

South Africa's Terrestrial Red List of Ecosystems (RLE):

Technical report on the revision of the list of terrestrial ecosystems that are threatened and in need of protection

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SUMMARY

An assessment of all terrestrial ecosystem types of South Africa was conducted in 2020/2021 using the IUCN Red List of Ecosystems assessment framework, and informed by the latest maps and information on ecosystem extent and condition. This technical report details the input data and methods used.

In 2011, the first national list of terrestrial ecosystems that are threatened and in need of protection was published in terms of [NEMBA](#). This list was limited to threatened terrestrial ecosystems, and was based on an assessments conducted between 2007 and 2010, and was based on land cover data from 2000. The 2011 list of threatened terrestrial ecosystems, and the associated maps, have been used in a wide range of environmental processes to guide decision making and inform biodiversity prioritisation and planning over the last 10 years.

Between 2015 and 2018, assessments of ecosystem threat status were comprehensively revised for all realms (terrestrial, marine, inland aquatic and estuarine) through the [National Biodiversity Assessment \(NBA\)](#). The assessment of terrestrial realm followed the [IUCN Red List of Ecosystems \(RLE\)](#) framework, and was based on an updated [national vegetation map](#) and new ecosystem condition data, derived primarily from the national land cover 1990–2014. This aligned the assessments with global monitoring, assessment and reporting processes linked to the United Nations Convention on Biological Diversity (CBD) and Sustainable Development Goals (SDGs).

After the publication of the NBA in late 2019, the Department of Forestry, Fisheries and the Environment released the 2018 national land cover. This data, together with new threatened species data provided the basis for 2020 version of the list of threatened terrestrial. In 2020 a series of technical engagements with conservation authorities was arranged via Environmental Working Groups 1 and 5. Technical focal points for each authority were nominated and these Focal Points formed part of the validation and review process involving one on one meetings and two workshops

arranged by SANBI and DFFE. Following extensive inputs and suggestions the list was adjusted where possible using additional information provided. Following the validation and review process the 2021 version of the list of threatened terrestrial ecosystems (hereafter referred to as the Red List of Ecosystems or RLE) represents the best available science for a variety of applications in the environmental sector. The South African National Biodiversity Institute (SANBI) will continue to curate the national Red List of Ecosystems database, and coordinate and facilitate future updates in conjunction with the conservation authorities, researchers and conservation NGOs.

INTRODUCTION

South Africa is one of several countries to independently develop indicators of ecosystem threat prior to the IUCN Red List of Ecosystems (RLE) (Keith *et al.*, 2013) (www.iucnrle.org). These indicators met a recognised need for an indicator similar to the IUCN Red List of Species that could identify risk for higher-levels of biodiversity organisation such as ecological communities (Noss, 1990; Rodríguez *et al.*, 2011; Keith *et al.*, 2013; Bland *et al.*, 2017a).

The South African list of threatened ecosystems was conceptualised as a national indicator of ecosystem conservation status in the early 2000s. From its early applications as a project-based indicator, it progressed into a legislated national listing of threatened terrestrial ecosystems (RSA, 2011; Botts *et al.*, 2020) which entrenched its use in land use planning and decision making (e.g. through the Environmental Impact Assessment processes). South Africa has been reporting on the threat status of its ecosystems for more than a decade, and using this information to focus scarce resources on conservation priorities through a wide range of government policies (Botts *et al.*, 2020).

For the National Biodiversity Assessment 2018, the ecosystem threat assessments were based on the updated national vegetation map and new ecosystem condition map (based primarily on the land cover change data) (Skowno *et al.*, 2019a; Skowno, A.L. *et al.*, 2019). Both the 2011 South Africa method and the 2017 IUCN RLE methods were implemented with the aim of comparing and contrasting the results (Skowno *et al.*, 2019b). Overall, the South African method and the IUCN method were similar, but the benefits of using the IUCN system (i.e. a stronger scientific evidence base than the South African method, recognition of the resulting RLE by the IUCN and alignment with international conventions and assessment processes) tend to outweigh the drawbacks (i.e. deviating from a locally well-established and accepted method) (Skowno *et al.*, 2019b). Consequently, the NBA 2018 Terrestrial Reference Group decided that the IUCN RLE approach should be adopted. Subsequent consultations with Conservation Authorities via Working Group structures concluded that the gazetted list of threatened terrestrial ecosystems should be updated with the new the information as soon as possible.

Following the completion of the NBA 2018 the red list of terrestrial ecosystems was updated during 2020 on the basis of updated national and provincial land cover data and updated threatened species data.¹

The IUCN Red List of Ecosystems Framework

Background of the IUCN RLE

The IUCN Red List of Ecosystems is a framework for assessing the risks to ecosystems and identifying where ecosystems are threatened (Rodríguez *et al.*, 2011). Using the familiar categories from the Red List of Species (Figure 2), and based on a set of criteria and thresholds developed collaboratively since 2008, the IUCN RLE was established to ensure that the assessment methods: (i) can be applied systematically across realms and geographic areas; (ii) are transparent and

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scientifically rigorous; (iii) are comparable and repeatable; (iv) can be easily understood by policy makers and the general public; and (v) complement the IUCN Red List of Threatened Species framework (Rodríguez *et al.*, 2011; Keith *et al.*, 2013; Bland *et al.*, 2017a).

The key concepts and definitions underpinning the RLE have been documented in a number of international journal publications, notably Nicholson *et al.*, 2009; Rodríguez *et al.*, 2011, 2015; Keith *et al.*, 2013, 2015; Bland *et al.*, 2017. There is growing uptake of the IUCN RLE standards with the number of published sub-global assessments (including North America, Philippines, Australia, Colombia, France, Finland) adopting the RLE approach. Ultimately, national and other sub-global assessments undertaken using these international standards will contribute towards establishing a global database of threatened ecosystems equivalent to the global Red List of Species (Bland *et al.*, 2019).

Key Concepts

The goal of the IUCN RLE is to identify ecosystems that are at risk of losing their constituent biodiversity. While there is substantial evidence that the ecosystem function and services are linked with biodiversity (Bland *et al.*, 2017a), the relationships between these three facets of ecosystems can be complex. Consequently, the RLE focusses specifically on risks to biodiversity (Keith *et al.*, 2013). The RLE requires consistent and clearly defined units of assessments (ecosystem types) that can be delineated spatially, while at the same time needs to be able to effectively assess risks across widely contrasting ecosystems (Keith *et al.*, 2013). Vegetation types, in particular, have been suggested as appropriate and consistent units that represent biodiversity and communities at an appropriate scale for use in the RLE (Keith *et al.*, 2013; Boitani *et al.*, 2015). The RLE framework used the concept of ecosystem collapse as the ‘end point’ of ecosystem decline, this is equivalent to species extinction in the RLS, and is defined operationally as a ‘transformation of identity, loss of defining abiotic or biotic features and characteristic native biota are no longer sustained’ (Keith *et al.*, 2013).

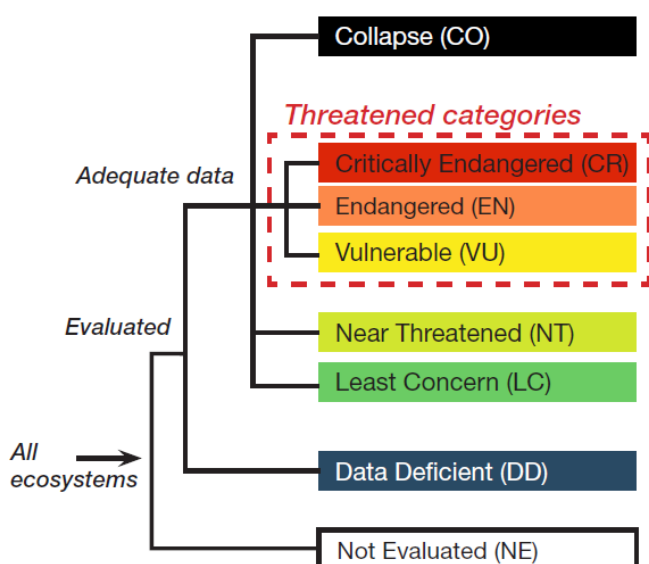


Figure 2. IUCN RLE threat categories, see glossary of terms of definitions. Source: Bland *et al.*, (2017).

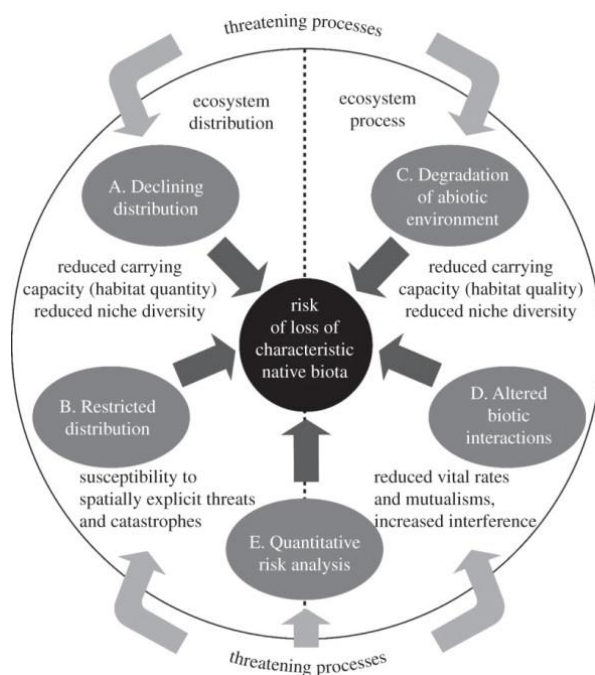


Figure 1. IUCN RLE framework for assessing the risk of ecosystem collapse. Source: Keith *et al.*, (2013).

Criteria and Thresholds

The risk assessment model for the IUCN RLE is illustrated schematically in Figure 2. Declining distributions (Figure 1-A) and restricted distributions (Figure 1-B) are considered distributional symptoms of decline; and degradation of abiotic environment (Figure 1-C) and altered biotic function (Figure 1-D) are considered functional symptoms of decline. It is possible for these mechanisms to interact and produce additional symptoms of decline (Keith *et al.*, 2013). The mechanisms in the conceptual model (Figure 1) translate into five rule-based criteria with thresholds for the distributional and functional symptoms. The final threat listing for each ecosystem is the worst threat category triggered by any of the criteria (i.e. if an ecosystem is listed CR under any criteria it is listed CR overall, even if it only scores LC or any other category under all other criteria).

IMPLEMENTATION OF THE IUCN RLE FOR SOUTH AFRICA 2020

We applied the IUCN Red List of Ecosystems (RLE) method for South Africa using a comprehensive systematic assessment based on IUCN Criteria A&B (criteria linked to spatial configuration and remaining extent of ecosystems) for all terrestrial ecosystem types (vegetation types). This assessment, referred to as the 'core' assessment, was then supplemented with additional assessments of selected ecosystem types based on additional data on ecosystem condition including: habitat loss in metropolitan areas, KwaZulu-Natal, the Western Cape and Mpumalanga; degradation in the Albany Thicket biome and the Western Cape; and degradation from invasive alien species and overgrazing using data extracted from threatened species assessments.

It is envisaged that the national RLE resulting from this assessment will be considered as the baseline for the nation, and that it will be updated as additional information becomes available and be released biennially. Given the general lack of appropriate ecosystem condition data available in South Africa this baseline assessment is likely to have underestimated the risk to certain ecosystem types – especially those that are threatened by more subtle ecosystem modification than land clearing (i.e. grazing, invasive alien plants). If the threat status of an ecosystem type is: a) considered an underestimate; or b) if the data used in the assessment is considered inaccurate or inadequate; or c) if a researcher can develop new datasets to address additional criteria for selected ecosystems; then further supplementary assessments should be undertaken in partnership with SANBI. The core assessment will be updated when updated national land cover change data becomes available, currently scheduled for 2021/2022.

Input data

The national habitat loss dataset (Skowno *et al.*, 2021) which was derived from national land cover data (GeoTerralimage, 2015a, 2015b, 2019) and the national vegetation map (Mucina & Rutherford, 2006; Dayaram *et al.*, 2019) were the primary input data input to the RLE 2020 analysis. Additional land cover data was sourced for City of Cape Town (2018), Nelson Mandela Bay Metropolitan Municipality (2015), Mpumalanga (2017), the Western Cape (2016) and KwaZulu-Natal (2017) (Table 1); these datasets were used to perform supplementary assessments for Criteria A3. The threatened species database (SANBI, Threatened Species Unit) was used to identify selected, limited range ecosystems (Criteria B) that are experiencing ongoing decline due to disrupted fire regimes, overgrazing or invasive plant species. Ecosystem degradation data for the Little Karoo, Albany Thicket biome, Nelson Mandela Bay, KwaZulu-Natal and the Western Cape allowed for a supplementary assessment of these regions using Criteria D (Table 1).

Table 1. Input data sources for the Red List of Ecosystem analysis.

Assessment	Dataset	Description	Reference
All assessments	Terrestrial ecosystem type map	Vegetation map of South Africa, Lesotho and Swaziland 2018 v 22.7. Polygon feature geodatabase developed and curated by SANBI.	South African National Biodiversity Institute (2006). The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Version 22.7
Criteria A3, A2b, B1, B2	National land cover	Land cover change raster developed by SANBI National Biodiversity Assessment Unit, with two timepoints 1990, 2018. Based on national land cover products by GeoTerra Image 2015 & 2019; with modifications for tracking habitat loss and identifying secondary vs. primary natural areas.	Skowno AL, Jewitt D, Slingsby JA (2021) Rates and patterns of habitat loss across South Africa's vegetation biomes. <i>South African Journal of Science</i> , 117 , 1–5. doi.org/10.17159/sajs.2021/8182 GeoTerraImage (2019) Technical Report: 2018 South African National Land Cover Dataset version 4. Pretoria, 43 pp. GeoTerraImage (2015) Technical Report: 1990 South African National Land Cover Dataset version 5.2. Pretoria, 63 pp.
Supplementary: Criterion A3 using alternative data and Criterion D3 and D1	City of Cape Town natural vegetation remnants map	2018 Vegetation remnants map produced by City of Cape Town based on remote sensing and in field validation of condition. Provided as a polygon feature geodatabase.	City of Cape Town (2018). Current Indigenous vegetation [Data file]. Retrieved from City of Cape Town Open Data Portal https://web1.capetown.gov.za/web1/opendataportal
	Nelson Mandela Bay Metro land cover	Natural areas map from the municipal bioregional planning process, with combination of desk top and field validated ecological condition. Provided as a polygon shapefile.	Stewart, W.I. and Jorgensen, P.J. 2016. Updating of Systematic Biodiversity Plan and development and publication of Bioregional Plan for the Nelson Mandela Bay Municipality: NMBM 2015 Landcover. SRK Consulting, South Africa.
	KwaZulu-Natal land cover	2017 provincial raster land cover product (20m resolution) validated by provincial conservation authorities.	Ezemvelo KZN Wildlife and GeoTerraImage. (2018) Updating the existing KZN Provincial Land-Cover Map (2011) to 2017: Data Users Report and Metadata (version 006). Unpublished report, Biodiversity Research and Assessment, Ezemvelo KZN Wildlife, Cascades, South Africa
	Mpumalanga land cover	2017 provincial raster land cover product (10m resolution) validated by provincial conservation authorities.	GeoTerraImage (2018). Mpumalanga Provincial Land Cover (2017 Sentinel 2 imagery; 10m raster dataset). Pretoria, South Africa.
	Western Cape land cover	2016 provincial raster land cover product (10m resolution) validated by provincial conservation authorities.	Pence, G.Q.K. (2017) Western Cape Biodiversity Spatial Plan: Technical Report. Unpublished Report. Western Cape Nature Conservation Board (Cape Nature), Cape Town.
	Albany Thicket biome degradation data	2002 biome-wide Landsat TM 5 based raster ecosystem degradation product (30m). Developed and field validated as part of the Subtropical Thicket Ecosystem Project (STEP) by the Agricultural Research Council.	Lloyd JW, Van den Berg EC, Palmer AR (2002) Patterns of transformation and degradation in the Thicket Biome, South Africa. Terrestrial Ecology Research Unit, University of Port Elizabeth.
	Eastern Little Karoo degradation mapping	Detailed (1:10 000) ecosystem condition mapping by Cape Nature of the Eastern Little Karoo ecosystem type	Cape Nature pers comm. (2020) Expert mapping by Dr A. Vlok, regional scientist.
Supplementary assessment: Criteria B1(iii), B2(iii)	Invasive plants, overgrazing and disrupted fire regimes	Evidence of ongoing decline for use under Criterion B. The threatened plant species database 2020 was used to calculate the number of species in each ecosystem type that were listed as threatened by land degradation processes, including disrupted fire regimes, invasive alien plants and overgrazing.	Threatened species database of South Africa (SANBI, Threatened Species Unit) (von Staden 2020 pers com).

Core assessment

Criteria A2b and A3 – historical and future reductions in geographic range

The ecosystem type data (which represents the geographic extent of potential vegetation circa 1750) and the habitat modification data (1990 and 2018) were cross-tabulated within a geographic information system and the historic reduction in geographic extent between ~1750 and 2018 was computed for each of the 456 ecosystem types. This was expressed as a percentage of the potential historical extent (~1750) (Equation 1). This allowed for the application of Criterion A3 (historical reduction in geographic extent). The absolute rate of decline in natural habitat between 1990 and 2018 (Equation 2) was used to estimate the reduction in geographic extent between 1990 and 2040 (a 50 year period) (Equation 3); allowing for the application of the Criterion A2b (past-present-future reductions in geographic range).

Equation 1: Reduction in extent since ~1750:

$$\text{Historical loss (\%)} = \frac{(Area_{1750} - Area_{2018})}{Area_{1750}} \times 100$$

Equation 2: Absolute rate of Decline:

$$\text{ARD (km}^2\text{/y)} = \frac{(Area_{2018} - Area_{1990})}{(Year_{2018} - Year_{1990})}$$

Equation 3: Reduction in extent over 50 years (1990-2040):

$$\text{50y loss (\%)} = \frac{(Area_{1990} - (ARD * 50))}{Area_{1990}} \times 100$$

Criteria B1(i) and B2(i) – Restricted geographic range and ongoing decline

The first step for the assessment under this criterion was to combine the habitat modification data for 2018 with the ecosystem type data to produce an 'ecosystem remnants' layer circa 2018. This layer (in geotiff format) was used to compute the Extent of Occurrence (EOO) and Area of Occupancy (AOO) for each ecosystem type with the package [redlistr] (Lee & Murray, 2017) (note; we added an iterative function to process all 456 ecosystem types) within the statistical software R (R Core Team, 2014). Ecosystem types only qualify for consideration under Criteria B1(i) and B2(i) if they are experiencing ongoing declines in extent or condition (observed or inferred). For the core assessment ARD (Equation 2) was expressed as a percentage of 1990 geographic extent (Equation 4). Ecosystems with percentage rate of decline of greater than or equal to 0.4%/y qualified for consideration under B1(i) and B2(i). Ecosystems with annual rates of decline above this threshold have lost approximately 10% of their natural remaining extent in the last 25 years. (Table 2). This threshold requires further testing, and was chosen at an expert reference group meeting on presentation of a simple sensitivity analysis that compared the number of qualifying ecosystems types at 0.3, 0.4, and 0.5% decline per year (Monyeki, in prep).

Equation 4: Percentage rate of decline:

$$\text{Percentage ARD (\%/y)} = \frac{ARD}{Area_{1990}} \times 100$$

Supplementary assessments

To complement the core assessment a number of additional datasets were compiled to ensure the ecosystem risk assessments were based on the best available data. The supplementary assessment used Criteria A, B and D.

Criterion A3 - Historical reductions in geographic range (using alternative land cover data) & Criterion D1 & D3 - Disruption of biotic processes (using ecosystem condition / degradation information)

High resolution and high confidence land cover data exist for certain regions within South Africa including the City of Cape Town, Nelson Mandela Bay Metropolitan Municipality, Mpumalanga, the Western Cape Province and KwaZulu-Natal Province (Table 1). There are also regional data sets that focus on mapping ecosystem condition such as the Sub Tropical Ecosystem Programme. These independent regional datasets were collated into a supplementary ecosystem condition dataset, resampled to a common grid resolution of 30m (all datasets were between 10 and 30m native resolution) and reclassified to a simple scheme with three classes: i) natural and near natural habitat (referred to as “natural”), ii) severely degraded habitat with substantial biotic disruptions (referred to as “degraded”), and iii) areas with no natural habitat remaining (referred to as “lost”). For “natural” and “lost” classes the regional land cover products needed no special alignment, but for the “degraded” class the technical documentation of the source data were consulted. In all cases the severely degraded classes contained in the regional data sources were composite estimates of overall pixel-level changes to structure, function and composition of the native plant communities equivalent to the scores $\geq 70\%$ severity. The biotic disruption in the regional datasets mostly reflect the impacts of overutilization by domestic stock, and substantial and persistent losses of plant cover. Other widespread biotic disruptions such as invasive alien species are not reliably reflected in these datasets.

The ecosystem type data (vegetation map version 2018_22_7) and supplementary land cover data were cross tabulated within a geographic information system. Historical reduction in geographic extent (Equation 1), and historical extent of degradation (Equation 5) were computed for each ecosystem type. This allowed for the formulation of an alternative Criteria A3 assessment (historical reductions in geographic range). A precautionary rule was applied such that the highest threat status of the A3 and A3-alternative was used. The calculation of the historical extent of degradation allowed the application of Criterion D3, historical disruptions of biotic process (in this case vegetation structure, function and composition are all severely impaired) (Lloyd, Van den Berg & Palmer 2002). The lost habitat was considered to have severity of biotic disruption of 100%, the severely degraded areas were considered to have biotic disruption of between 70% and 80%. In addition, high resolution data were available for one ecosystem type, Eastern Little Karoo, which allowed for the application of Criterion D1 – degradation in the past 50 years – using the same equation as for Criterion D3 (Equation 6).

Equation 5: Reduction in extent since ~1750:

$$\text{Historical loss ALT 2018 (\%)} = \frac{\text{Area}_{\text{LOST}}}{(\text{Area}_{\text{NAT}} + \text{Area}_{\text{DEG}} + \text{Area}_{\text{LOST}})} \times 100$$

Equation 6: Extent of historical biotic disruption at $\geq 70\%$ severity:

$$\text{Historical biotic disruption 2018 (\%)} = \frac{(\text{Area}_{\text{DEG}} + \text{Area}_{\text{LOST}})}{(\text{Area}_{\text{NAT}} + \text{Area}_{\text{DEG}} + \text{Area}_{\text{LOST}})} \times 100$$

Criteria B1(iii)s and B2(iii)s – Restricted geographic range and species threats

A key challenge in the application of the RLE is the poor availability of spatially explicit ecosystem condition data (biotic disruption and degradation). As a result, the risk of collapse of many ecosystem types may have been underestimated in the core assessment. A supplementary assessment of Criterion B was undertaken using the threatening processes data from the

Threatened Plant Species Database, the most reliable source of data on functional symptoms of biodiversity decline in South Africa. For the supplementary assessment of Criterion B, the qualifying criteria (i.e. evidence of biotic disruption) was a quantitative assessment of threatening processes listed for the threatened species occurring in each ecosystem type. To do this, each threatened plant species was assigned to an ecosystem type or ecosystem types using their spatial position and descriptions of preferred habitat. We then calculated the number of species per ecosystem type that were threatened by a) poor rangeland management (over grazing), b) invasive alien species and c) inappropriate fire management. The qualifier for biotic disruption Criteria B1(iii) and B2(iii) in the supplementary assessment was set to: ecosystems that contained ≥ 40 threatened plant species, of which $\geq 60\%$ were threatened due to major biotic disruptions, with number of threatened species per $\text{km}^2 \geq 0.15$. This is a preliminary solution while additional data on biotic disruption, severity and extent are collected.

Table 2. Full list of IUCN RLE criteria and thresholds (Rodríguez et al., 2011); for the list of criteria used in the South African implementation of the RLE see Table 3.

A. Reduction in geographic distribution over ANY of the following time periods:				
		CR	EN	VU
A1	Present (over the past 50 years).	≥ 80%	≥ 50%	≥ 30%
A2a	Future (over the next 50 years).	≥ 80%	≥ 50%	≥ 30%
A2b	Future (over any 50 year period including the present and future).	≥ 80%	≥ 50%	≥ 30%
A3	Historic (since 1750).	≥ 90%	≥ 70%	≥ 50%

B. Restricted geographic distribution indicated by EITHER B1, B2 or B3:				
		CR	EN	VU
B1	Extent of a minimum convex polygon enclosing all occurrences (Extent of Occurrence) AND at least one of the following (a-c): (a) An observed or inferred continuing decline in EITHER: i. a measure of spatial extent appropriate to the ecosystem; OR ii. a measure of environmental quality appropriate to characteristic biota of the ecosystem; OR iii. a measure of disruption to biotic interactions appropriate to the characteristic biota of the ecosystem. (b) An observed or inferred threatening processes that are likely to cause continuing declines in either geographic distribution, environmental quality or biotic interactions within the next 20 years. (c) Ecosystem exists at ...	≤ 2,000 km ²	≤ 20,000 km ²	≤ 50,000 km ²
B2	The number of 10 × 10 km grid cells occupied (Area of Occupancy) AND at least one of a-c above (same subcriteria as for B1).	≤ 2	≤ 20	≤ 50
B3	A very small number of locations (generally fewer than 5) AND prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and thus capable of collapse or becoming Critically Endangered within a very short time period (B3 can only lead to a listing as VU).			VU

C. Environmental degradation over ANY of the following time periods:					
		Relative severity (%)			
C1	The past 50 years based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:	Extent (%)	≥ 80	≥ 50	≥ 30
		≥ 80	CR	EN	VU
		≥ 50	EN	VU	
C2	The next 50 years, or any 50-year period including the present and future, based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:	Extent (%)	≥ 80	≥ 50	≥ 30
		≥ 80	CR	EN	VU
		≥ 50	EN	VU	
C3	Since 1750 based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:	Extent (%)	≥ 90	≥ 70	≥ 50
		≥ 90	CR	EN	VU
		≥ 70	EN	VU	

D. Disruption of biotic processes or interactions over ANY of the following time periods:					
		Relative severity (%)			
D1	The past 50 years based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:	Extent (%)	≥ 80	≥ 50	≥ 30
		≥ 80	CR	EN	VU
		≥ 50	EN	VU	
D2	The next 50 years, or any 50-year period including the present and future, based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:	Extent (%)	≥ 80	≥ 50	≥ 30
		≥ 80	CR	EN	VU
		≥ 50	EN	VU	
D3	Disruption of biotic processes or interactions since 1750 based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:	Extent (%)	≥ 90	≥ 70	≥ 50
		≥ 90	CR	EN	VU
		≥ 70	EN	VU	

E. Quantitative analysis ...				
		CR	EN	VU
	... that estimates the probability of ecosystem collapse to be:	≥ 50% within 50 years	≥ 20% within 50 years	≥ 10% within 100 years

Table 3. IUCN RLE criteria and thresholds applied in the South African assessment 2020.

Criteria & Sub-criteria	CR	EN	VU
Criteria A: Reduced geographic distribution			
Sub-criterion A2b - Loss of habitat over a 50 year period including past present and future The absolute rate of decline in natural habitat between 1990 and 2018 (Equation 2) was used to estimate the reduction in ecosystem extent between 1990 and 2040 2), this projected value was then expressed as a percentage of the 1990 extent; allowing for the application of the Criterion A2b (past-present-future reductions in geographic range).	≥ 80%	≥ 50%	≥ 30%
Sub-criterion A3 – Historical loss of habitat (since ~1750) The historical reduction in geographic extent of each ecosystem type between 1750 and 2018 was expressed as a percentage of the original (1750) extent; allowing for the application of the thresholds for Criterion A3 (historical reductions in geographic range). Equivalent supplementary assessments utilised higher resolution land cover products available for KwaZulu-Natal, Mpumalanga, the Western Cape province and two large metropolitan areas. The supplementary assessments are referred to as “A3alt”.	≥ 90%	≥ 70%	≥ 50%
Criteria B: Restricted distribution & continuing declines in geographic distribution			
Sub-criterion B1 (i) & (iii) - Extent of a minimum convex polygon (km ²) enclosing all occurrences (EOO) & an observed or inferred continuing decline in spatial extent. The percentage rate of decline (Equation 4) was used to identify ecosystems with significant “ongoing decline” required by this criterion. A threshold of >=0.4%/y was used for those ecosystem types below the EOO size thresholds for this criterion B1(ii). A supplementary assessment used a comprehensive threatened species database to identify ecosystems with very high levels of biotic disruption from over grazing, invasive species and poor fire management, as evidence of “ongoing decline”. Those ecosystems below the EOO thresholds and showing ongoing decline qualified under this criterion B1(iii).	≤ 2 000 km ²	≤ 20 000 km ²	≤ 50 000 km ²
Sub-criterion B2 (i) & (iii) - The number of 10×10 km grid cells occupied (AOO) & an observed or inferred continuing decline in spatial extent. The percentage rate of decline (Equation 4) was used to identify ecosystems with significant “ongoing decline” required by this criterion. A threshold of >=0.4%/y was used for those ecosystem types below the AOO thresholds for this criterion B2(ii). A supplementary assessment used a comprehensive threatened species database to identify ecosystems with very high levels of biotic disruption from overgrazing, invasive species and poor fire management as evidence of “ongoing decline”. Those ecosystems below the AOO thresholds and showing ongoing decline qualified under this criterion B2(iii).	≤ 2	≤ 20	≤ 50
Criteria D: Disruption of biotic processes or interactions			
Sub-criterion D1 – Disruption of biotic processes, in the last 50 years (circa 1970), based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the table. Ecosystem condition data from Cape Nature scientists (Vlok et al. per com) was used to identify the extent of Eastern Little Karoo where biotic disruption was >= 80% in severity. The extent of this biotic disruption then dictates the risk category	Relative severity (%)		
	≥ 80	≥ 50	≥ 30
Extent (%)	≥ 80	CR	EN
	≥ 50	EN	VU
	≥ 30	VU	
Sub-criterion D3 – Disruption of biotic processes, since 1750, based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the table. Ecosystem condition data from the Albany Thicket biome, KwaZulu-Natal, Mpumalanga, the Western Cape Province, the City of Cape Town and Nelson Mandela Bay Metro was used to identify the extent of each ecosystem type where biotic disruption was >= 70% in severity. The extent of this biotic disruption then dictates the risk category.	Relative severity (%)		
	≥ 90	≥ 70	≥ 50
Extent (%)	≥ 90	CR	EN
	≥ 70	EN	VU
	≥ 50	VU	

Ecosystem types with distribution ranges beyond South Africa's borders

This assessment includes all ecosystem types within the borders of mainland South Africa (n = 456). An important consideration when conducting RLE assessments is national vs. global extent of the type. The vegetation map that forms the basis of the Red List of Ecosystems for South Africa (i.e. Mucina and Rutherford 2006) also covers the neighbouring countries of Lesotho and Swaziland (Figure 3). As a result, ecosystem types that are distributed across these particular international boundaries can be considered to have been assessed globally. For Namibia, Botswana, Zimbabwe and Mozambique, no comparable vegetation maps exist at present (though work is underway in Mozambique and Namibia) and ecosystem types that cross these borders cannot be assessed across their full global extent at present.

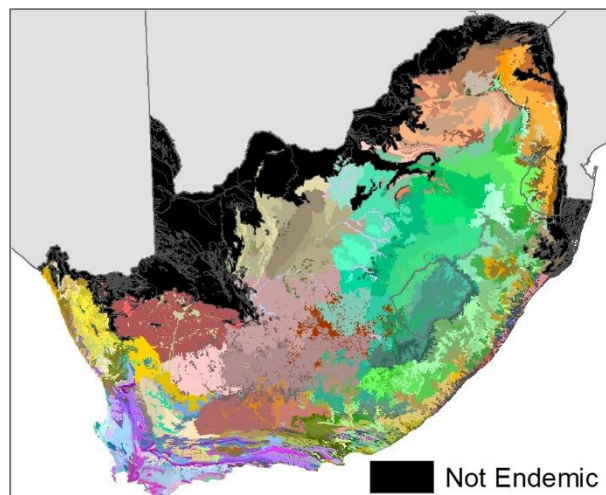


Figure 3. The vegetation map that provides the ecosystem type units for the terrestrial Red List of Ecosystems covers South Africa, Lesotho and Swaziland. Types that are likely to occur in Namibia, Botswana, Zimbabwe or Mozambique are shown in black. These 73 types contribute to the national RLE but not the global RLE.

For the most part, however, South African terrestrial ecosystem types in the Fynbos, Albany Thicket, Grassland and Nama-Karoo are endemic to South Africa, Lesotho and Swaziland (385 out of 456 ecosystem types). The remaining 71 types are members of the Savanna biome (the dominant biome in southern Africa), the Desert and Succulent Karoo biomes (the dominant biome in western Namibia), and the Indian Ocean coastal Belt and Forest biomes (which extend into southern Mozambique) (Figure 7). Further research and mapping is required before the endemism of many of these 73 types can be known with any degree of certainty.

For this assessment, all ecosystem types that occur in South Africa are included in the RLE. Those types for which endemism is not yet resolved are considered to have been assessed nationally and are assigned a “national” RLE status, endemic types are considered to have been globally assessed and are assigned a “global” (and national) RLE status. These globally assessed types will be submitted to the IUCN international RLE database.

RESULTS OF THE ECOSYSTEM THREAT ASSESSMENT

This 2020/2021 implementation of the IUCN RLE for South African terrestrial ecosystems (including 456 vegetation types) resulted in the listing of 51 Critically Endangered, 55 Endangered and 14 Vulnerable ecosystem types (Table 4, Figure 4). While 11% of ecosystem types are Critically Endangered, this amounts to less than one percent of the extent of natural remaining habitat in South Africa. Endangered ecosystems make up 12% of ecosystems by type and make up 5% of natural remaining habitat. Vulnerable ecosystems make up 3% of ecosystem by type, amounting to 4% of the natural remaining habitat of South Africa (Table 4, Figure 5).

Table 4. Summary of the assessment outcomes; including the number of ecosystem types per category & proportion of the natural areas remaining per category. Appendix 1 contains a full list of ecosystem types assessed.

Category (IUCN RLE)	Number of ecosystems	Natural extent remaining within South Africa in 2018 (km ²)	Percentage of total terrestrial landmass extent	Percentage of natural remaining extent
Critically Endangered	51	7 509	0.62%	0.79%
Endangered	55	50 315	4.13%	5%
Vulnerable	14	35 346	2.90%	3.72%
Least Concern	336	857 576	70.39%	90.20%
Total for South Africa	456	950 745	78%	100.00%

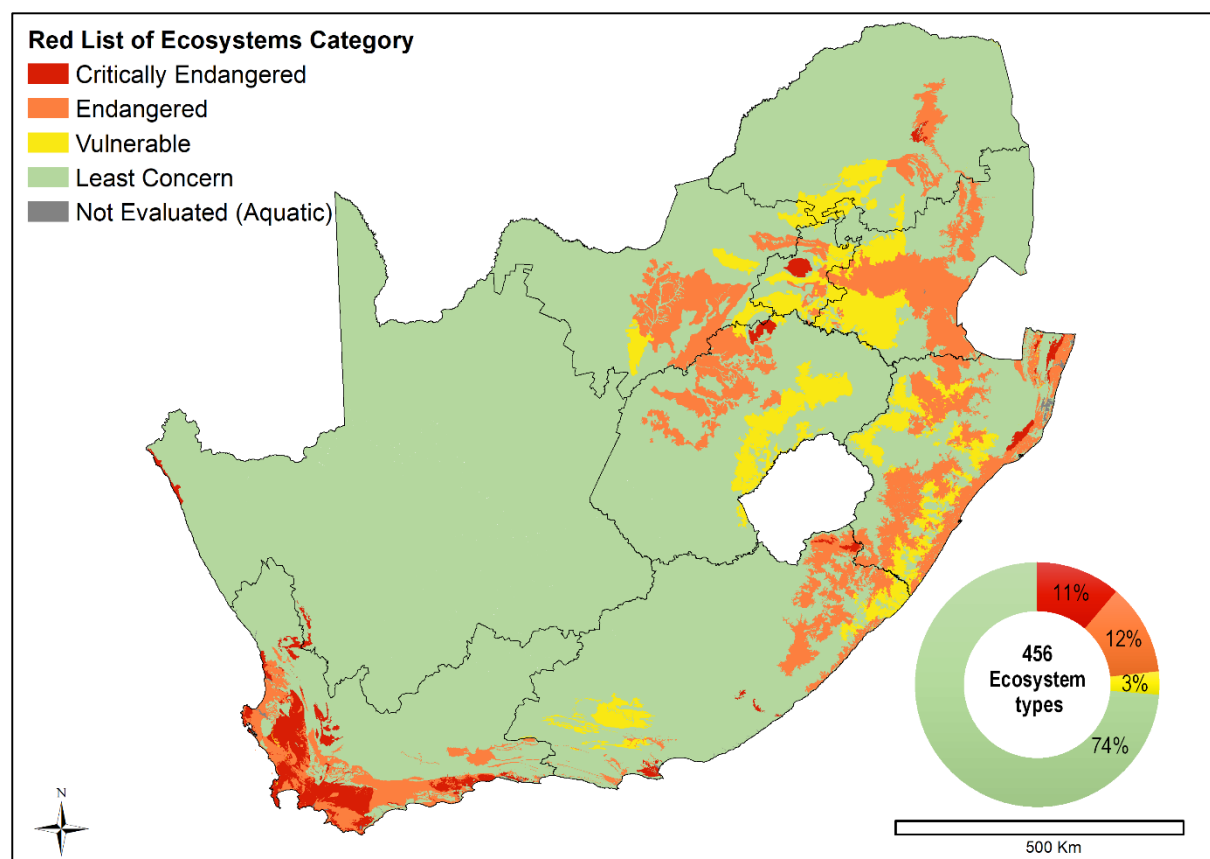


Figure 4. Map showing the distribution of threatened ecosystems according to the IUCN Red List of Ecosystems. The map shows the historical extent of the ecosystem types (based on the National Vegetation Map 2018). The inset graph shows the percentage of ecosystem types that falls within each threat category.

Results per biome

The Fynbos biome has the highest number of threatened ecosystems types (59), followed by Grassland (24) and Savanna (13) and these make up 23%, 29% and 4% respectively of the natural remaining habitat of each biome respectively (Table 5, Figure 6). All six ecosystems types making up the Indian Ocean Coastal Belt biome are threatened which means that 100% the natural habitat remaining in the biome is threatened. The arid regions of the country have less threatened ecosystems (by type and by remaining extent); the Succulent Karoo has three threatened ecosystems (amounting to 0.8% of the natural remaining habitat) and the Nama-Karoo has no threatened ecosystems. The Forest biome covers less than 0.5% of South Africa, and this study identified no threatened terrestrial types. This is likely due to a mismatch in the scale of the land cover change data and forest patches; additional research is required to better understand historical and current distribution of this biome. In addition, two forest types, namely Swamp Forest and Mangrove Forest are not considered terrestrial and are not included in this study; recent research suggests Swamp Forest may be Critically Endangered (Van Deventer *et al.*, 2021), while Mangroves have yet to be assessed.

Appendix 1 contains a list of ecosystem types assessed in 2020/2021, and resulting threat status category. The full terrestrial threatened ecosystem assessment database is available on request, and summary information can be found at <http://ecosystemstatus.sanbi.org.za>.

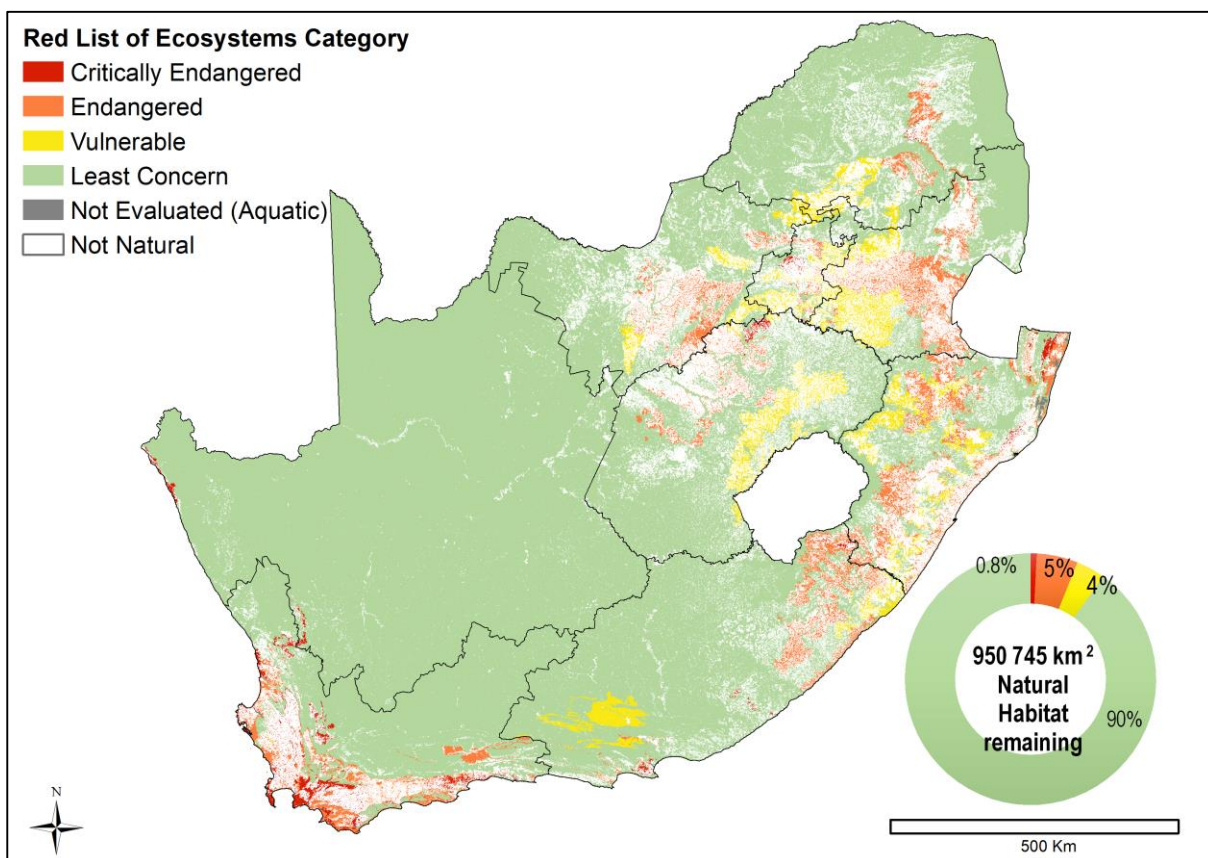


Figure 5. Map showing the natural remaining extent (circa 2018) of threatened ecosystems according to the IUCN Red List of Ecosystems. The inset graph shows the percentage of the total natural habitat remaining in South Africa (950 855 km²) that falls within each threat category.

Table 5. Percentage natural remaining habitat within each IUCN RLE threat category, listed per biome. The number of ecosystem types per threat category, per biome is shown in parenthesis. Appendix 1 contains a full list of ecosystem types assessed.

BIOME	Critically Endangered	Endangered	Vulnerable	All Threatened Ecosystems	Least Concern	Grand Total
Azonal Vegetation	0% (2)	2.6% (3)	0% (0)	2.7% (5)	97.3% (13)	18
Succulent Karoo	0.6% (3)	1.9% (1)	0% (0)	2.4% (4)	97.6% (60)	64
Savanna	0.3% (3)	1.9% (7)	1.7% (3)	3.8% (13)	96.2% (78)	91
Nama-Karoo	0% (0)	0% (0)	0% (0)	0% (0)	100% (13)	13
Indian Ocean Coastal Belt	0% (0)	83.6% (5)	16.4% (1)	100% (6)	0% (0)	6
Grassland	0.5% (4)	16.2% (14)	12.2% (6)	28.9% (24)	71.1% (49)	73
Fynbos	9.3% (33)	13.3% (24)	0.1% (2)	22.7% (59)	77.3% (63)	122
Forests	0% (0)	0% (0)	2.4% (1)	2.3% (1)	97.6% (9)	10
Desert	0.04% (2)	0% (0)	0% (0)	0.04% (2)	100% (13)	15
Albany Thicket	0.9% (4)	1.6% (1)	17.3% (1)	19.8% (6)	80.2% (38)	44
Grand Total	0.8% (51)	5.3% (55)	3.7% (14)	9.8% (120)	90.2% (336)	456

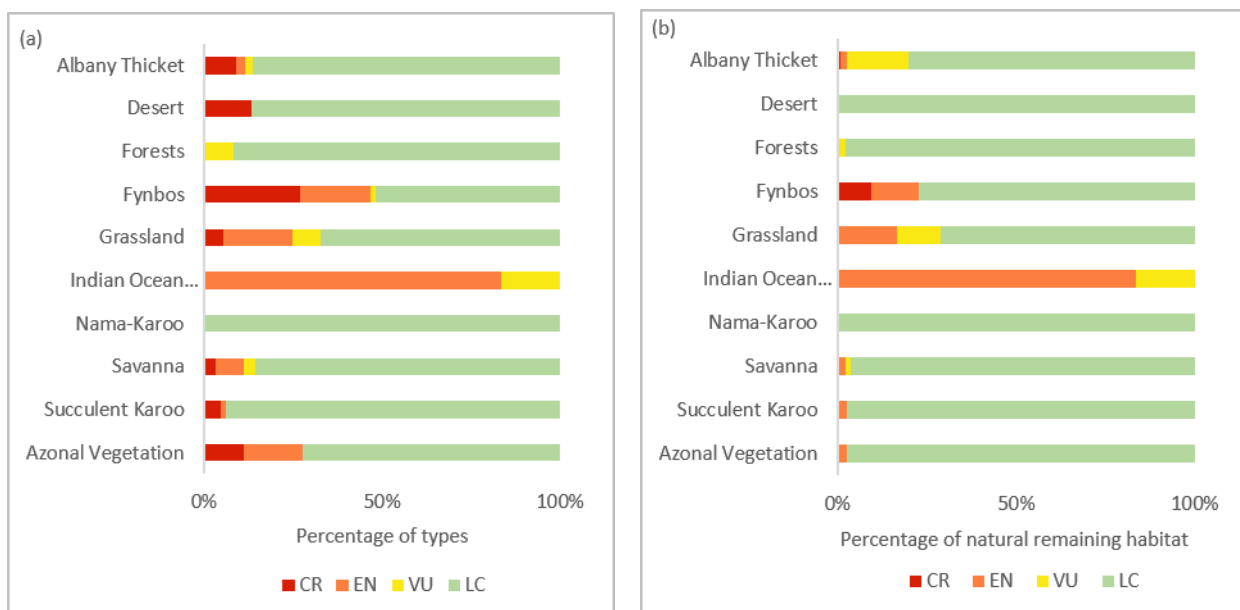


Figure 6. Threatened ecosystem types per biome, showing (a) the percentage of ecosystem types per biome that fall within each threat category, and (b) the percentage of the total natural habitat remaining in each biome that falls within each threat category (Critically Endangered – CR; Endangered – EN; Vulnerable – VU; Least Concern – LC).

Ecosystem threat status limitations

The key shortcoming of all of these ecosystem threat status assessments in the terrestrial realm is the lack of comprehensive data on ecosystem condition, land degradation and biotic disruption of ecosystems. This means that in many regions the baseline ecosystem assessment reported here will tend to underestimate the risk of collapse. We have reasonable confidence that the ecosystems that are listed as threatened are genuinely at risk of collapse – but there are many ecosystems that are at risk that which are not on currently listed as threatened – purely as a result of lack of data. Some (outdated) data is available for the thicket biome, but in other biomes it is a

very challenging problem that will need significant focussed research. One aspect of degradation that should be possible to map accurately, and therefore use in ecosystem assessment, is distribution and abundance of alien invasive species. For woody plants that reach high abundances and high visibility, this certainly seems possible in the near future. Another challenge is that for many of the ecosystem types there is no clear model of ecosystem function against which we can measure biotic disruption or degradation. This makes calibrating models of ecosystem condition difficult.

Ecosystem types assessed nationally vs globally

There are nine terrestrial ecosystem types that are listed as nationally threatened but are likely to occur outside of South Africa, Lesotho and Swaziland (Table 6, Figure 7). Four of these ecosystem types fall into the Savanna biome, two in the Indian Ocean Coastal Belt, one in the Forest biome and two in the Desert biome. A further 62 ecosystem types are listed as Least Concern and are also likely to occur outside of South Africa. These 71 (9+62) ecosystem types are included in the national terrestrial Red List of Ecosystems and continue to form an important part of South Africa’s national biodiversity prioritisation processes; but they will not be submitted to global IUCN RLE database until vegetation maps across national boundaries have been aligned and global assessments of these types undertaken. The 385 terrestrial ecosystem types judged to be endemic to South Africa have been assessed globally (and nationally) and will be reflected on the global IUCN RLE database.

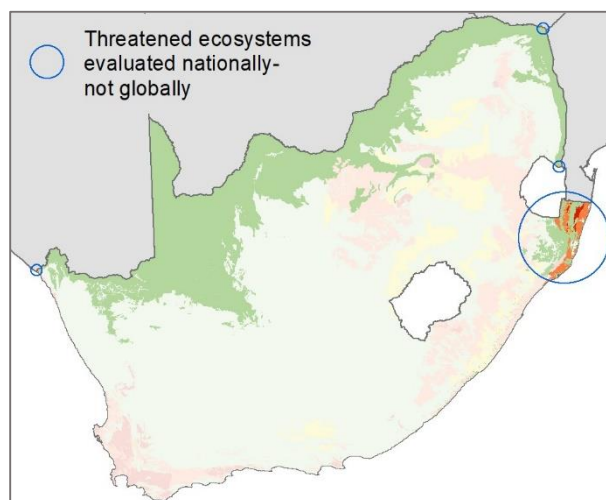


Figure 7. Ecosystem types for which a limited national assessment was undertaken. The global extent of these types has yet to be mapped and assessed.

Table 6. Non-endemic ecosystem types included in the national Red List of Ecosystems – these types have been assessed nationally but until their extent and condition outside of South Africa has been determined their global status remains Not Evaluated. For all other types the national and global status are the same.

Ecosystem type	Biome	National RLE status	Global RLE status
Alexander Bay Coastal Duneveld	Desert	Critically Endangered	Not Evaluated
Lebombo Summit Sourveld	Savanna	Endangered	Not Evaluated
Lowveld Riverine Forest	Forests	Vulnerable	Not Evaluated
Maputaland Coastal Belt	Indian Ocean Coastal Belt	Endangered	Not Evaluated
Maputaland Wooded Grassland	Indian Ocean Coastal Belt	Endangered	Not Evaluated
Muzi Palm Veld and Wooded Grassland	Savanna	Critically Endangered	Not Evaluated
Namib Lichen Fields	Desert	Critically Endangered	Not Evaluated
Western Maputaland Clay Bushveld	Savanna	Endangered	Not Evaluated
Western Maputaland Sandy Bushveld	Savanna	Critically Endangered	Not Evaluated

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Appendix 1. Red List of Terrestrial Ecosystem Types Assessed in 2020/2021 (full details as <http://ecosystemstatus.sanbi.org.za>)

NAME of Ecosystem Types (Vegetation Map 2018)	Biome	Original extent (~1750)	Remaining extent (2018)	RLE 2021 June	Basis	Explanation	Endemic
Aggeneys Gravel Vygieveld	Succulent Karoo	372.00	368.50	LC			Endemic
Agter-Sederberg Shrubland	Succulent Karoo	928.61	903.99	LC			Endemic
Agulhas Limestone Fynbos	Fynbos	294.01	265.51	CR	B1(iii)	Restricted distribution & threatening processes	Endemic
Agulhas Sand Fynbos	Fynbos	246.83	120.71	CR	B1(iii)	Restricted distribution & threatening processes	Endemic
Albany Alluvial Vegetation	Azonal Vegetation	653.87	292.38	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Albany Arid Thicket	Albany Thicket	14.61	14.60	LC			Endemic
Albany Bontveld	Albany Thicket	53.76	51.28	LC			Endemic
Albany Broken Veld	Nama-Karoo	742.64	685.79	LC			Endemic
Albany Mesic Thicket	Albany Thicket	729.21	579.07	LC			Endemic
Albany Valley Thicket	Albany Thicket	1175.65	1038.10	LC			Endemic
Albertinia Sand Fynbos	Fynbos	517.61	266.77	EN	B1(iii)	Restricted distribution & threatening processes	Endemic
Alexander Bay Coastal Duneveld	Desert	17.08	1.40	CR*	A3, B1(i), B2(i)	Not evaluated globally; Historical decline in extent (national data), Restricted distribution & rate of loss	Unsure - needs research
Algoa Sandstone Fynbos	Fynbos	345.62	139.93	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Aliwal North Dry Grassland	Grassland	7163.26	5694.28	LC			Endemic
Amathole Mistbelt Grassland	Grassland	158.30	153.98	LC			Endemic
Amathole Montane Grassland	Grassland	5027.01	4246.42	LC			Endemic
Amersfoort Highveld Clay Grassland	Grassland	3927.05	2154.81	LC			Endemic
Andesite Mountain Bushveld	Savanna	2017.81	1438.99	LC			Endemic
Anenous Plateau Shrubland	Succulent Karoo	241.78	200.89	LC			Endemic
Atlantis Sand Fynbos	Fynbos	689.05	338.57	EN	B1(iii)	Restricted distribution & threatening processes	Endemic
Auob Duneveld	Savanna	2898.16	2897.94	LC*		Not evaluated globally	Likely not endemic
Barberton Montane Grassland	Grassland	1291.38	807.44	LC			Likely endemic to ZA, LES, SWA
Barberton Serpentine Sourveld	Savanna	109.49	72.82	LC			Endemic
Basotho Montane Shrubland	Grassland	3469.84	2457.45	LC			Likely endemic to ZA, LES, SWA
Baviaans Valley Thicket	Albany Thicket	1077.53	1062.65	LC			Endemic
Baviaanskloof Shale Renosterveld	Fynbos	118.72	118.67	LC			Endemic
Bedford Dry Grassland	Grassland	1433.77	1409.65	LC			Endemic

NAME of Ecosystem Types (Vegetation Map 2018)	Biome	Original extent (~1750)	Remaining extent (2018)	RLE 2021 June	Basis	Explanation	Endemic
Besemkaree Koppies Shrubland	Grassland	9677.82	9230.92	LC			Endemic
Bethelsdorp Bontveld	Albany Thicket	35.53	20.18	LC			Endemic
Bhisho Thornveld	Savanna	7762.40	4845.63	LC			Endemic
Bloemfontein Dry Grassland	Grassland	4949.57	2610.64	LC			Endemic
Bloemfontein Karroid Shrubland	Grassland	80.50	66.76	LC			Endemic
Blombos Strandveld	Fynbos	20.77	20.36	LC			Endemic
Blouputs Karroid Thornveld	Nama-Karoo	607.46	601.92	LC*		Not evaluated globally	Likely not endemic
Bokkeveld Sandstone Fynbos	Fynbos	1014.17	803.54	LC			Endemic
Boland Granite Fynbos	Fynbos	523.97	283.89	EN	B1(i), B1(iii)	Restricted distribution & rate of loss & threatening processes	Endemic
Breede Alluvium Fynbos	Fynbos	501.67	173.83	EN	B1(i), B2(i), B1(iii), B2(iii)	Restricted distribution & rate of loss & threatening processes	Endemic
Breede Alluvium Renosterveld	Fynbos	497.69	180.83	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Breede Quartzite Fynbos	Fynbos	97.85	91.65	LC			Endemic
Breede Sand Fynbos	Fynbos	97.70	43.99	CR	B1(iii)	Restricted distribution & threatening processes	Endemic
Breede Shale Fynbos	Fynbos	318.15	206.36	EN	B1(i), B1(iii)	Restricted distribution & rate of loss & threatening processes	Endemic
Breede Shale Renosterveld	Fynbos	1049.91	621.81	EN	B1(iii)	Restricted distribution & threatening processes	Endemic
Buffels Mesic Thicket	Albany Thicket	386.34	312.21	LC			Endemic
Buffels Valley Thicket	Albany Thicket	215.46	94.26	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Bushmanland Arid Grassland	Nama-Karoo	41251.69	41007.98	LC*		Not evaluated globally	Likely not endemic
Bushmanland Basin Shrubland	Nama-Karoo	41250.82	41006.53	LC			Endemic
Bushmanland Inselberg Shrubland	Succulent Karoo	817.65	812.85	LC*		Not evaluated globally	Likely not endemic
Bushmanland Sandy Grassland	Nama-Karoo	2677.22	2672.98	LC			Endemic
Bushmanland Vloere	Azonal Vegetation	5177.07	4837.85	LC			Endemic
Canca Limestone Fynbos	Fynbos	781.33	613.95	LC			Endemic
Cape Flats Dune Strandveld	Fynbos	398.64	197.97	EN	B1(i), B2(i), B1(iii), B2(iii)	Restricted distribution & rate of loss & threatening processes	Endemic
Cape Flats Sand Fynbos	Fynbos	556.97	102.25	CR	B1(i), B1(iii)	Restricted distribution & rate of loss & threatening processes	Endemic
Cape Lowland Alluvial Vegetation	Azonal Vegetation	350.89	118.72	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Cape Seashore Vegetation	Azonal Vegetation	219.89	215.48	LC			Endemic
Cape Winelands Shale Fynbos	Fynbos	83.99	36.64	CR	B1(i), B1(iii)	Restricted distribution & rate of loss & threatening processes	Endemic

NAME of Ecosystem Types (Vegetation Map 2018)	Biome	Original extent (~1750)	Remaining extent (2018)	RLE 2021 June	Basis	Explanation	Endemic
Carletonville Dolomite Grassland	Grassland	9200.45	5651.33	LC*		Not evaluated globally	Unsure - needs research
Cathedral Mopane Bushveld	Savanna	277.07	276.92	LC*		Not evaluated globally	Likely not endemic
Cederberg Sandstone Fynbos	Fynbos	2523.63	2241.97	LC			Endemic
Central Coastal Shale Band Vegetation	Fynbos	62.77	55.06	LC			Endemic
Central Free State Grassland	Grassland	16012.84	10586.33	LC			Endemic
Central Inland Shale Band Vegetation	Fynbos	97.90	97.79	LC			Endemic
Central Knersvlakte Vygieveld	Succulent Karoo	129.89	129.35	LC			Endemic
Central Mountain Shale Renosterveld	Fynbos	1236.48	1200.54	LC			Endemic
Central Richtersveld Mountain Shrubland	Succulent Karoo	1200.45	1200.07	LC*		Not evaluated globally	Unsure - needs research
Central Ruens Shale Renosterveld	Fynbos	2027.53	204.23	CR	A3, A3alt	Historical decline in extent (national & regional data)	Endemic
Central Sandy Bushveld	Savanna	17255.23	11010.86	LC			Endemic
Ceres Shale Renosterveld	Fynbos	491.73	215.32	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Citrusdal Shale Renosterveld	Fynbos	47.01	11.82	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Citrusdal Vygieveld	Succulent Karoo	185.22	133.10	LC			Endemic
Crocodile Gorge Mountain Bushveld	Savanna	539.89	429.35	LC			Endemic
Crossroads Grassland Thicket	Albany Thicket	311.14	269.07	LC			Endemic
De Hoop Limestone Fynbos	Fynbos	690.27	660.99	LC			Endemic
Delagoa Lowveld	Savanna	2722.06	1971.36	LC			Likely endemic to ZA, LES, SWA
Die Plate Succulent Shrubland	Succulent Karoo	127.57	127.49	LC			Endemic
Doringrivier Quartzite Karoo	Succulent Karoo	540.78	451.98	LC			Endemic
Doubledrift Karroid Thicket	Albany Thicket	2975.92	2605.10	LC			Endemic
Drakensberg Afroalpine Heathland	Grassland	2830.73	2752.36	LC			Likely endemic to ZA, LES, SWA
Drakensberg Foothill Moist Grassland	Grassland	10944.67	7648.24	LC			Endemic
Drakensberg-Amathole Afromontane Fynbos	Grassland	21.63	21.56	LC			Likely endemic to ZA, LES, SWA
Dry Coast Hinterland Grassland	Grassland	3024.25	1359.32	VU	A3, B1(i)	Historical decline in extent (national data); Restricted distribution & rate of loss	Endemic
Dwaalboom Thornveld	Savanna	9663.25	7662.32	LC*		Not evaluated globally	Likely not endemic
Dwarsberg-Swartruggens Mountain Bushveld	Savanna	2646.49	2329.17	LC*		Not evaluated globally	Likely not endemic
East Griqualand Grassland	Grassland	8728.25	4719.59	EN	B1(i)	Restricted distribution & rate of loss	Endemic

NAME of Ecosystem Types (Vegetation Map 2018)	Biome	Original extent (~1750)	Remaining extent (2018)	RLE 2021 June	Basis	Explanation	Endemic
Eastern Coastal Shale Band Vegetation	Fynbos	78.04	30.02	EN	B1(i), B2(i)	Restricted distribution & rate of loss	Endemic
Eastern Free State Clay Grassland	Grassland	15063.86	6030.98	VU	A3, B1(i)	Historical decline in extent (national data), Restricted distribution & rate of loss	Likely endemic to ZA, LES, SWA
Eastern Free State Sandy Grassland	Grassland	14254.51	7511.39	LC			Likely endemic to ZA, LES, SWA
Eastern Gariep Plains Desert	Desert	1217.98	1201.37	LC*		Not evaluated globally	Likely not endemic
Eastern Gariep Rocky Desert	Desert	2094.70	2085.67	LC*		Not evaluated globally	Likely not endemic
Eastern Gwarrieveld	Albany Thicket	2128.96	2114.14	LC			Endemic
Eastern Highveld Grassland	Grassland	12772.49	3888.45	EN	A3	Historical decline in extent (national data)	Endemic
Eastern Inland Shale Band Vegetation	Fynbos	108.41	96.24	LC			Endemic
Eastern Little Karoo	Succulent Karoo	1578.46	1379.67	EN	D1	Biotic disruptions in the last 50 years, supplementary analysis Nov2020	Endemic
Eastern Lower Karoo	Nama-Karoo	8321.27	8190.32	LC			Endemic
Eastern Ruens Shale Renosterveld	Fynbos	2762.70	409.46	EN	A2b, A3, A3alt, B1(i), B1(iii), D3	Decline in extent 1990-2040, Historical decline in extent (national and regional data), Restricted distribution & rate of loss & threatening processes, Historical disruption of biotic processes	Endemic
Eastern Upper Karoo	Nama-Karoo	49834.23	48098.39	LC			Endemic
Eastern Valley Bushveld	Savanna	10185.44	7081.57	LC			Endemic
Enriet Plains Succulent Shrubland	Succulent Karoo	260.78	260.20	LC			Endemic
Egoli Granite Grassland	Grassland	1093.18	196.60	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Elands Forest Thicket	Albany Thicket	40.47	30.35	LC			Endemic
Elgin Shale Fynbos	Fynbos	279.46	70.51	CR	B1(i), B1(iii)	Restricted distribution & rate of loss & threatening processes	Endemic
Elim Ferricrete Fynbos	Fynbos	693.88	239.05	EN	B1(i), B1(iii)	Restricted distribution & rate of loss & threatening processes	Endemic
Escarpment Arid Thicket	Albany Thicket	1239.92	1232.30	LC			Endemic
Escarpment Mesic Thicket	Albany Thicket	1030.53	910.02	LC			Endemic
Escarpment Valley Thicket	Albany Thicket	784.63	769.25	LC			Endemic
Fish Arid Thicket	Albany Thicket	674.02	627.82	LC			Endemic
Fish Mesic Thicket	Albany Thicket	241.37	211.25	LC			Endemic
Fish Valley Thicket	Albany Thicket	3596.31	3457.97	LC			Endemic
Frankfort Highveld Grassland	Grassland	9891.60	5498.52	LC			Endemic
Fynbos Riparian Vegetation	Azonal Vegetation	18.67	18.21	LC			Endemic

NAME of Ecosystem Types (Vegetation Map 2018)	Biome	Original extent (~1750)	Remaining extent (2018)	RLE 2021 June	Basis	Explanation	Endemic
Gabbro Grassy Bushveld	Savanna	760.25	758.02	LC			Endemic
Gamka Arid Thicket	Albany Thicket	491.87	484.97	LC			Endemic
Gamka Karoo	Nama-Karoo	20205.90	20118.75	LC			Endemic
Gamka Valley Thicket	Albany Thicket	167.54	161.90	LC			Endemic
Garden Route Granite Fynbos	Fynbos	498.34	182.97	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Garden Route Shale Fynbos	Fynbos	564.74	250.17	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Gauteng Shale Mountain Bushveld	Savanna	1024.99	702.59	LC			Endemic
Geluk Grassland Thicket	Albany Thicket	30.15	18.55	LC			Endemic
Ghaap Plateau Vaalbosveld	Savanna	15482.87	15096.22	LC			Endemic
Goariep Mountain Succulent Shrubland	Succulent Karoo	170.77	170.77	LC			Endemic
Gold Reef Mountain Bushveld	Savanna	2030.92	1600.93	LC			Endemic
Gordonia Duneveld	Savanna	37063.40	37027.99	LC*		Not evaluated globally	Likely not endemic
Gordonia Kameeldoring Bushveld	Savanna	2242.35	2241.81	LC*		Not evaluated globally	Likely not endemic
Gordonia Plains Shrubland	Savanna	7918.57	7910.83	LC*		Not evaluated globally	Unsure - needs research
Goukamma Dune Thicket	Albany Thicket	91.78	64.71	LC			Endemic
Gouritz Valley Thicket	Albany Thicket	176.85	107.38	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Graafwater Sandstone Fynbos	Fynbos	1343.11	950.33	LC			Endemic
Grahamstown Grassland Thicket	Albany Thicket	1290.84	857.90	LC			Endemic
Granite Lowveld	Savanna	19839.12	15035.65	LC			Likely endemic to ZA, LES, SWA
Grassridge Bontveld	Albany Thicket	245.85	220.02	LC			Endemic
Gravelotte Rocky Bushveld	Savanna	323.50	287.80	LC			Endemic
Greyton Shale Fynbos	Fynbos	266.63	149.78	CR	B1(iii)	Restricted distribution & threatening processes	Endemic
Groot Brak Dune Strandveld	Fynbos	28.19	12.63	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Grootrivier Quartzite Fynbos	Fynbos	388.88	388.46	LC			Endemic
Hamburg Dune Thicket	Albany Thicket	701.66	471.61	LC			Endemic
Hangklip Sand Fynbos	Fynbos	88.68	53.08	CR	B1(i), B1(iii)	Restricted distribution & rate of loss & threatening processes	Endemic
Hantam Karoo	Succulent Karoo	7632.56	7331.90	LC			Endemic
Hantam Plateau Dolerite Renosterveld	Fynbos	578.89	565.64	LC			Endemic
Hartenbos Dune Thicket	Albany Thicket	650.69	515.95	EN	B1(iii)	Restricted distribution & threatening processes	Endemic

NAME of Ecosystem Types (Vegetation Map 2018)	Biome	Original extent (~1750)	Remaining extent (2018)	RLE 2021 June	Basis	Explanation	Endemic
Hawequas Sandstone Fynbos	Fynbos	1050.64	1010.30	LC			Endemic
Helskloof Canyon Desert	Desert	8.23	8.23	LC*		Not evaluated globally	Likely not endemic
Highveld Alluvial Vegetation	Azonal Vegetation	4670.86	3092.09	LC			Endemic
Hopefield Sand Fynbos	Fynbos	1009.59	644.63	LC			Endemic
Humansdorp Shale Renosterveld	Fynbos	372.05	158.52	EN	B1(i), B2(i)	Restricted distribution & rate of loss	Endemic
Income Sandy Grassland	Grassland	4653.67	2287.20	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Ironwood Dry Forest	Forests	81.68	81.31	LC*		Not evaluated globally	Likely not endemic
Ithala Quartzite Sourveld	Grassland	1545.49	1246.79	LC			Likely endemic to ZA, LES, SWA
Kaalrug Mountain Bushveld	Savanna	468.38	369.15	LC			Likely endemic to ZA, LES, SWA
Kahams Mountain Desert	Desert	592.26	592.20	LC*		Not evaluated globally	Likely not endemic
Kalahari Karroid Shrubland	Nama-Karoo	8634.15	8565.36	LC*		Not evaluated globally	Likely not endemic
Kamiesberg Granite Fynbos	Fynbos	64.82	64.05	LC			Endemic
Kamiesberg Mountains Shrubland	Succulent Karoo	396.87	391.79	LC			Endemic
Kango Conglomerate Fynbos	Fynbos	404.93	396.01	LC			Endemic
Kango Limestone Renosterveld	Fynbos	501.70	434.64	LC			Endemic
KaNgwane Montane Grassland	Grassland	9654.18	5385.12	EN	B1(i)	Restricted distribution & rate of loss	Likely endemic to ZA, LES, SWA
Karoo Escarpment Grassland	Grassland	8370.62	8151.04	LC			Endemic
Kasouga Dune Thicket	Albany Thicket	307.54	209.88	LC			Endemic
Kathu Bushveld	Savanna	7452.60	7290.40	LC*		Not evaluated globally	Likely not endemic
Kimberley Thornveld	Savanna	19593.22	14207.65	LC			Endemic
Klawer Sandy Shrubland	Succulent Karoo	201.12	110.69	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Klerksdorp Thornveld	Grassland	3932.27	2234.66	LC*		Not evaluated globally	Unsure - needs research
Knersvlakte Dolomite Vygieveld	Succulent Karoo	59.84	57.25	LC			Endemic
Knersvlakte Quartz Vygieveld	Succulent Karoo	1320.88	1301.14	LC			Endemic
Knersvlakte Shale Vygieveld	Succulent Karoo	983.58	980.68	LC			Endemic
Knysna Sand Fynbos	Fynbos	152.12	31.66	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Kobee Succulent Shrubland	Succulent Karoo	142.75	140.34	LC			Endemic
Koedoesberge-Moordenaars Karoo	Succulent Karoo	4714.48	4683.02	LC			Endemic
Koedoeskloof Karroid Thicket	Albany Thicket	59.85	53.35	LC			Endemic

NAME of Ecosystem Types (Vegetation Map 2018)	Biome	Original extent (~1750)	Remaining extent (2018)	RLE 2021 June	Basis	Explanation	Endemic
Kogelberg Sandstone Fynbos	Fynbos	914.23	766.16	CR	B1(iii)	Restricted distribution & threatening processes	Endemic
Koranna-Langeberg Mountain Bushveld	Savanna	1620.87	1618.25	LC			Endemic
Kosiesberg Succulent Shrubland	Succulent Karoo	612.17	612.06	LC			Endemic
Kouebokkeveld Alluvium Fynbos	Fynbos	180.08	54.49	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Kouebokkeveld Shale Fynbos	Fynbos	428.02	201.72	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Kouga Grassy Sandstone Fynbos	Fynbos	4052.13	3707.98	LC			Endemic
Kouga Sandstone Fynbos	Fynbos	2402.92	2165.44	LC			Endemic
Kuruman Mountain Bushveld	Savanna	4361.66	4279.60	LC			Endemic
Kuruman Thornveld	Savanna	5801.21	5562.65	LC			Endemic
Kuruman Vaalbosveld	Savanna	3948.00	3754.61	LC			Endemic
Kwaggarug Mountain Desert	Desert	107.79	107.25	LC*		Not evaluated globally	Likely not endemic
KwaZulu-Natal Coastal Belt Grassland	Indian Ocean Coastal Belt	4141.56	695.98	EN	A2b, A3, B1(i)	Decline in extent 1990-2040, Historical decline in extent (national data), Restricted distribution & rate of loss	Endemic
KwaZulu-Natal Coastal Belt Thornveld	Indian Ocean Coastal Belt	1121.13	416.98	EN	B1(i)	Restricted distribution & rate of loss	Endemic
KwaZulu-Natal Highland Thornveld	Grassland	5227.49	3281.68	LC			Endemic
KwaZulu-Natal Hinterland Thornveld	Savanna	1533.49	1023.23	LC			Endemic
KwaZulu-Natal Sandstone Sourveld	Savanna	1812.74	257.39	EN	A2b, A3, B1(i)	Decline in extent 1990-2040, Historical decline in extent (national data), Restricted distribution & rate of loss	Endemic
Lambert's Bay Strandveld	Fynbos	354.28	238.54	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Langebaan Dune Strandveld	Fynbos	341.86	293.60	EN	B1(iii)	Restricted distribution & threatening processes	Endemic
Langkloof Shale Renosterveld	Fynbos	207.13	65.67	EN	A3alt, B1(i)	Historical decline in extent (regional data), Restricted distribution & rate of loss	Endemic
Lebombo Summit Sourveld	Savanna	134.58	43.23	EN*	B1(i), B2(i)	Not evaluated globally ; Restricted distribution & rate of loss	Likely not endemic
Legogote Sour Bushveld	Savanna	3562.42	1137.40	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Leipoldtville Sand Fynbos	Fynbos	2055.64	775.97	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Lekkersing Succulent Shrubland	Succulent Karoo	836.30	828.05	LC			Endemic
Leolo Summit Sourveld	Grassland	20.34	19.01	LC			Endemic
Lesotho Highland Basalt Grassland	Grassland	20169.17	17293.47	LC			Likely endemic to ZA, LES, SWA
Limpopo Ridge Bushveld	Savanna	2779.63	2696.40	LC		Not evaluated globally	Likely not endemic
Limpopo Sweet Bushveld	Savanna	12011.98	10749.17	LC		Not evaluated globally	Likely not endemic

NAME of Ecosystem Types (Vegetation Map 2018)	Biome	Original extent (~1750)	Remaining extent (2018)	RLE 2021 June	Basis	Explanation	Endemic
Little Karoo Quartz Vygieveld	Succulent Karoo	240.08	227.68	LC			Endemic
Loerie Conglomerate Fynbos	Fynbos	211.19	182.83	LC			Endemic
Long Tom Pass Montane Grassland	Grassland	1048.19	539.81	LC			Endemic
Loskop Mountain Bushveld	Savanna	2066.33	1929.95	LC			Endemic
Loskop Thornveld	Savanna	759.94	448.41	LC			Endemic
Lourensford Alluvium Fynbos	Fynbos	35.85	5.81	CR	A2b, A3alt, B1(i), B1(iii)	Decline in extent 1990-2040, Historical decline in extent (regional data), Restricted distribution & rate of loss & threatening processes	Endemic
Low Escarpment Moist Grassland	Grassland	1742.29	1568.42	LC			Endemic
Lower Gariep Alluvial Vegetation	Azonal Vegetation	867.84	546.16	LC*		Not evaluated globally	Likely not endemic
Lower Gariep Broken Veld	Nama-Karoo	4671.13	4641.46	LC*		Not evaluated globally	Likely not endemic
Lowveld Riverine Forest	Forests	176.56	133.98	VU*	B2(i)	Not evaluated globally ; Restricted distribution & rate of loss	Likely not endemic
Lowveld Rugged Mopaneveld	Savanna	3154.11	2451.55	LC			Endemic
Lydenburg Thornveld	Grassland	1551.10	1202.88	LC			Endemic
Mabela Sandy Grassland	Grassland	492.92	155.31	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Madikwe Dolomite Bushveld	Savanna	974.02	949.58	LC*		Not evaluated globally	Likely not endemic
Mafikeng Bushveld	Savanna	14382.76	8880.42	LC*		Not evaluated globally	Likely not endemic
Makatini Clay Thicket	Savanna	335.09	272.05	LC*		Not evaluated globally	Likely not endemic
Makhado Sweet Bushveld	Savanna	10110.95	6367.80	LC			Endemic
Makuleke Sandy Bushveld	Savanna	2090.62	1597.58	LC*		Not evaluated globally	Unsure - needs research
Malelane Mountain Bushveld	Savanna	630.57	599.59	LC			Endemic
Mamabolo Mountain Bushveld	Savanna	666.89	599.02	LC			Endemic
Maputaland Coastal Belt	Indian Ocean Coastal Belt	2354.79	863.22	EN*	B1(i)	Not evaluated globally ; Restricted distribution & rate of loss	Likely not endemic
Maputaland Pallid Sandy Bushveld	Savanna	660.62	477.97	LC*		Not evaluated globally	Likely not endemic
Maputaland Wooded Grassland	Indian Ocean Coastal Belt	1122.14	412.63	EN*	B1(i)	Not evaluated globally ; Restricted distribution & rate of loss	Likely not endemic
Marikana Thornveld	Savanna	2528.70	878.47	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Matjiesfontein Quartzite Fynbos	Fynbos	1268.23	1250.47	LC			Endemic
Matjiesfontein Shale Fynbos	Fynbos	106.53	101.37	LC			Endemic
Matjiesfontein Shale Renosterveld	Fynbos	2095.93	1815.40	LC			Endemic

NAME of Ecosystem Types (Vegetation Map 2018)	Biome	Original extent (~1750)	Remaining extent (2018)	RLE 2021 June	Basis	Explanation	Endemic
Midlands Mistbelt Grassland	Grassland	6972.23	2057.89	EN	A3	Historical decline in extent (national data)	Endemic
Moist Coast Hinterland Grassland	Grassland	6280.58	2293.33	VU	A3, A3alt B1(i)	Historical decline in extent (national & regional data), Restricted distribution & rate of loss	Endemic
Molopo Bushveld	Savanna	22765.89	21818.54	LC*		Not evaluated globally	Likely not endemic
Mons Ruber Fynbos Thicket	Albany Thicket	286.19	266.86	LC			Endemic
Montagu Shale Fynbos	Fynbos	186.77	145.06	LC			Endemic
Montagu Shale Renosterveld	Fynbos	1607.91	1299.19	LC			Endemic
Mooi River Highland Grassland	Grassland	2862.43	1683.76	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Moot Plains Bushveld	Savanna	2900.82	1890.59	LC			Endemic
Mopane Basalt Shrubland	Savanna	2804.72	2800.11	LC*		Not evaluated globally	Likely not endemic
Mopane Gabbro Shrubland	Savanna	310.43	310.23	LC			Endemic
Mossel Bay Shale Renosterveld	Fynbos	866.49	330.75	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Motherwell Karroid Thicket	Albany Thicket	163.41	65.95	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Mthatha Moist Grassland	Grassland	5281.55	2178.50	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Muscadel Riviere	Azonal Vegetation	407.26	149.18	EN	A3alt, B1(i)	Historical decline in extent (regional data), Restricted distribution & rate of loss	Endemic
Musina Mopane Bushveld	Savanna	8796.29	8061.97	LC*		Not evaluated globally	Likely not endemic
Muzi Palm Veld and Wooded Grassland	Savanna	703.53	524.64	CR*	B1(i)	Not evaluated globally ; Restricted distribution & rate of loss	Likely not endemic
Namaqualand Arid Grassland	Succulent Karoo	287.01	286.97	LC			Endemic
Namaqualand Blomveld	Succulent Karoo	3108.35	2899.27	LC			Endemic
Namaqualand Coastal Duneveld	Succulent Karoo	868.07	735.23	LC			Endemic
Namaqualand Granite Renosterveld	Fynbos	305.48	253.86	LC			Endemic
Namaqualand Heuweltjie Strandveld	Succulent Karoo	838.94	647.07	LC			Endemic
Namaqualand Heuweltjieveld	Succulent Karoo	5040.68	4594.46	LC			Endemic
Namaqualand Inland Duneveld	Succulent Karoo	917.49	888.08	LC			Endemic
Namaqualand Klipkoppe Shrubland	Succulent Karoo	7581.84	7350.08	LC			Endemic
Namaqualand Riviere	Azonal Vegetation	1363.95	1207.15	LC			Endemic
Namaqualand Sand Fynbos	Fynbos	1301.00	1109.52	LC			Endemic
Namaqualand Seashore Vegetation	Azonal Vegetation	13.21	9.69	CR	B2(i)	Restricted distribution & rate of loss	Endemic
Namaqualand Shale Shrubland	Succulent Karoo	539.35	534.91	LC			Endemic
Namaqualand Spinescent Grassland	Succulent Karoo	469.91	424.97	LC			Endemic

NAME of Ecosystem Types (Vegetation Map 2018)	Biome	Original extent (~1750)	Remaining extent (2018)	RLE 2021 June	Basis	Explanation	Endemic
Namaqualand Strandveld	Succulent Karoo	3151.64	2550.85	LC			Endemic
Namib Lichen Fields	Desert	1.53	1.01	CR*	B1(i), B2(i)	Not evaluated globally: Restricted distribution & rate of loss	Unsure - needs research
Namib Seashore Vegetation	Azonal Vegetation	6.44	0.35	CR	A3, B1(i), B2(i)	Historical decline in extent (national & data), Restricted distribution & rate of loss	Endemic
Nanaga Savanna Thicket	Albany Thicket	697.00	433.50	LC			Endemic
Nardouw Sandstone Fynbos	Fynbos	547.97	361.44	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Ngongoni Veld	Savanna	803.11	334.10	VU	A3, A3alt	Historical decline in extent (national & regional data)	Endemic
Nieuwoudtville Shale Renosterveld	Fynbos	218.82	105.19	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Nieuwoudtville-Roggeveld Dolerite Renosterveld	Fynbos	219.54	197.97	LC			Endemic
Noms Mountain Desert	Desert	335.95	333.06	LC*		Not evaluated globally	Likely not endemic
Norite Koppies Bushveld	Savanna	260.10	216.83	LC			Endemic
North Hex Sandstone Fynbos	Fynbos	394.05	371.54	LC			Endemic
North Kammanassie Sandstone Fynbos	Fynbos	332.61	331.03	LC			Endemic
North Langeberg Sandstone Fynbos	Fynbos	994.78	909.39	LC			Endemic
North Outeniqua Sandstone Fynbos	Fynbos	878.82	734.52	LC			Endemic
North Rooiberg Sandstone Fynbos	Fynbos	318.25	318.03	LC			Endemic
North Sonderend Sandstone Fynbos	Fynbos	531.53	521.23	LC			Endemic
North Swartberg Sandstone Fynbos	Fynbos	852.22	846.59	LC			Endemic
Northern Afrotropical Forest	Forests	194.03	162.82	LC			Endemic
Northern Coastal Forest	Forests	679.27	516.38	LC*		Not evaluated globally	Likely not endemic
Northern Drakensberg Highland Grassland	Grassland	1237.67	1117.53	LC			Likely endemic to ZA, LES, SWA
Northern Escarpment Afromontane Fynbos	Grassland	10.00	9.34	LC			Endemic
Northern Escarpment Dolomite Grassland	Grassland	939.15	354.70	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Northern Escarpment Quartzite Sourveld	Grassland	1373.83	763.06	LC			Endemic
Northern Free State Shrubland	Grassland	30.04	27.63	LC			Endemic
Northern Inland Shale Band Vegetation	Fynbos	279.14	258.95	LC			Endemic
Northern Knersvlakte Vygieveld	Succulent Karoo	1673.85	1670.23	LC			Endemic
Northern KwaZulu-Natal Moist Grassland	Grassland	7440.21	4262.99	VU	B1(i)	Restricted distribution & rate of loss	Endemic
Northern Lebombo Bushveld	Savanna	1335.53	1333.99	LC*		Not evaluated globally	Likely not endemic
Northern Mistbelt Forest	Forests	389.29	289.32	LC			Likely endemic to ZA, LES, SWA

NAME of Ecosystem Types (Vegetation Map 2018)	Biome	Original extent (~1750)	Remaining extent (2018)	RLE 2021 June	Basis	Explanation	Endemic
Northern Nababiepsberge Mountain Desert	Desert	247.02	244.53	LC*		Not evaluated globally	Likely not endemic
Northern Richtersveld Scorpionstailveld	Succulent Karoo	327.15	327.11	LC			Unsure - needs research
Northern Richtersveld Yellow Duneveld	Succulent Karoo	536.07	526.53	LC			Endemic
Northern Upper Karoo	Nama-Karoo	42273.64	39885.35	LC			Endemic
Northern Zululand Mistbelt Grassland	Grassland	539.23	283.32	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Northern Zululand Sourveld	Savanna	5173.73	3689.23	LC			Likely endemic to ZA, LES, SWA
Nossob Bushveld	Savanna	762.46	762.34	LC*		Not evaluated globally	Likely not endemic
Nwambyia-Pumbe Sandy Bushveld	Savanna	181.69	181.67	LC*		Not evaluated globally	Likely not endemic
Ohrigstad Mountain Bushveld	Savanna	1999.98	1760.24	LC			Endemic
Olifants Sandstone Fynbos	Fynbos	498.27	470.59	LC			Endemic
Olifantshoek Plains Thornveld	Savanna	8517.83	8440.97	LC			Endemic
Oograbies Plains Sandy Grassland	Succulent Karoo	123.31	123.07	LC			Endemic
Oudshoorn Karroid Thicket	Albany Thicket	571.93	553.82	LC			Endemic
Overberg Dune Strandveld	Fynbos	347.54	324.34	EN	B1(iii)	Restricted distribution & threatening processes	Endemic
Overberg Sandstone Fynbos	Fynbos	1179.68	1054.17	EN	B1(iii)	Restricted distribution & threatening processes	Endemic
Paulpietersburg Moist Grassland	Grassland	4216.71	2011.26	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Peninsula Granite Fynbos	Fynbos	91.83	31.88	CR	B1(i), B1(iii)	Restricted distribution & rate of loss & threatening processes	Endemic
Peninsula Sandstone Fynbos	Fynbos	219.45	203.98	CR	B1(iii)	Restricted distribution & threatening processes	Endemic
Peninsula Shale Fynbos	Fynbos	12.63	5.59	VU	A3	Historical decline in extent (national data)	Endemic
Peninsula Shale Renosterveld	Fynbos	25.28	3.02	CR	B1(i), B2(i), B1(iii), B2(iii)	Restricted distribution & rate of loss & threatening processes	Endemic
Phalaborwa-Timbavati Mopaneveld	Savanna	2225.61	2035.90	LC			Endemic
Piketberg Quartz Succulent Shrubland	Succulent Karoo	2.86	0.59	CR	B1(i), B2(i)	Restricted distribution & rate of loss	Endemic
Piketberg Sandstone Fynbos	Fynbos	422.88	372.10	LC			Endemic
Pilanesberg Mountain Bushveld	Savanna	434.98	418.95	LC			Endemic
Platbakkies Succulent Shrubland	Succulent Karoo	653.33	652.05	LC			Endemic
Polokwane Plateau Bushveld	Savanna	4445.30	2565.96	LC			Endemic
Pondoland-Ugu Sandstone Coastal Sourveld	Indian Ocean Coastal Belt	1299.90	647.97	VU	A3	Historical decline in extent (national data)	Endemic
Postmasburg Thornveld	Savanna	929.21	888.01	LC			Endemic
Potberg Ferricrete Fynbos	Fynbos	40.57	19.54	CR	B1(iii)	Restricted distribution & threatening processes	Endemic

NAME of Ecosystem Types (Vegetation Map 2018)	Biome	Original extent (~1750)	Remaining extent (2018)	RLE 2021 June	Basis	Explanation	Endemic
Potberg Sandstone Fynbos	Fynbos	107.49	100.80	LC			Endemic
Poung Dolomite Mountain Bushveld	Savanna	891.38	828.92	LC			Endemic
Pretoriuskop Sour Bushveld	Savanna	942.90	624.88	LC			Endemic
Prince Albert Succulent Karoo	Succulent Karoo	2555.19	2520.51	LC			Endemic
Queenstown Thornveld	Grassland	3606.33	3003.81	LC			Endemic
Rand Highveld Grassland	Grassland	10306.38	4432.27	VU	A3, B1(i)	Historical decline in extent (national & data), Restricted distribution & rate of loss	Endemic
Richtersberg Mountain Desert	Desert	361.42	361.41	LC*		Not evaluated globally	Likely not endemic
Richtersveld Coastal Duneveld	Succulent Karoo	508.06	316.16	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Richtersveld Red Duneveld	Succulent Karoo	566.06	565.75	LC*		Not evaluated globally	Unsure - needs research
Richtersveld Sandy Coastal Scorpionstailveld	Succulent Karoo	449.09	442.12	LC			Endemic
Richtersveld Sheet Wash Desert	Desert	160.04	156.48	LC*		Not evaluated globally	Likely not endemic
Riethuis-Wallekraal Quartz Vygiveld	Succulent Karoo	136.43	134.39	LC			Endemic
Robertson Granite Fynbos	Fynbos	16.99	14.22	LC			Endemic
Robertson Granite Renosterveld	Fynbos	19.23	18.90	LC			Endemic
Robertson Karoo	Succulent Karoo	653.42	501.74	LC			Endemic
Roggeveld Karoo	Succulent Karoo	5357.99	5238.01	LC			Endemic
Roggeveld Shale Renosterveld	Fynbos	3217.46	3152.35	LC			Endemic
Roodeberg Bushveld	Savanna	6496.39	5157.85	LC*		Not evaluated globally	Unsure - needs research
Rooiberg Quartz Vygiveld	Succulent Karoo	129.25	128.81	LC			Endemic
Rosyntjieberg Succulent Shrubland	Succulent Karoo	50.56	50.54	LC*		Not evaluated globally	Likely not endemic
Ruens Silcrete Renosterveld	Fynbos	209.72	29.16	EN	A2b, A3, A3alt, B1(i), B2(i), B1(iii), B2(iii), D3	Decline in extent 1990-2040, Historical decline in extent (national and regional data), Restricted distribution & rate of loss & threatening processes, Historical disruption of biotic processes	Endemic
Saldanha Flats Strandveld	Fynbos	1643.40	594.11	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Saldanha Granite Strandveld	Fynbos	298.56	80.02	CR	B1(i), B1(iii)	Restricted distribution & rate of loss & threatening processes	Endemic
Saldanha Limestone Strandveld	Fynbos	61.54	49.84	CR	B1(iii)	Restricted distribution & threatening processes	Endemic
Saltaire Karroid Thicket	Albany Thicket	910.47	890.07	LC			Endemic
Sand Forest	Forests	265.19	244.51	LC*		Not evaluated globally	Likely not endemic
Sardinia Forest Thicket	Albany Thicket	25.25	16.04	LC			Endemic
Scarp Forest	Forests	1029.63	946.94	LC*		Not evaluated globally	Likely not endemic

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Schmidtsdrif Thornveld	Savanna	5038.92	4102.01	LC			Endemic
Schweizer-Reneke Bushveld	Savanna	2027.52	988.82	VU	A3	Historical decline in extent (national data)	Endemic
Sekhukhune Montane Grassland	Grassland	1380.85	858.10	LC			Endemic
Sekhukhune Mountain Bushveld	Savanna	2316.16	1809.04	LC			Endemic
Sekhukhune Plains Bushveld	Savanna	2522.84	1173.08	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Senqu Montane Shrubland	Grassland	3737.09	2797.85	LC			Likely endemic to ZA, LES, SWA
South Eastern Coastal Thornveld	Savanna	1589.89	919.79	LC			Endemic
South Hex Sandstone Fynbos	Fynbos	319.74	316.04	LC			Endemic
South Kammanassie Sandstone Fynbos	Fynbos	304.18	287.46	LC			Endemic
South Langeberg Sandstone Fynbos	Fynbos	1223.79	1183.31	LC			Endemic
South Outeniqua Sandstone Fynbos	Fynbos	1571.23	1054.06	LC			Endemic
South Rooiberg Sandstone Fynbos	Fynbos	388.32	385.49	LC			Endemic
South Sonderend Sandstone Fynbos	Fynbos	358.92	333.76	CR	B1(iii)	Restricted distribution & threatening processes	Endemic
South Swartberg Sandstone Fynbos	Fynbos	1084.77	1082.94	LC			Endemic
Southern Afrotropical Forest	Forests	775.32	619.88	LC			Endemic
Southern Cape Dune Fynbos	Fynbos	81.32	64.96	LC			Endemic
Southern Coastal Forest	Forests	185.25	151.23	LC			Endemic
Southern Drakensberg Highland Grassland	Grassland	6646.97	6014.89	LC			Endemic
Southern Kalahari Mekgacha	Azonal Vegetation	2157.81	2133.20	LC*		Not evaluated globally	Likely not endemic
Southern Karoo Riviere	Azonal Vegetation	5302.79	4571.95	LC			Endemic
Southern KwaZulu-Natal Moist Grassland	Grassland	2342.10	1030.33	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Southern Lebombo Bushveld	Savanna	2583.97	2256.14	LC*		Not evaluated globally	Likely not endemic
Southern Mistbelt Forest	Forests	1062.14	885.20	LC			Endemic
Southern Nababiepsberge Mountain Desert	Desert	343.21	343.14	LC*		Not evaluated globally	Likely not endemic
Southern Namaqualand Quartzite Klipkoppe Shrubland	Succulent Karoo	996.96	909.58	LC			Endemic
Southern Richtersveld Inselberg Shrubland	Succulent Karoo	365.56	365.36	LC			Endemic
Southern Richtersveld Scorpionstailveld	Succulent Karoo	722.64	722.31	LC			Endemic
Southern Richtersveld Yellow Duneveld	Succulent Karoo	331.37	303.86	LC			Endemic
Soutpansberg Mountain Bushveld	Savanna	4148.00	3076.34	LC			Endemic
Soutpansberg Summit Sourveld	Grassland	93.88	91.64	LC			Endemic

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Soweto Highveld Grassland	Grassland	14573.72	5693.68	VU	A3, B1(i)	Historical decline in extent (national data), Restricted distribution & rate of loss	Endemic
Springbokvlakte Thornveld	Savanna	8928.42	3996.30	VU	A3	Historical decline in extent (national data)	Endemic
St Francis Dune Thicket	Albany Thicket	264.39	223.28	LC			Endemic
Steenkampsberg Montane Grassland	Grassland	3858.59	2645.28	LC			Endemic
Stella Bushveld	Savanna	3221.17	1895.12	LC			Endemic
Steytlerville Karoo	Succulent Karoo	793.30	772.52	LC			Endemic
Stinkfonteinberge Eastern Apron Shrubland	Succulent Karoo	65.88	65.87	LC			Endemic
Stinkfonteinberge Quartzite Fynbos	Fynbos	49.01	49.01	LC			Endemic
Stormberg Plateau Grassland	Grassland	2966.32	2408.59	LC			Endemic
Strydpoort Summit Sourveld	Grassland	268.04	261.77	LC			Endemic
Subtropical Alluvial Vegetation	Azonal Vegetation	1259.43	861.07	LC*		Not evaluated globally	Likely not endemic
Subtropical Dune Thicket	Azonal Vegetation	12.98	11.98	LC			Endemic
Subtropical Seashore Vegetation	Azonal Vegetation	27.98	26.17	LC*		Not evaluated globally	Likely not endemic
Sundays Arid Thicket	Albany Thicket	5647.18	5544.77	VU	D3	Historical disruption of biotic processes	Endemic
Sundays Mesic Thicket	Albany Thicket	580.20	518.71	LC			Endemic
Sundays Valley Thicket	Albany Thicket	1963.48	1707.25	LC			Endemic
Suurberg Quartzite Fynbos	Fynbos	683.38	670.25	LC			Endemic
Suurberg Shale Fynbos	Fynbos	283.32	278.30	LC			Endemic
Swartberg Altimontane Sandstone Fynbos	Fynbos	50.82	50.77	LC			Endemic
Swartberg Shale Fynbos	Fynbos	75.13	63.92	LC			Endemic
Swartberg Shale Renosterveld	Fynbos	276.37	264.87	LC			Endemic
Swartland Alluvium Fynbos	Fynbos	477.26	143.29	EN	A3, A3alt, B1(i), B2(i), B1(iii)	Historical decline in extent (national & regional data), Restricted distribution & rate of loss & threatening processes	Endemic
Swartland Alluvium Renosterveld	Fynbos	63.04	36.99	VU	A3alt	Historical decline in extent (regional data)	Endemic
Swartland Granite Renosterveld	Fynbos	951.31	160.61	EN	A2b, A3, A3alt, B1(i), B1(iii)	Decline in extent 1990-2040, Historical decline in extent (national & regional data), Restricted distribution & rate of loss & threatening processes	Endemic
Swartland Shale Renosterveld	Fynbos	4963.74	509.29	CR	A3, A3alt	Historical decline in extent (national & regional data)	Endemic
Swartland Silcrete Renosterveld	Fynbos	101.07	13.38	CR	A3alt, B2(i), B2(iii)	Historical decline in extent (regional data), Restricted distribution & rate of loss & threatening processes	Endemic
Swartruggens Quartzite Fynbos	Fynbos	1646.14	1618.55	LC			Endemic

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Swartruggens Quartzite Karoo	Succulent Karoo	559.39	557.26	LC			Endemic
Swaziland Sour Bushveld	Savanna	4460.34	3426.72	LC			Likely endemic to ZA, LES, SWA
Swellendam Silcrete Fynbos	Fynbos	868.55	393.40	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Tanqua Escarpment Shrubland	Succulent Karoo	1318.33	1314.58	LC			Endemic
Tanqua Karoo	Succulent Karoo	6988.28	6935.52	LC			Endemic
Tanqua Wash Riviere	Azonal Vegetation	2130.07	1989.47	LC			Endemic
Tarkastad Montane Shrubland	Grassland	4242.27	4174.24	LC			Endemic
Tatasberg Mountain Succulent Shrubland	Succulent Karoo	3.27	3.27	LC*		Not evaluated globally	Unsure - needs research
Tembe Sandy Bushveld	Savanna	1124.37	872.99	LC*		Not evaluated globally	Likely not endemic
Thorndale Forest Thicket	Albany Thicket	43.61	30.38	LC			Endemic
Thukela Thornveld	Savanna	2215.72	1614.10	LC			Endemic
Thukela Valley Bushveld	Savanna	2706.62	1941.53	LC			Endemic
Transkei Coastal Belt	Indian Ocean Coastal Belt	1652.03	908.12	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Tsakane Clay Grassland	Grassland	1313.28	451.76	EN	B1(i)	Restricted distribution & rate of loss	Endemic
Tsende Mopaneveld	Savanna	5315.20	4729.43	LC*		Not evaluated globally	Likely not endemic
Tshokwane-Hlane Basalt Lowveld	Savanna	3568.71	2980.65	LC*		Not evaluated globally	Likely not endemic
Tsitsikamma Sandstone Fynbos	Fynbos	2296.52	1577.49	LC			Endemic
Tsomo Grassland	Grassland	6137.24	3739.96	LC			Endemic
Tzaneen Sour Bushveld	Savanna	3399.51	1789.85	EN	B1(i)	Restricted distribution & rate of loss	Endemic
uKhahlamba Basalt Grassland	Grassland	1346.91	1345.46	LC			Likely endemic to ZA, LES, SWA
Umdaus Mountains Succulent Shrubland	Succulent Karoo	432.81	432.51	LC			Endemic
Umtiza Forest Thicket	Albany Thicket	27.09	16.87	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Uniondale Shale Renosterveld	Fynbos	1347.79	1108.59	LC			Endemic
Upper Annisvlakte Succulent Shrubland	Succulent Karoo	192.12	191.65	LC			Endemic
Upper Gariiep Alluvial Vegetation	Azonal Vegetation	1787.23	1257.51	LC			Endemic
Upper Karoo Hardeveld	Nama-Karoo	11734.34	11709.85	LC			Endemic
Vaal Reefs Dolomite Sinkhole Woodland	Grassland	346.94	245.28	LC			Endemic
Vaalbos Rocky Shrubland	Savanna	1457.81	1419.25	LC			Endemic
Vaal-Vet Sandy Grassland	Grassland	22843.82	6331.64	EN	A3	Historical decline in extent (national data)	Endemic

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Vanrhynsdorp Gannabosveld	Succulent Karoo	988.53	834.92	LC			Endemic
Vanrhynsdorp Shale Renosterveld	Fynbos	207.27	196.34	LC			Endemic
Vanstadens Forest Thicket	Albany Thicket	187.74	184.98	LC			Endemic
VhaVenda Miombo	Savanna	0.34	0.32	LC			Endemic
Vredefort Dome Granite Grassland	Grassland	921.57	424.81	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Vyftienmyl se Berge Succulent Shrubland	Succulent Karoo	18.37	18.37	LC			Endemic
Wakkerstroom Montane Grassland	Grassland	3750.40	2989.78	LC			Endemic
Waterberg Mountain Bushveld	Savanna	8823.54	8187.27	LC			Endemic
Waterberg-Magaliesberg Summit Sourveld	Grassland	525.90	507.50	LC			Endemic
Western Altimontane Sandstone Fynbos	Fynbos	37.52	37.49	LC			Endemic
Western Bushmanland Klipveld	Succulent Karoo	101.79	101.71	LC			Endemic
Western Coastal Shale Band Vegetation	Fynbos	134.43	128.36	EN	B1(iii)	Restricted distribution & threatening processes	Endemic
Western Free State Clay Grassland	Grassland	7074.41	5354.99	LC			Endemic
Western Gariep Hills Desert	Desert	418.27	385.88	LC*		Not evaluated globally	Likely not endemic
Western Gariep Lowland Desert	Desert	217.01	196.56	LC*		Not evaluated globally	Likely not endemic
Western Gariep Plains Desert	Desert	139.93	123.99	LC*		Not evaluated globally	Likely not endemic
Western Gwarrieveld	Albany Thicket	760.35	743.78	LC			Endemic
Western Highveld Sandy Grassland	Grassland	8592.24	1522.67	EN	A3, B1(i)	Historical decline in extent (national data), Restricted distribution & rate of loss	Endemic
Western Little Karoo	Succulent Karoo	4109.03	3943.96	LC			Endemic
Western Mafuataland Clay Bushveld	Savanna	1644.97	663.18	EN*	B1(i)	Not evaluated globally; Restricted distribution & rate of loss	Likely not endemic
Western Mafuataland Sandy Bushveld	Savanna	152.95	83.75	CR*	B1(i)	Not evaluated globally ; Restricted distribution & rate of loss	Unsure - needs research
Western Ruens Shale Renosterveld	Fynbos	1193.65	159.23	CR	B1(i), B1(iii)	Restricted distribution & rate of loss & threatening processes	Endemic
Western Sandy Bushveld	Savanna	6494.14	6010.17	LC*		Not evaluated globally	Unsure - needs research
Western Upper Karoo	Nama-Karoo	17149.40	17006.87	LC			Endemic
Willowmore Gwarrieveld	Albany Thicket	2252.31	2226.12	LC			Endemic
Winburg Grassy Shrubland	Grassland	1571.96	1295.90	LC			Endemic
Winterhoek Sandstone Fynbos	Fynbos	1135.96	1052.74	LC			Endemic
Wolkberg Dolomite Grassland	Grassland	260.59	242.80	LC			Endemic

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Woodbush Granite Grassland	Grassland	430.59	107.56	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Xhariep Karroid Grassland	Grassland	13392.49	12392.94	LC			Endemic
Zastron Moist Grassland	Grassland	4268.06	2730.91	LC			Likely endemic to ZA, LES, SWA
Zeerust Thornveld	Savanna	4128.10	2852.04	LC*		Not evaluated globally	Likely not endemic
Zululand Coastal Thornveld	Savanna	694.62	185.46	CR	B1(i)	Restricted distribution & rate of loss	Endemic
Zululand Lowveld	Savanna	8564.75	5744.11	LC*		Not evaluated globally	Unsure - needs research