

# Cape Flats Sand Fynbos, South Africa

Assessment by: Keith, D

Overall risk category **CR**

NOT EVALUATED	DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	ENDANGERED	CRITICALLY ENDANGERED	COLLAPSED
NE	DD	LC	NT	VU	EN	CR	CO

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Scope of assessment: Sub-global

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## Cape Flats Sand Fynbos, South Africa

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### Keywords:

Biodiversity loss, Conservation Biology, Ecological communities, Environmental - chance, Extinction risk, Food-web perspective, Global synthesis, Habitat loss, Relative resilience, Vegetation classification

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## Ecosystem Description

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Cape Flats Sand Fynbos is a species-rich, dense, moderately tall shrubland with scattered emergent shrubs (Rebello et al. 2006). This ecosystem is species rich in low shrubs compared with other fynbos units on sand flats. This ecosystem is an edaphically determined species assemblage restricted to Tertiary acid, deep grey regic sands at low elevations (20 - 200 m) on flat to undulating terrain (Rebello et al. 2006). The climate is dry temperate, receiving a mean annual precipitation of 580 - 980 mm, with strong winter dominance, including precipitation as mists. Frosts occur on about three days per year. Cape Flats Sand Fynbos is restricted to the Western Cape Province of South Africa.

### Classification

#### IUCN Habitats Classification Scheme

- 3. Shrubland
  - 3.4. Shrubland - Temperate

#### IUCN Global Typology

- Terrestrial
  - T3. Shrublands and shrubby woodlands
    - T3.2 Seasonally dry temperate heath and shrublands

### Distribution

Cape Flats Sand Fynbos is restricted to the Western Cape Province of South Africa (latitude 33° 55' S, longitude 18° 22' E), almost entirely within the limits of the City of Cape Town (Rebello et al. 2006). Its distribution extends from Blouberg and Koeberg Hills west of the Tygerberg Hills to Lakeside and Pelican Park in the south near False Bay, from Bellville and Durbanville to Klapmuts and Joostenberg Hill in the east, and to the southwest of the Bottelary Hills to Macassar and Firgrove in the south.

### System

Terrestrial

### Biogeographic Realm

Afrotropical

### Countries

South Africa

### Geographic Region

South Africa

### Characteristic Native Biota

Cape Flats Sand Fynbos is an edaphically determined species assemblage. This ecosystem is a species-rich, dense, moderately tall shrubland with scattered emergent shrubs (Rebelo et al. 2006) and is species rich in low shrubs compared with other fynbos units on sand flats. The dominant plant families are Ericaceae, Proteaceae, Asteraceae and Restionaceae. Dures and Cumming (2010) recorded 79 bird taxa within Cape Flats Sand Fynbos.

### Taxa

*Aspalathus variegata*, *Athanasia capitata*, *Berkheya rigida*, *Carpobrotus acinaciformis*, *Cliffortia ericifolia*, *Conyza pinnatifida*, *Corvus albus*, *Cynodon dactylon*, *Diastella proteoides*, *Diosma hisuta*, *Dipogon lignosus*, *Edmondia sesamoides*, *Ehrharta villosa* var. *villosa*, *Elgia tectorum*, *Erica lasciva*, *Erica margaritacea*, *Erica mucosa*, *Erica pyramidalis*, *Erica turgida*, *Erica verticillata*, *Helichrysum tinctorum*, *Indigofera procumbens*, *Ixia versicolor*, *Knowntonia vesicatoria*, *Leucadendron levisanus*, *Liparia graminifolia*, *Metalasia densa*, *Morella cordifolia*, *Morella serrata*, *Passerina cormbosa*, *Phylica cephalantha*, *Prinia maculosa*, *Protea burchellii*, *Protea repens*, *Psoralea pinnata*, *Pteroclatrus tricuspidatus*, *Restio quinquefarius*, *Rhus lucida*, *Senecio halimifolius*, *Serratia foeniculacea*, *Serratia furcellata*, *Serruria aemula*, *Serruria glomerata*, *Sporobolus virginicus*, *Stoebe plumosa*, *Streptopelia capicola*, *Tetraria variabilis*, *Thamnochortus erectus*, *Trianoptiles solitaria*, *Wachendorfia paniculata*, *Watsonia meriana*, *Wiborgia obcordata*, *Willdenowia incurvata*, *Zantedeschia aethiopica*, *Zosterops virens*

### Abiotic Features

Cape Flats Sand Fynbos is an edaphically determined species assemblage restricted to Tertiary acid, deep grey regic sands at low elevations (20 - 200 m) on flat to undulating terrain (Rebelo et al. 2006). The sands are heavily leached and nutrient deficient podzolic soils of the Lamotte form. The climate is dry temperate, receiving a mean annual precipitation of 580 - 980 mm, with strong winter dominance, including precipitation as mists (Rebelo et al. 2006). On average, less than 10 mm of rain falls per month between November and March. Mean annual temperatures are 16.2°C, with mean summer daily maximum of 27°C in February and mean winter daily minimum of 7°C in July (Rebelo et al. 2006). Frosts occur on about three days per year.

### Biotic Processes

Soil nutrient deficiency determines much of the functional character of this and other fynbos ecosystems (Stock and Allsopp 1992). Key characteristics of fynbos vegetation that are linked to nutritional poverty include sclerophyllous foliage, low nutrient concentrations in foliage and reproductive tissues, high concentrations of fibre and phenolic compounds in foliage, specialised mechanisms for nutrient uptake such as cluster roots and mycorrhiza, high root:shoot mass ratios, high rates of nitrogen and phosphorus withdrawal from senescent leaf tissues, slow rates of leaf turnover litter production and decomposition, low rates of herbivory and high rates of nectivory among birds and mammals (Low 1983; Rebelo et al. 1984; Mitchell et al. 1986; Stock and Allsopp 1992; Lambers et al. 2003). The high fibre and phenolic concentration, together with a climate characterised by seasonal drought, predisposes fynbos vegetation to recurring fires, generally every 5 - 50 years. Fires have a profound effect on the evolution of plant life histories and on ecosystem dynamics (Bond and van Wilgen 1996). Plant life history traits that are well represented in the fynbos flora include resprouting and obligate seeding, serotinous seedbanks, myrmecochory, heat- and smoke-stimulated seed germination, pyrogenic flower production and post-fire seedling recruitment (Le Maitre and Midgley 1992). Variations in fire frequency, intensity and season drive changes in community composition and structure of fynbos through successive fire intervals, as different plant species are favoured by contrasting fire regimes (Bond et al. 1984; Bond and van Wilgen 1996).

### Threatening Processes

Habitat loss, through conversion of native vegetation to urban land use associated with the expansion of Cape Town, now with a population of almost 4 million people, is a major threat to Cape Flats Sand Fynbos (Wood et al. 1994). Extraction of ground water for urban consumption is a related threat that is likely exacerbate fragmentation impacts on urban remnants of the ecosystem, however invasion of alien plants is the most severe threat to the remaining area of Cape Flats Sand Fynbos (Rebelo et al. 2006). Alterations to fire regimes and climate change pose a potential threat to persistence of biota within Cape Flats Sand Fynbos.

## Collapse

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Collapse was assumed to occur when the mapped distribution of Cape Flats Sands Fynbos declines to zero, signaling the replacement of upland swamp by developed areas. The relative abundance of exotic plant species would be suitable for assessing disruption of biotic processes and interactions if sufficient data were available.

## Ecosystem Risk Assessment

Assessment Protocol	IUCN Red List of Ecosystems Category and Criteria	Last Assessed
IUCN RLE v2.0	Critically Endangered B1ai,ii,iii,b	2013

### Justification

Cape Flats Sand Fynbos encompasses an area of 1,427 km<sup>2</sup>. Continuing decline in distribution of the ecosystem, with loss of unproclaimed vegetation and associated declines in diversity of avifauna, together with the large number of Red Listed plant taxa, suggest continuing declines in ecosystem diversity and degradation of biotic processes. Additionally, given the severe and immediate nature of the threats (Rebelo et al. 2011), the ecosystem is prone to the effects of human activity or stochastic events such that it is capable of collapse or becoming Critically Endangered within a very short time period. Thus, the ecosystem is classified as Critically Endangered under criterion B1ai,ii,iii,b.

### Criterion A

EN

### Summary

Models of bioclimatically suitable habitat for the Fynbos Biome using five bioclimatic variables (Midgley et al. 2003) showed that the total bioclimatically suitable area of the Fynbos Biome is likely to decline by 51-65% between the present and 2050. Spatially explicit projections show the eastern portion (50-60%) of the distribution of Cape Flats Sand Fynbos becoming climatically unsuitable by 2050 (Midgley et al. 2003). In addition, the area climatically suitable for fynbos was estimated to decline by approximately 60% within the altitudinal band occupied by this ecosystem (0 - 300 m asl). These estimates suggest a future decline in distribution of 50-65%, and hence Endangered status under sub-criterion A2a. Modelled estimates of the reconstructed historic distributions of vegetation types (Mucina and Rutherford 2006) and a map of the extant native vegetation based on 2005 aerial photography ground truthed in 2007-2008 suggests that the extent of Cape Flats Sand Fynbos has declined from 54,448 ha to 8,467 ha, a decline of 84.4% historically; thus, the ecosystem is classified as Endangered under subcriteria A2a and A3.

### Risk Category

EN

Subcriterion	Category	Justification
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A1

VU

Limited data are available for estimating the reduction in distribution of Cape Flats Sand Fynbos over the past 50 years. However, Rebelo et al. (2011) estimate the trajectories of change in extent of native vegetation within the City of Cape Town, in which Cape Flats Sand Fynbos was the most widespread vegetation type (22% of the area). The extent of proclaimed reserves and unproclaimed vegetation, respectively, was approximately 132,000 ha and 3,000 ha in 1955, and 57,000 ha and 32,000 ha in 2005 (Rebelo et al. 2011). Subtracting the area of reserves (37,000 ha), gives a change in the remaining vegetated area from 98,000 ha to 52,000 ha, a 47% decline over the past 50 years. Assuming that the decline in distribution of Cape Flats Sand Fynbos was proportionate to that in other vegetation types outside protected areas, the ecosystem is classified as Vulnerable under subcriterion A1.

#### Key Indicators in detail

Evidence of Continuing Decline: Decreasing  
 Evidence of Threatening Processes: Yes

**Indicator Variable:** Change in distribution

Extent ( % ): 47

Mapped distribution

Year: 1955

Mapped distribution ( ha ): 98,000

Year: 2005

Mapped distribution ( ha ): 52,000

A2a

EN

Models of bioclimatically suitable habitat for the Fynbos Biome using five bioclimatic variables (Midgley et al. 2003) showed that the total bioclimatically suitable area of the Fynbos Biome is likely to decline by 51-65% between the present and 2050. Spatially explicit projections show the eastern portion (50-60%) of the distribution of Cape Flats Sand Fynbos becoming climatically unsuitable by 2050 (Midgley et al. 2003). In addition, the area climatically suitable for fynbos was estimated to decline by approximately 60% within the altitudinal band occupied by this ecosystem (0 - 300 m ASL). These estimates suggest a future decline in distribution of 50-65%, and hence Endangered status under subcriterion A2a.

**Key Indicators in detail**

Evidence of Continuing Decline: Decreasing

Evidence of Threatening Processes: Yes

**Indicator Variable:** Change in distribution

Extent ( % ): 50-65

Mapped distribution

Year: 2003

Year: 2050

A2b

NE

This subcriterion was not assessed.

**Key Indicators in detail**

Evidence of Continuing Decline: Stable or Increasing

Evidence of Threatening Processes: No

A3

EN

Modelled estimates of the reconstructed historic distributions of vegetation types (Mucina and Rutherford 2006) and a map of the extant native vegetation based on 2005 aerial photography ground truthed in 2007-2008 suggests that the extent of Cape Flats Sand Fynbos has declined from 54,448 ha to 8,467 ha, a decline of 84.4%. It is assumed that almost all of this decline occurred since 1750, although it had been occupied by Europeans a century earlier (Rebello et al. 2011). The status of the ecosystem is therefore Endangered under subcriterion A3.

**Key Indicators in detail**

Evidence of Continuing Decline: Decreasing

Evidence of Threatening Processes: Yes

**Indicator Variable:** Change in distribution

Extent ( % ): 84.4

Mapped distribution

Year: 1750

Mapped distribution ( ha ): 54,448

Year: 2006

Mapped distribution ( ha ): 8,467

Criterion B

CR

Summary

Cape Flats Sand Fynbos encompasses an area of 1,427 km<sup>2</sup>. Continuing decline in distribution of the ecosystem, with loss of unproclaimed vegetation and associated declines in diversity of avifauna, together with the large number of Red Listed plant taxa (92), including 4 extinct species (Raimondo et al. 2009; Rebelo et al. 2011), suggest continuing declines in ecosystem diversity and degradation of biotic processes, as well as future threats; thus, the ecosystem is classified as Critically Endangered under subcriterion B1ai,ii,iii,b.

**Risk Category**



**Subcriterion Category Justification**

**B1**



Cape Flats Sand Fynbos encompasses an area of 1,427 km<sup>2</sup>. Continuing decline in distribution of the ecosystem, with loss of unproclaimed vegetation and associated declines in diversity of avifauna, together with the large number of Red Listed plant taxa (92), including 4 extinct species (Raimondo et al. 2009; Rebelo et al. 2011), suggest continuing declines in ecosystem diversity and degradation of biotic processes, as well as future threats ; thus, the ecosystem is classified as Critically Endangered under subcriterion B1ai,ii,iii,b.

**Key Indicators in detail**

Number of Threat-defined Locations: 2  
 Evidence of Continuing Decline: Decreasing  
 Evidence of Threatening Processes: Yes

**Indicator Variable: EOO**

Mapped distribution  
 Year: 2013  
 Mapped distribution ( km<sup>2</sup> ): 1,427

**B2**



Cape Flats Sand Fynbos occupies no more than 12 grid cells with more than 1 km<sup>2</sup> of the ecosystem. Continuing decline in distribution of the ecosystem, with loss of unproclaimed vegetation and associated declines in diversity of avifauna, together with the large number of Red Listed plant taxa (92), including 4 extinct species (Raimondo et al. 2009; Rebelo et al. 2011), suggest continuing declines in ecosystem diversity and degradation of biotic processes, as well as future threats; thus, the ecosystem is classified as Critically Endangered under subcriterion B2ai,ii,iii,b.

**Key Indicators in detail**

Number of Threat-defined Locations: 2  
 Evidence of Continuing Decline: Decreasing  
 Evidence of Threatening Processes: Yes

**Indicator Variable: AOO**

Mapped distribution  
 Year: 2013  
 Mapped distribution ( 10x10-km grid cells ): 12

**B3**



Cape Flats Sand Fynbos remaining vegetation occurs within an urban landscape and all is exposed to similar pressures from invasive exotics. The distribution is therefore interpreted as two semi-independent locations; one outside protected areas (threatened by habitat destruction and invasive plants) and one within protected areas (threatened by invasive plants, but not habitat destruction). Given the severe and immediate nature of the threats (Rebelo et al. 2011), the ecosystem is prone to the effects of human activity or stochastic events such that it is capable of collapse or becoming Critically Endangered within a very short time period; thus, the ecosystem is classified as Vulnerable under subcriterion B3.

**Key Indicators in detail**

Number of Threat-defined Locations: 2  
 Evidence of Continuing Decline: Decreasing  
 Evidence of Threatening Processes: Yes

**Criterion C**



### Summary

There are currently no time series data available enabling an assessment of the rate of degradation in the abiotic environment of Cape Flats Sand Fynbos so the ecosystem is Data Deficient under criterion C.

### Risk Category

DD

Subcriterion	Category	Justification
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C1

DD

No data is available to assess changes in abiotic variables affecting the ecosystem in the past 50 years.

**Key Indicators in detail**

Evidence of Threatening Processes: No

C2a

DD

No data is available to assess changes in abiotic variables affecting the ecosystem in the next 50 years.

**Key Indicators in detail**

Evidence of Threatening Processes: No

C2b

NE

This sub-criterion was not assessed.

**Key Indicators in detail**

Evidence of Threatening Processes: No

C3

DD

No data is available to assess changes in abiotic variables affecting the ecosystem since 1750.

**Key Indicators in detail**

Evidence of Threatening Processes: No

### Criterion D

DD

### Summary

Remnant patches of the Cape Flat Sand Fynbos are fragmented and undergoing loss of plant species diversity, as indicated by the large number (92) of species listed as threatened on the South African Red List (Raimondo et al. 2009; Rebelo et al. 2011). In addition, remnant patches are becoming more degraded by invasion of exotic plants and there is an associated loss of diversity in avifauna (Dures and Cumming 2010). However, there is insufficient data to quantify trends in ecosystem fragmentation, invasion of exotic plants and there is an associated loss of diversity in avifauna; thus, the ecosystem is classified as Data Deficient under criterion D.

### Risk Category

DD

Subcriterion	Category	Justification
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D1

DD

No reliable information is available to assess the disruption of biotic processes or interactions in the ecosystem in the past 50 years; thus, it is classified as Data Deficient under subcriterion D1.

**Key Indicators in detail**

Evidence of Threatening Processes: No

**D2a**  No reliable information is available to assess the disruption of biotic processes or interactions in the ecosystem in the next 50 years; thus, it is classified as Data Deficient under subcriterion D2a.

**Key Indicators in detail**

Evidence of Threatening Processes: No

**D2b**  This subcriterion was not assessed.

**Key Indicators in detail**

Evidence of Threatening Processes: No

**D3**  No data has been collected to assess degradation in biotic processes and interactions within the ecosystem since 1750.

**Key Indicators in detail**

Evidence of Threatening Processes: No

**Criterion E**



**Summary**

No quantitative analysis has been carried out to assess the risk of ecosystem collapse for Cape Flats Sand Fynbos ecosystems; thus, is classified as Data Deficient for criterion E.

**Risk Category**



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