanites oceanicus</i>	Common			Ocean				
Yellownosed Albatross		<i>Diomedea chlororhynchos</i>	Common			Ocean				
Whitechinned Petrel		<i>Procellaria aequinoctialis</i>	Common		Monitoring	Ocean				
Arctic Skua		<i>Stercorarius parasiticus</i>	Common			Coastal				
Bartailed Godwit		<i>Limosa lapponica</i>	Common			Coastal				
Bittern		<i>Botaurus stellaris</i>	Rare		Vulnerable	Waterbodies				
<b>Curlew</b>		<i>Numenius arquata</i>	Common			Coastal				

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
<b>Axis2</b>									
Passerine									
low	Whitebreasted Cuckooshrike	<i>Coracina pectoralis</i>	Rare			Woodland			
	Burchell's Starling	<i>Lamprotornis australis</i>	Common	Endemic		Woodland	Thicket		
	<b>Redbilled Buffalo Weaver</b>	<i>Bubalornis niger</i>	Nomadic			Woodland	Thicket		
	<b>Purple Widowfinch</b>	<i>Vidua purpurascens</i>	Locally common		Monitoring	Woodland	Thicket		
	Longtailed Shrike	<i>Corvinella melanoleuca</i>	Common			Thicket	Woodland		
	<b>Redbilled Helmetshrike</b>	<i>Prionops retzii</i>	Common		Threatened	Woodland			
	Olivetree Warbler	<i>Hippolais olivetorum</i>	Uncommon	Non-breeding endemic		Woodland	Degraded woodland		
	Clapper Lark	<i>Mirafra apiata</i>	Common	Endemic		Grassland	Shrubland	Dryland agriculture	
	Redheaded Weaver	<i>Anaplectes rubriceps</i>	Common			Woodland			
	Jameson's Firefinch	<i>Lagonosticta rhodopareia</i>	Locally common			Woodland	Thicket		
high	<b>Pied Mannikin</b>	<i>Spermestes fringilloides</i>	Rare		Indeterminate	Coastal forest	Urban-residential	Dryland agriculture	
	<b>House Crow</b>	<i>Corvus splendens</i>	Locally common	Alien		Urban-residential			
	Spotted Thrush	<i>Zoothera guttata</i>	Uncommon		Endangered	Coastal forest			
	<b>European Starling</b>	<i>Sturnus vulgaris</i>	Common	Alien		Urban-residential	Dryland agriculture		
	Golden Weaver	<i>Ploceus xanthops</i>	Common			Waterbodies	Thicket		
	Larklike Bunting	<i>Emberiza impetواني</i>	Common	Near-endemic		Shrubland	Grassland	Thicket	Waterbodies
	Brown Robin	<i>Erythropygia signata</i>	Common	Endemic	Vulnerable	Coastal forest			
	Barratt's Warbler	<i>Bradypterus barratti</i>	Common	Endemic		Forest	Plantations	Grassland	
	European Sedge Warbler	<i>Acrocephalus schoenobaenus</i>	Rare			Waterbodies			
	Grey Cuckooshrike	<i>Coracina caesia</i>	Uncommon			Woodland	Forest (A/C)		
Non-passerine									
low	Bennett's Woodpecker	<i>Campethera bennettii</i>	Locally common			Woodland			
	<b>Thickbilled Cuckoo</b>	<i>Pachycoccyx audeberti</i>	Rare		Monitoring	Thicket	Woodland		
	<b>Pearlspotted Owl</b>	<i>Glaucidium perlatum</i>	Common			Woodland	Thicket		
	Barred Owl	<i>Glaucidium capense</i>	Locally common		Rare	Woodland			
	Swallowtailed Bee-eater	<i>Merops hirundineus</i>	Rare			Woodland			
	Redcrested Korhaan	<i>Eupodotis ruficrista</i>	Common	Near endemic	Monitoring	Grassland	Woodland	Shrubland	
	<b>Purple Roller</b>	<i>Coracias naevia</i>	Common			Woodland	Thicket		
	Grey Lourie	<i>Corythaixoides concolor</i>	Common			Woodland	Thicket	Urban-residential	
	Whiteheaded Vulture	<i>Trigonoceps occipitalis</i>	Uncommon		Rare	Woodland			
	Giant Eagle Owl	<i>Bubo lacteus</i>	Uncommon		Monitoring	Woodland			
high	Gullbilled Tern	<i>Gelochelidon nilotica</i>	Rare			Coastal			

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
<b>Axis2</b>									
	Broadbilled Sandpiper	<i>Limicola falcinellus</i>	Rare			Coastal			
	Mongolian Plover	<i>Charadrius mongolus</i>	Common			Coastal			
	Pintado Petrel	<i>Daption capense</i>	Common			Ocean			
	Whitechinned Petrel	<i>Procellaria aequinoctialis</i>	Common		Monitoring	Ocean			
	Softplumaged Petrel	<i>Pterodroma mollis</i>	Common			Ocean			
	<b>Wilson's Storm Petrel</b>	<i>Oceanites oceanicus</i>	Common			Ocean			
	<b>Whitebellied Storm Petrel</b>	<i>Fregetta grallaria</i>	Rare			Ocean			
	<b>Blackbellied Storm Petrel</b>	<i>Fregetta tropica</i>	Common			Ocean			
	Pomarine Skua	<i>Stercorarius pomarinus</i>	Common			Coastal			
Breeding									
low	Burchell's Starling	<i>Lamprotornis australis</i>	Common	Endemic		Woodland	Thicket		
	Bennett's Woodpecker	<i>Campethera bennettii</i>	Locally common			Woodland			
	<b>Thickbilled Cuckoo</b>	<i>Pachycoccyx audeberti</i>	Rare		Monitoring	Thicket	Woodland		
	Pearlspotted Owl	<i>Glaucidium perlatum</i>	Common			Woodland	Thicket		
	<b>Redbilled Buffalo Weaver</b>	<i>Bubalornis niger</i>	Nomadic			Woodland	Thicket		
	Whitebreasted Cuckooshrike	<i>Coracina pectoralis</i>	Rare			Woodland			
	Burchell's Courser	<i>Cursorius rufus</i>	Uncommon	Endemic	Monitoring	Shrubland	Degraded grassland	Degraded shrubland	Dryland agriculture
	Swallowtailed Bee-eater	<i>Merops hirundineus</i>	Rare			Woodland			
	Barred Owl	<i>Glaucidium capense</i>	Locally common		Rare	Woodland			
	<b>Purple Widowfinch</b>	<i>Vidua purpurascens</i>	Locally common		Monitoring	Woodland	Thicket		
high	Pied Mannikin	<i>Spermestes fringilloides</i>	Rare		Indeterminate	Coastal forest	Urban-residential	Dryland agriculture	
	House Crow	<i>Corvus splendens</i>	Locally common	Alien		Urban-residential			
	Knysna Woodpecker	<i>Campethera notata</i>	Locally common	Endemic	Near-threatened	Coastal forest	Thicket		
	Mangrove Kingfisher	<i>Halcyon senegaloides</i>	Uncommon		Vulnerable	Coastal forest	Rivers	Urban-residential	
	Bittern	<i>Botaurus stellaris</i>	Rare		Vulnerable	Waterbodies			
	<b>Green Barbet</b>	<i>Stactolaema olivacea</i>	Locally common	Endemic	Vulnerable	Forest (A/C)			
	Spotted Thrush	<i>Zoothera guttata</i>	Uncommon		Endangered	Coastal forest			
	<b>Cape Cormorant</b>	<i>Phalacrocorax capensis</i>	Common	Breeding endemic		Ocean			
	<b>African Black Oystercatcher</b>	<i>Haematopus moquini</i>	Common			Coastal			
	<b>Cape Gannet</b>	<i>Morus capensis</i>	Common	Breeding endemic		Coastal			
Non-breeding									
low	<b>Olivetree Warbler</b>	<i>Hippolais olivetorum</i>	Uncommon	Non-breeding endemic		Woodland	Degraded woodland		
	<b>Steppe Eagle</b>	<i>Aquila nipalensis</i>	Uncommon			Woodland			



SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
	<b>Grey Wagtail</b>	<i>Motacilla cinerea</i>	Rare			Forest	Waterbodies		
	Bluecheeked Bee-eater	<i>Merops persicus</i>	Locally common			Grassland	Woodland	Waterbodies	
	<b>Lesser Spotted Eagle</b>	<i>Aquila pomarina</i>	Uncommon		Monitoring	Woodland			
	<b>European Bee-eater</b>	<i>Merops apiaster</i>	Common			Thicket	Woodland	Shrubland	
	Redshank	<i>Tringa totanus</i>	Rare			Waterbodies	Coastal		
	<b>Dusky Lark</b>	<i>Pinarocorys nigricans</i>	Uncommon			Woodland	Urban-residential		
	Lesser Flamingo	<i>Phoeniconaias minor</i>	Locally common		Near-threatened	Waterbodies			
	Icterine Warbler	<i>Hippolais icterina</i>	Common			Woodland	Plantations	Urban-residential	
high	Subantarctic Skua	<i>Catharacta antarctica</i>	Common			Coastal			
	Wandering Albatross	<i>Diomedea exulans</i>	Uncommon			Ocean			
	Pintado Petrel	<i>Daption capense</i>	Common			Ocean			
	Whitewinged Flufftail	<i>Sarothrura ayresi</i>	Rare		Endangered	Waterbodies			
	Softplumaged Petrel	<i>Pterodroma mollis</i>	Common			Ocean			
	Western Redfooted Kestrel	<i>Falco vespertinus</i>	Uncommon			Grassland	Woodland		
	Whitechinned Petrel	<i>Procellaria aequinoctialis</i>	Common		Monitoring	Ocean			
	Blackbrowed Albatross	<i>Diomedea melanophris</i>	Common			Ocean			
	Wilson's Storm Petrel	<i>Oceanites oceanicus</i>	Common			Ocean			
	Yellownosed Albatross	<i>Diomedea chlororhynchos</i>	Common			Ocean			
Human									
low	Burchell's Courser	<i>Cursorius rufus</i>	Uncommon	Endemic	Monitoring	Shrubland	Degraded grassland	Degraded shrubland	Dryland agriculture
	Olivetree Warbler	<i>Hippolais olivetorum</i>	Uncommon	Non-breeding endemic		Woodland	Degraded woodland		
	<b>Heuglin's Robin</b>	<i>Cossypha heuglini</i>	Common			Thicket	Woodland	Urban-residential	
	<b>Striped Cuckoo</b>	<i>Clamator levaillantii</i>	Locally common			Woodland	Thicket	Urban-residential	
	<b>Grey Lourie</b>	<i>Corythaixoides concolor</i>	Common			Woodland	Thicket	Urban-residential	
	<b>Chestnutbacked Finchlark</b>	<i>Eremopterix leucotis</i>	Common			Grassland	Woodland	Dryland agriculture	
	<b>Bushveld Pipit</b>	<i>Anthus caffer</i>	Common			Woodland	Degraded woodland		
	Flappet Lark	<i>Mirafraga rufocinnamomea</i>	Common			Woodland	Degraded woodland	Dryland agriculture	
	White Helmetshrike	<i>Prionops plumatus</i>	Common			Woodland	Thicket	Urban-residential	Plantations
	<b>Sabota Lark</b>	<i>Mirafraga sabota</i>	Common	Near endemic		Woodland	Shrubland	Degraded woodland	
high	Pintado Petrel	<i>Daption capense</i>	Common			Ocean			
	<b>Wilson's Storm Petrel</b>	<i>Oceanites oceanicus</i>	Common			Ocean			
	Whitechinned Petrel	<i>Procellaria aequinoctialis</i>	Common		Monitoring	Ocean			
	Greatwinged Petrel	<i>Pterodroma macroptera</i>	Common		Vulnerable	Ocean			

SCORE	COMMON	SPECIES	ABUNDANCE	DISTRIBUTION	RED DATA	VEG 1	VEG 2	VEG 3	VEG 4
Axis2	Pied Mannikin	<i>Spermestes fringilloides</i>	Rare		Indeterminate	Coastal forest	Urban-residential	Dryland agriculture	
	<b>Subantarctic Skua</b>	<i>Catharacta antarctica</i>	Common			Coastal			
	<b>Fleshfooted Shearwater</b>	<i>Puffinus carneipes</i>	Common			Ocean			
	<b>Blackbrowed Albatross</b>	<i>Diomedea melanophris</i>	Common			Ocean			
	<b>Southern Giant Petrel</b>	<i>Macronectes giganteus</i>	Common			Ocean			
	House Crow	<i>Corvus splendens</i>	Locally common	Alien		Urban-residential			
Non-human	Bennett's Woodpecker	<i>Campethera bennettii</i>	Locally common			Woodland			
low	Burchell's Starling	<i>Lamprotornis australis</i>	Common	Endemic		Woodland	Thicket		
	<b>Thickbilled Cuckoo</b>	<i>Pachycoccyx audeberti</i>	Rare		Monitoring	Thicket	Woodland		
	Pearlspotted Owl	<i>Glaucidium perlatum</i>	Common			Woodland	Thicket		
	<b>Redbilled Buffalo Weaver</b>	<i>Bubalornis niger</i>	Nomadic			Woodland	Thicket		
	Whitebreasted Cuckooshrike	<i>Coracina pectoralis</i>	Rare			Woodland			
	<b>Purple Widowfinch</b>	<i>Vidua purpurascens</i>	Locally common		Monitoring	Woodland	Thicket		
	Barred Owl	<i>Glaucidium capense</i>	Locally common		Rare	Woodland			
	Swallowtailed Bee-eater	<i>Merops hirundineus</i>	Rare			Woodland			
	Redcrested Korhaan	<i>Eupodotis ruficrista</i>	Common	Near endemic	Monitoring	Grassland	Woodland	Shrubland	
high	Gullbilled Tern	<i>Gelochelidon nilotica</i>	Rare			Coastal			
	<b>Broadbilled Sandpiper</b>	<i>Limicola falcinellus</i>	Rare			Coastal			
	Mongolian Plover	<i>Charadrius mongolus</i>	Common			Coastal			
	<b>Softplumaged Petrel</b>	<i>Pterodroma mollis</i>	Common			Ocean			
	Arctic Skua	<i>Stercorarius parasiticus</i>	Common			Coastal			
	Yellownosed Albatross	<i>Diomedea chlororhynchos</i>	Common			Ocean			
	<b>Whitebellied Storm Petrel</b>	<i>Fregetta grallaria</i>	Rare			Ocean			
	Pomarine Skua	<i>Stercorarius pomarinus</i>	Common			Coastal			
	<b>Cory's Shearwater</b>	<i>Calonectris diomedea</i>	Common			Ocean			
	Blackbellied Storm Petrel	<i>Fregetta tropica</i>	Common			Ocean			

## Appendix D

The following table lists the birds that were found in the CR survey but not found in the ADU survey, and birds found in the ADU survey but not found in during the CR survey. ADU birds in bold denote species found in the province before 1970 by Clancey (1964).

Table D-1: Avian species recorded in KwaZulu-Natal during the CR survey but not found in the ADU survey, and species recorded during the ADU survey but not found in the CR survey. ADU birds in bold denote species found in the province before 1970 by Clancey (1964).

DATA	SPECIES	COMMON	ABUNDANCE	DISTRIBUTION	RED DATA
CR	<i>Spheniscus demersus</i>	Jackass Penguin	Locally common	Endemic	Globally near-threatened
CR	<i>Pachyptila belcheri</i>	Slenderbilled Prion	Uncommon		
CR	<i>Neophron percnopterus</i>	Egyptian Vulture	Rare		Extinct South Africa
CR	<i>Necrosyrtes monachus</i>	Hooded Vulture	Rare		Vulnerable
CR	<i>Macheiramphus alcinus</i>	Bat Hawk	Rare		
CR	<i>Pernis apivorus</i>	Honey Buzzard	Rare		
CR	<i>Buteo augur</i>	Augur Buzzard	Rare		
CR	<i>Melierax metabates</i>	Dark Chanting Goshawk	Locally common		
CR	<i>Falco cuvierii</i>	African Hobby Falcon	Uncommon		
CR	<i>Falco dickinsoni</i>	Dickinson's Kestrel	Rare		
CR	<i>Coturnix adansonii</i>	Blue Quail	Rare		
CR	<i>Ardeotis kori</i>	Kori Bustard	Rare		Indeterminate
CR	<i>Calidris ruficollis</i>	Rednecked Stint	Rare		Vulnerable
CR	<i>Larus sabini</i>	Sabine's Gull	Rare		
CR	<i>Sterna dougallii</i>	Roseate Tern	Locally common		
CR	<i>Sterna anaethetus</i>	Bridled Tern	Rare		Endangered
CR	<i>Macrodipteryx vexillaria</i>	Pennantwinged Nightjar	Locally common		Indeterminate
CR	<i>Merops nubicoides</i>	Carmine Bee-eater	Common		
CR	<i>Coracias spatulata</i>	Rackettailed Roller	Uncommon		
CR	<i>Oenanthe pileata</i>	Capped Wheatear	Common		Vulnerable
CR	<i>Saxicola rubetra</i>	Whinchat	Rare		
CR	<i>Luscinia luscinia</i>	Thrush Nightingale	Uncommon		
CR	<i>Sylvia communis</i>	Whitethroat	Locally common		
CR	<i>Apalis melanocephala</i>	Blackheaded Apalis	Locally common		
CR	<i>Ficedula albicollis</i>	Collared Flycatcher	Rare		
CR	<i>Anthus trivialis</i>	Tree Pipit	Rare		
CR	<i>Prionops scopifrons</i>	Chestnutfronted Helmetshrike	Uncommon		
CR	<i>Eurocephalus anguimans</i>	Whitecrowned Shrike	Common	Endemic	Vulnerable
CR	<i>Nectarinia venusta</i>	Yellowbellied Sunbird	Locally common		
CR	<i>Anthreptes reichenowi</i>	Bluethroated Sunbird	Uncommon		
CR	<i>Uraeginthus granatinus</i>	Violeteared Waxbill	Common	Near endemic	Globally near-threatened
CR	<i>Amadina fasciata</i>	Cutthroat Finch	Uncommon		
CR	<i>Serinus albogularis</i>	Whitethroated Canary	Common	Near endemic	
ADU	<i>Diomedea chrysostoma</i>	Greyheaded Albatross	Rare		
ADU	<i>Accipiter ovampensis</i>	<b>Ovambo Sparrowhawk</b>	Rare		
ADU	<i>Circus aeruginosus</i>	European Marsh Harrier	Rare		
ADU	<i>Sarothrura ayresi</i>	<b>Whitewinged Flufftail</b>	Rare		
ADU	<i>Rynchops flavirostris</i>	<b>African Skimmer</b>	Rare		
ADU	<i>Columba livia</i>	Feral Pigeon	Common	Alien	Globally endangered
ADU	<i>Cuculus gularis</i>	African Cuckoo	Locally common		Endangered
ADU	<i>Glaucidium capense</i>	<b>Barred Owl</b>	Locally common		
ADU	<i>Campethera notata</i>	<b>Knysna Woodpecker</b>	Locally common	Endemic	
ADU	<i>Mirafra apiata</i>	Clapper Lark	Common	Endemic	Rare
ADU	<i>Mirafra ruddi</i>	<b>Rudd's Lark</b>	Uncommon	Endemic	Globally near threatened
ADU	<i>Spizocorys fringillaris</i>	Botha's Lark	Uncommon	Endemic	
ADU	<i>Coracina pectoralis</i>	Whitebreasted Cuckooshrike	Rare		
ADU	<i>Parus afer</i>	<b>Southern Grey Tit</b>	Common	Endemic	Critical
ADU	<i>Prinia flavicans</i>	Blackchested Prinia	Common	Near endemic	Indeterminate
ADU	<i>Lamprotornis australis</i>	<b>Burchell's Starling</b>	Common	Endemic	
ADU	<i>Buphagus africanus</i>	<b>Yellowbilled Oxpecker</b>	Locally common		
ADU	<i>Anthus hoeschi</i>	Mountain Pipit	Common	Breeding endemic	Vulnerable