

Part B: Biodiversity Profile

Significance of the biodiversity within the bioregion

The biodiversity of the Nelson Mandela Bay municipal area is globally significant. The area falls within both the Cape Floristic Region and the Maputaland-Pondoland-Albany Centre of Endemism, two recognised centres of diversity and endemism. Both of these areas have experienced severe transformation of natural habitat and continue to face land use pressures to the extent that they are now accepted as global biodiversity hotspots (Myers *et al.*, 2000; Mittermeier, 2004). Biodiversity hotspots are internationally recognised as the richest and most threatened reservoirs of plant and animal life on earth.

Endemism is a situation in which a species or other taxonomic group is restricted to a particular geographic region.

A Centre of Endemism is a localised area that has a high occurrence of endemic species.

A biome is a regional-scale ecosystem characterized by distinct types of vegetation, animals, and microbes that have developed under specific soil and climatic conditions.

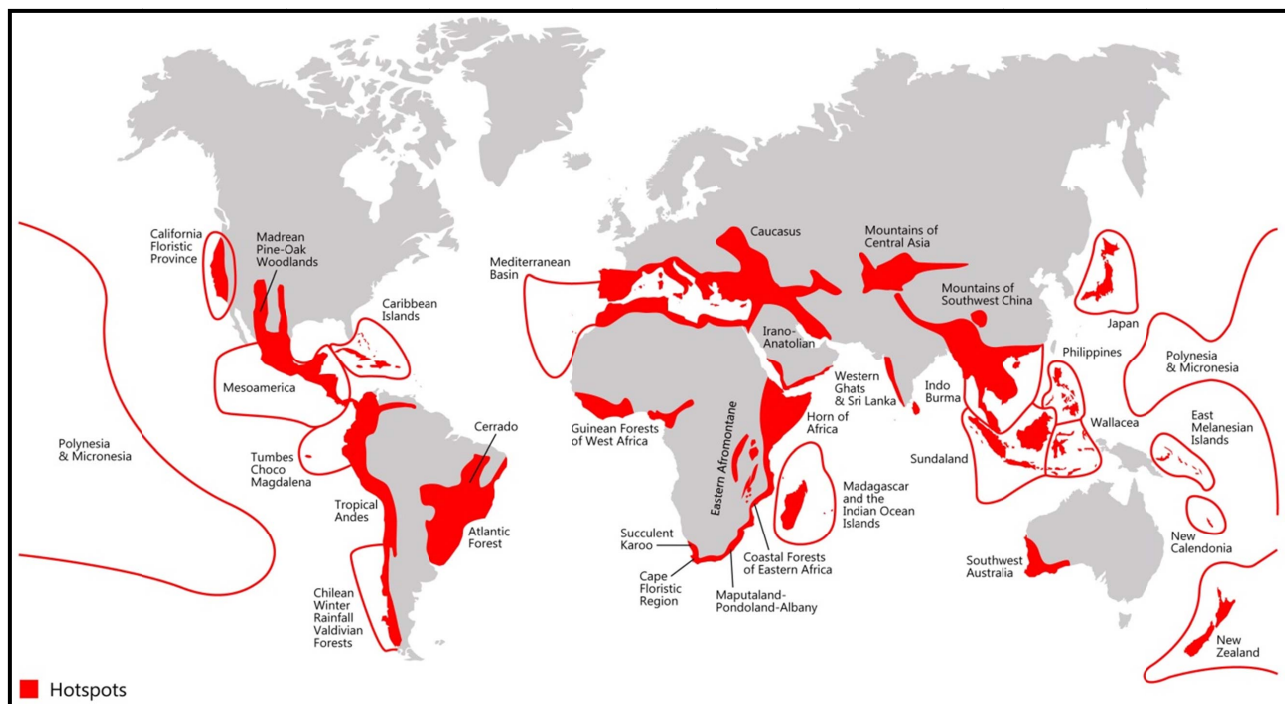


Figure 1: Biodiversity hotspots of the world (Conservation International, 2005)

The rich biological diversity of the Nelson Mandela Bay is partly attributed to the fact that it is an area of convergence of five of South Africa's nine biomes (see Figure 2): the Fynbos, Subtropical Thicket, Forest, Nama Karoo, and Grassland biomes (Low & Rebelo, 1998). Such a juxtaposition of biomes within a city is unparalleled in the world (Conservation International, 2009).



Figure 2: The biomes within Nelson Mandela Bay municipal area (Stewart et al., 2008)

Important terrestrial features

At a finer scale, a total of 58 vegetation types can be discerned within the municipal area (see Figure 3) (SRK Consulting, 2010), the southern part being mostly dominated by a mosaic of Fynbos, Subtropical Thicket and Forest while the northern part is dominated by various forms of Subtropical Thicket, including mosaic vegetation types with varying Grassland and Nama Karoo components (Vlok & Euston-Brown, 2002).

A high proportion of the vegetation types within the municipal area are threatened. The *Conservation Assessment and Plan for the Nelson Mandela Bay Municipality* (SRK Consulting, 2010) determined that twenty-three are *Critically Endangered* and a further ten are *Endangered* vegetation types require 40% or more of their remaining habitat to be conserved (Figure 3, Figure 4 and Table 2).

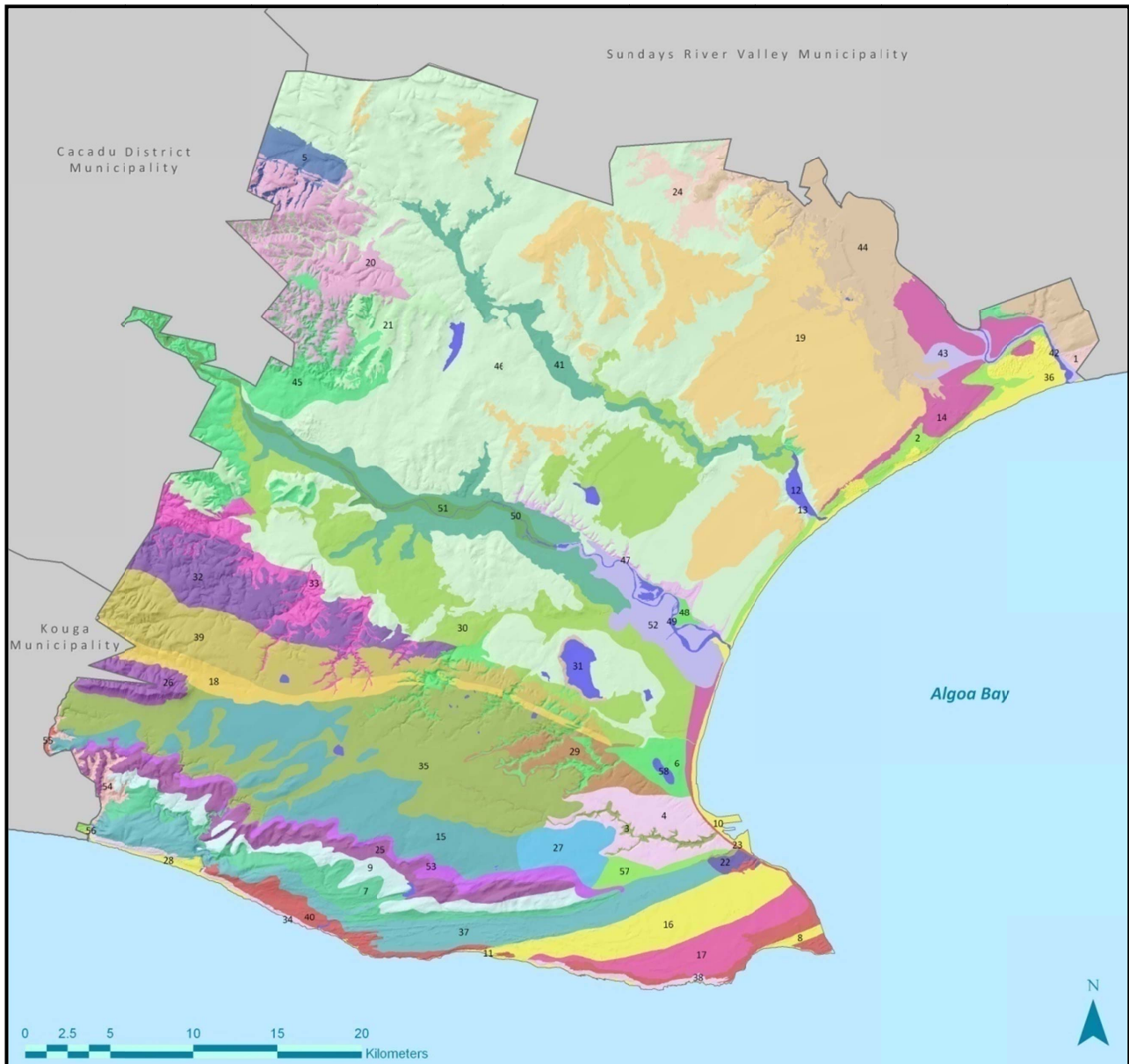


Figure 3: The historical distribution of natural vegetation types in the Nelson Mandela Bay municipal area (Stewart *et al.*, 2008)

The threatened status of these habitats is mirrored by the number of threatened species within the municipal area. The Eastern Cape State of the Environment Report identifies that the Nelson Mandela Bay Municipality has the highest number of *Endangered* species of all the municipalities in the Eastern Cape (CSIR, 2004).

Table 1: Key to Figure 3 vegetation type numbers

No.	Vegetation Type	No.	Vegetation Type	No.	Vegetation Type
1	Albany Dune Thicket	21	Groendal Fynbos Thicket	41	Sundays Doringveld Thicket
2	Algoa Dune Thicket	22	Humewood Dune Fynbos	42	Sundays River
3	Baakens Forest Thicket	23	Intermediate Beach	43	Sundays River Floodplain
4	Baakens Grassy Fynbos	24	Koedoeskloof Karroid Thicket	44	Sundays Spekboom Thicket
5	Baviaans Spekboom Thicket	25	Kragga Kamma Indian Ocean Forest	45	Sundays Thicket
6	Bethelsdorp Bontveld	26	Lady Slipper Mountain Fynbos	46	Sundays Valley Thicket
7	Bushy Park Indian Ocean Forest	27	Lorraine Transitional Grassy Fynbos	47	Swartkops Escarpment Valley Thicket
8	Cape Recife Bypass Dunefield	28	Maitlands Dunefield	48	Swartkops Estuarine Floodplain
9	Chelsea Forest Thicket Mosaic	29	Malabar Grassy Fynbos	49	Swartkops Estuary
10	Coastal	30	Motherwell Karroid Thicket	50	Swartkops River
11	Coastal Hummock Dunes	31	Pan	51	Swartkops River Floodplain
12	Coega Estuary	32	Rocklands Renoster Bontveld	52	Swartkops Salt Marsh
13	Coega Estuary Floodplain	33	Rocklands Valley Thicket	53	Thornhill Forest and Thornveld
14	Colchester Strandveld	34	Rocky Beach	54	Van Stadens Afro. Ind. Ocean Forest
15	Colleen Glen Grassy Fynbos	35	Rowallan Park Grassy fynbos	55	Van Stadens Forest Thicket
16	Driftsands Bypass Dunefield	36	Sandy Beach	56	Van Stadens River
17	Driftsands Dune fynbos	37	Sardinia Bay Forest Thicket	56	Van Stadens River
18	Goudini Grassy Fynbos	38	Schoenmakerskop Rocky Shelf Fynbos	57	Walmer Grassy Fynbos
19	Grass Ridge Bontveld	39	Skurweberg Grassy Fynbos	58	Wetland
20	Groendal Fynbos	40	St Francis Dune Fynbos Thicket Mosaic		

Table 2: An overview of the Ecosystem Threat Status of the vegetation types of the NMBM municipal area (Stewart et al., 2008)

Ecosystem Threat Status	Number of Vegetation Types
Critically Endangered	23
Endangered	10
Vulnerable	15
Least Threatened	10
Total	58

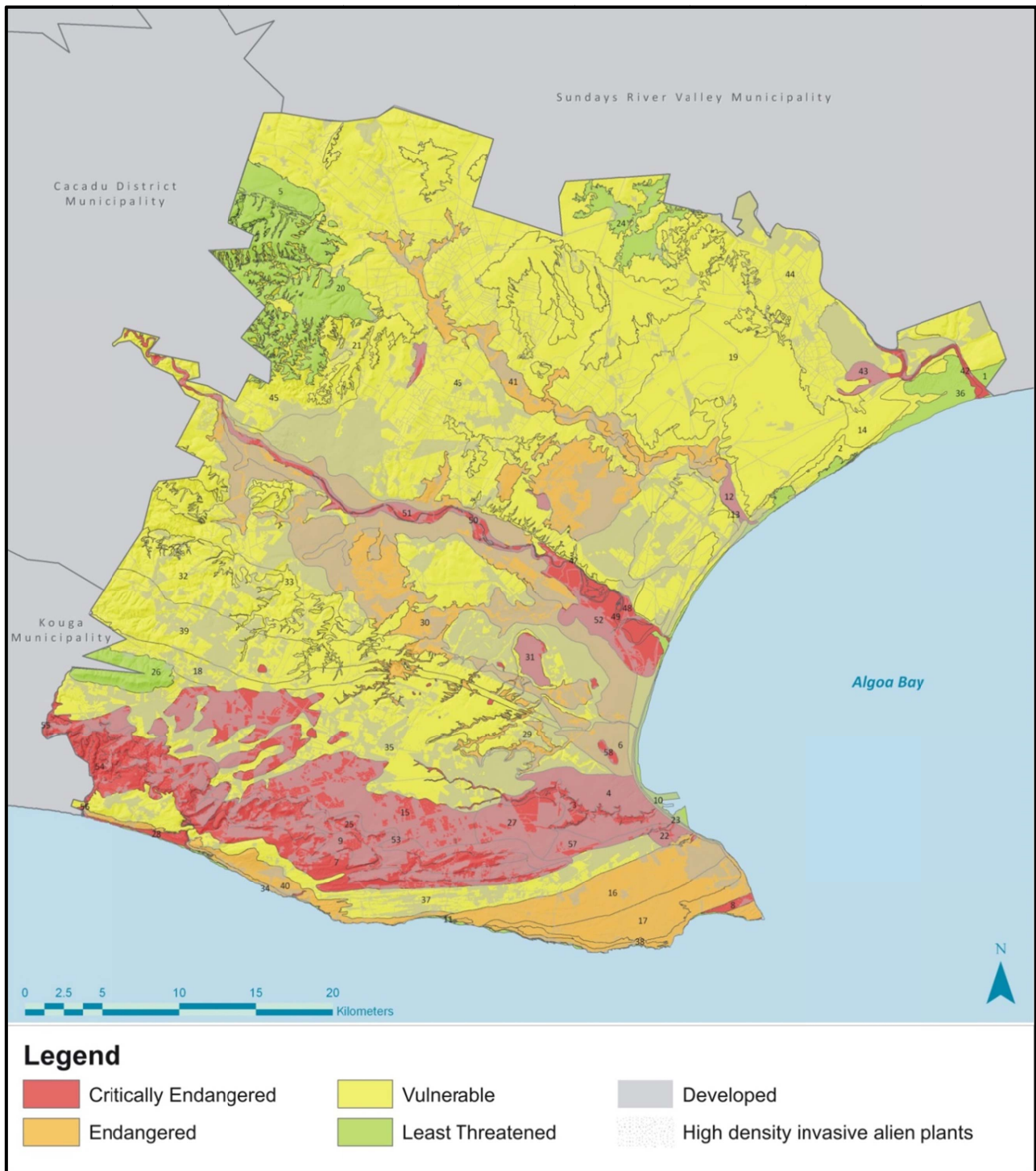


Figure 4: The Ecosystem Threat Status of vegetation types within the Nelson Mandela Bay municipal area (Stewart *et al.*, 2008)

Terrestrial biodiversity features that are most threatened within Nelson Mandela Bay include Lowland Fynbos, Subtropical Thicket mosaics and Forest.

Lowland Fynbos

The Lowland Fynbos ecosystems in the NMBM municipal area are predominantly grassy fynbos systems, which are characterised by a high cover of summer-growing grasses. Within the Cape Floristic Region, Grassy Fynbos is found in the south eastern lowlands and the southern montane margins.

Grassy Fynbos has high levels of plant and invertebrate diversity and endemism but, due to the fact that much of the urban expanse of Port Elizabeth was developed on these ecosystems, they are also some of the most threatened vegetation types within the municipal area (Stewart *et al.*, 2008).

The most threatened Grassy Fynbos types within the municipal area are:

- Colleen Glen Grassy Fynbos (*Critically Endangered*);
- Lorraine Transitional Grassy Fynbos (*Critically Endangered*);
- Baakens Grassy Fynbos (*Critically Endangered*); and
- Walmer Grassy Fynbos (*Critically Endangered*).

Threatened plant species include South Africa's national flower, the king protea *Protea cynaroides* (*Critically Endangered*), *Cyclopia pubescens* (*Critically Endangered*) and *Brunsvigia litoralis* (*Endangered*). Local endemic plant species include *Protea foliosa*, *Erica zeyheriana*, *Hypoxis villosa*, *Harveya hyobanchoides*, *Romulea longipes*, *Aspalathus lanceicarpa* and *Blepharis procumbens* (Stewart *et al.*, 2008).

Bird endemism and diversity is relatively low in Fynbos, but the black harrier *Circus maurus* deserves special attention as a Fynbos biome near-endemic that breeds within the municipal area. Mammal endemism, diversity and abundance are also low in fynbos and there are no endemic or threatened large mammals occurring within the fynbos of Nelson Mandela Bay.

Threats to the Lowland Fynbos within the NMBM municipal area include invasion by alien vegetation (especially by Australian wattles such as Port Jackson willow *Acacia saligna*, Black wattle *Acacia mearnsii* and rooikrans *Acacia cyclops* and by pines *Pinus spp.* and gums *Eucalyptus spp.*), urban development (especially expansion of residential development on the outskirts of Port Elizabeth west of Bridgmead and Sherwood), inappropriate fire regimes (either by the vegetation being burned too frequently or not frequently enough – the former is more commonplace as an attempt to increase the grass component of the vegetation to support more intense grazing), the fragmentation of habitat, and global climate change (Pierce-Cowling, 2009).

Coastal Fynbos Thicket mosaics

The Coastal Fynbos Thicket mosaics within the municipal area are confined to the calcareous sands on the southern coastline and are a mixture of fynbos elements (mainly ericoid shrubs and restioids) and large-leaved subtropical shrubs.

The Coastal Fynbos Thicket mosaics within the NMBM municipal area include:

- Humewood Dune Fynbos (*Critically Endangered*);
- Schoenmakerskop Rocky Shelf Fynbos (*Endangered*);
- Driftsands Bypass Dunefield (*Endangered*);
- Driftsands Dune Fynbos (*Endangered*); and
- St Francis Dune Fynbos Thicket Mosaic (*Endangered*).

Aspalathus recurvispina, which was until recently thought to be extinct, was recently found near Humewood in a small patch of semi-intact habitat. This plant is now classified as *Critically Endangered*. Plants such as *Erica chloroloma*, *Agathosma stenopetala*, *Phyllica litoralis*, *Rapanea gilliana* and *Felicia echinata* are endemic to the region and occur within the coastal fynbos thicket mosaics of the Nelson Mandela Bay municipal area (Stewart *et al.*, 2008).

The coastal mosaics are threatened by alien invasive plants, primarily rooikrans *A. cyclops*, and coastal development (especially around the coastal resort and residential areas of Blue Horizon Bay, Beachview, Seaview and Schoenmakerskop). Sand mining also occurs in the coastal zone near Sardinia Bay and Seaview.

Subtropical Thicket mosaics

The most threatened subtropical thicket types occurring within the municipal area are those that form mosaics with vegetation with affinities to other biomes, such as:

- Sundays Doringveld Thicket (*Endangered*) – a mosaic of subtropical thicket and Nama karoo.
- Bethelsdorp Bontveld (*Endangered*) – a mosaic of subtropical thicket, renosterveld, grassland and fynbos species. This vegetation type is rich in species, many of which are rare; and
- Motherwell Karroid Thicket (*Endangered*) – a mosaic of subtropical thicket and succulent karoo. This vegetation type is characterised by a number of local endemic succulents.

Endemic plants include *Orthopterum coegana* (*Critically Endangered*), a succulent that only occurs on a small number of outcrops on Coega Kop east of Port Elizabeth and *Strelitzia juncea* (*Near Threatened*). Other threatened plants within the thicket mosaics include *Aloe bowiea* (*Critically Endangered*), *Euphorbia globosa* (*Endangered*) and *Haworthia sordida* (*Vulnerable*). The Albany adder *Bitis albanica* (*Critically Endangered*) is confined to the Algoa Bay area and occurs in thicket and thicket mosaic habitat types (Stewart *et al.*, 2008).

The mosaics are threatened by the development of informal and formal housing (especially around the Motherwell area), industrial development (around the Coega Industrial Development Zone), plant harvesting for medicinal and cultural use, overgrazing and mining (around Grassridge).

Forest

Forest in Nelson Mandela Bay occurs in a solid form and in a mosaic with thicket. The solid forest types within the NMBM municipal area are mostly confined to steep riverine gorges, which serve as fire refugia, or within a band along the wetter southern portion of the municipal area.

The most threatened forest types within the municipal area are:

- Chelsea Forest Thicket Mosaic (*Critically Endangered*);
- Bushy Park Indian Ocean Forest (*Critically Endangered*);
- Van Stadens Afromontane Indian Ocean Forest (*Critically Endangered*);
- Van Stadens Forest Thicket (*Critically Endangered*);
- Kragga Kamma Indian Ocean Forest (*Critically Endangered*);
- Thornhill Forest and Thornveld (*Critically Endangered*); and
- Baakens Forest Thicket Mosaic (*Endangered*).

The protected milkwood *Sideroxylon inerme*, dwarf Cape Beach *Rapanea gilliana*, and yellowwood *Afrocarpus falcatus* trees are prominent in many of the forest types. The southern population of blue duiker *Philantomba monticola*, which is confined to the Maputaland-Pondoland-Albany hotspot, occurs in the southern forested portions of Nelson Mandela Bay (Stewart *et al.*, 2008).

The forest within the municipality is threatened by increased prevalence of fire, natural resource use and the development of informal and formal housing (Stewart *et al.*, 2008).

Important freshwater features

Nelson Mandela Bay has ten main rivers, each with a unique river ecosystem type (Roux *et al.*, 2002). Of these main rivers, four are deemed to no longer be intact. A further 59 tributaries of all the rivers in Nelson Mandela Bay are no longer intact (SRK Consulting, 2010).

Since all of the mainstem rivers in Nelson Mandela Bay have unique river ecosystem types, they all require some degree of safe-guarding in order to meet the required conservation targets. Four rivers cannot currently achieve their biodiversity target as intact riverine systems, namely the Coega, Hume, Paapenkuis and Swartkops Rivers, and consequently require the institution of restoration or rehabilitation measures. Sections of a total of 156 tributaries of these mainstem rivers also need to be conserved in order to achieve the required conservation targets for freshwater systems (SRK Consulting, 2010).

Of particular importance is the Swartkops River system. The Swartkops River catchment contains two main rivers systems, the Elands and the Kwazunga, and two subsidiary tributaries, the Brak and Chatty. The Groendal Wilderness Area constitutes 30 % of the catchment of this river system, and the Groendal Dam supplies 63 % of Uitenhage's domestic water.

A number of threatened and rare species occur on Groendal, including the Cape redbin minnow *Pseudobarbus afer*, which is restricted to the area, and the possible presence of Hewitt's ghost frog *Heleophryne hewitti* (*Critically Endangered*) (Cunningham *et al.*, 2003; Conradie *et al.*, 2013).

Cultivation, mining and invasive alien plants along this river system have impacted on its functioning by respectively increasing sedimentation and reducing the volume of water of the river. Alien species, such as the largemouth bass *Micropterus salmoides*, are a threat to the survival of indigenous fish species.

A number of small vleis and pans occur within the municipal area, particularly in grassy Fynbos, Subtropical Thicket, and coastal areas. These provide distinct habitats for species, including both threatened and common amphibian species such as the African bullfrog *Pyxicephalus adspersus*¹ and the yellow-striped reed frog *Hyperolius semidiscus*². In addition to providing habitat, these wetlands are also important for the functions that they provide, such as flood attenuation, water filtration and erosion reduction. The main pressures on wetlands are through infilling or draining (e.g. for urban development and grazing), erosion, water abstraction and diversion (e.g. through dams and weirs).

Important coastal features and estuaries

The coastal zone of Nelson Mandela Bay provides an array of recreational and sustainable resource utilisation opportunities and underpins a substantial segment of the municipality's economy. Important features within the coastal area of Nelson Mandela Bay include the Swartkops and Sundays Estuaries, foredune ecosystems and sand movement corridors.

¹ Regionally the African Bullfrog is regarded as rare and of conservation concern. Its current official IUCN Red List rating is Least Concern (Measey, 2011). The population in the Bridgmead area is of conservation concern as this is the most southern distribution of the species (Minter *et al.*, 2004).

² The Yellow Striped Reed Frog is common and widespread along the east coast of South Africa (Minter *et al.*, 2004). They reach a most southern/western distribution in the Port Elizabeth area. They are sensitive to disturbance and only occur in deep wetlands/streams with dense vegetation.

Swartkops estuary

The Swartkops Estuary is an open tidal inlet estuary that lies about 8 km north of the Port Elizabeth city centre. The estuary is lined on both banks by industrial and residential areas, which are occasionally damaged by floods.

The floodplain is dominated by saltmarshes (identified as a *Critically Endangered* habitat type in the NMBM). Here biological diversity is low, but the system is nevertheless important due to its high productivity. The mud prawn *Upogebia africana* is a dominant crustacean of the muddy, non-marshland areas of the lower estuary and the sand prawn *Callinassa kraussi* occurs in the sand flats of the mouth region and upper reaches of the estuary. These species form the basis of the important informal bait collecting industry. As an illustration, the Swartkops Estuary was estimated to have the highest total annual catch of sand and mud prawns of all the estuaries of the Cape Floristic Region and was ranked as the top temperate estuary in terms of subsistence value (Turpie & Clark, 2007). The bait collecting industry is also responsible for destruction of the mudflats, leading to significant impacts on the functioning of the system (Baird *et al.*, 1988). Relevant sections of the Swartkops River and Estuary are currently proposed for declaration as either a Protected Environment or Nature Reserve in terms of the NEM: Protected Areas Act, 2003 (Act No. 57 of 2003). Declaration thereafter as a RAMSAR site is also being considered. Under the auspices of the Department of Water and Sanitation (DWAS), a Catchment Management Forum has been formed with the objective of safeguarding the welfare of the Swartkops River and Estuary from source to sea (T Potts 2014, pers. comm., 30 Oct).

The eelgrass *Zostera capensis* beds of the estuary are important as a nursery area for marine fish species. The most important fish to the angling community is the spotted grunter *Pomadasys commersonnii*, followed by white steenbras *Lithognathus lithognathus* and leervis *Lichia amia*. Studies have suggested that over-fishing of popular angling fish within the estuarine environment has resulted in changes to the relative abundance of species, with some species numbers being severely reduced (Baird *et al.*, 1988).

The estuary is considered to be one of the best places in the country to see the less common estuarine waders and terns (Martin, 2002). Dominant species here include kelp gull *Larus dominicanus*, grey plover *Pluvialis squatarola*, whimbrel *Numerius phaeopus* and common tern *Sterna hirundo*.

The functioning of the estuary is threatened by pollution (e.g. from stormwater canals, adjacent industries, pesticides from upstream agriculture), enrichment (e.g. from sewage outlets), sand mining in the upper reaches of the estuary, illegal and unsustainable bait harvesting and the associated habitat destruction, overfishing, insufficient inflow of freshwater due to damming, and inappropriate development.

Sundays estuary

The Sundays Estuary forms the part of the northern border of the municipal area. It lies about 30 km north-east of the Port Elizabeth city centre. Adjacent to the estuary are the coastal hamlets of Colchester and Cannonvale. The estuary is about 24 km in length and, like the Swartkops, opens into Algoa Bay. The estuary is characterised by steep banks and an absence of salt marshes or large mud flats (Beckley, 1984) and is considered to be in good health (Whitfield, 2000).

The nursery function for fish of the Sundays Estuary is high, although less so than the Swartkops (Turpie & Clark, 2007). Although the Sundays Estuary is important in terms of subsistence bait collecting, the total annual catch in this estuary is much lower than for the Swartkops Estuary. It

nonetheless ranks as the eighth most important temperate estuary in terms of subsistence value (Turpie & Clark, 2007).

The Sundays Estuary is popular for activities such as canoeing, camping, boating and recreational angling. Possible impacts include the impact of agricultural activities up river and further expansion of Colchester and Cannonvale.

Foredune ecosystems

The foredune vegetation along the Nelson Mandela Bay coastline plays an important role as a buffer against the high energy influences of the tides, wind and waves. These systems are sensitive to disturbance and are susceptible to the formation of blow-outs if disturbed.

Although the pioneer dune communities do not have especially high biodiversity, the dune slacks behind these, where standing water is common, are more biologically diverse (Lubke & de Moor, 1998). Plant species occurring within the foredune ecosystems include *Arctotheca populifolia*, *Gazania rigens* var. *uniflora*, *Chasmanthe aethiopica*, *Felicia echinata*, *Pentaschistis heptamera*, *Silene primuliflora*. Roseate tern (*Endangered*) has previously been recorded breeding at Cape Recife (ADU, 2009).

Beach tourism is a major component of the municipality's tourism market. However, this area is often targeted for coastal resort or housing development, primarily due its ocean views. The protection of the coastal foredune systems is important in order to safeguard the scenic attributes of the coastal zone and to provide protection against the natural coastal agents of change, particularly in light of the implications of global sea-level rise.

Sand movement corridors

Three important sand movement corridors occur within the municipal area of Nelson Mandela Bay: the Algoa, Cape Recife and Maitland Dunefields.

Although largely outside of Nelson Mandela Bay, the Alexandria dunefield (the Algoa dunefield being the western section thereof) has its beginnings at the north-eastern extent of the municipal area. The dunefield is considered to be one of the largest (covering about 15,800 ha) and most pristine active coastal dunefields in the world. Larger and more extensive dunefields are only found in desert areas. As such, it has been incorporated into the Addo Elephant National Park and was nominated by South African National Parks as a World Heritage Site. Currently it is on the Tentative List of the UNESCO World Heritage Programme in terms of criterion VII: "Contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance" and criterion X: "Contains the most important and significant natural habitats for *in-situ* conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation" (UNESCO, 2009).

The site is important to dune breeding birds. It is one of the few nesting sites in South Africa for the damara tern *Sterna balaenarum* (*Endangered*). African black oystercatcher *Haematopus moquini* (*Near Threatened*) and whitefronted plovers *Charadrius marginatus* also nest in the dunefield. A subspecies of peregrine falcon, the Siberian peregrine *Falco peregrinus calidus*, has relatively recently been recorded as rare migrant to the dunefields. Little is known of the status of this subspecies (Jenkins & Stephenson 1997).

The Cape Recife Dunefield is at the south-eastern tip of the municipal coastline and is the most expansive remaining example of a functional headland bypass dunefield within the municipal area. This dunefield, although stabilised at its eastern end, historically transported windblown sand across

the peninsula at Cape Recife and played a role in the replenishment of the beaches between Summerstrand and the Port Elizabeth harbour. The Driftsands headland bypass dunefield was stabilised in the beginning of the twentieth century.

The Maitlands Dunefield occurs between the resorts of Beachview and Blue Horizon Bay, on the south-western part of the Nelson Mandela Bay coastline. This dunefield supports what is believed to be the highest density of black oystercatcher in the country (Bornman & Klages, 2003). The Maitland area, in general, is one of the most visually spectacular areas in the municipality and has significant value in terms of recreation and tourism.

Although the prohibition of off-road vehicles on the dunefields has substantially reduced threats to these systems, they continue to be threatened principally by encroachment of alien invasive plants and are vulnerable to insensitive recreational use.

Important ecological corridors

A number of ecological corridors were identified as part of the NMBM conservation assessment. These corridors were designed to promote connectivity between natural areas in order for ecological processes (such as migration and seed dispersal) to continue.

While all of the identified corridors are important, the Baakens River Valley, which forms an east-west corridor through the urban expanse of the municipal area, deserves a special mention. It forms and represents one of the municipality's last remaining and most extensive corridors of fynbos habitats and is of critical importance for the continuation of ecological processes that sustain biodiversity. The area also provides numerous ecosystem services, playing an important role in flood attenuation, storm water management, environmental education and nature-based recreation.

Ecosystem Protection Level within the Nelson Mandela Bay municipal area

The existing protected area network in Nelson Mandela Bay totals approximately 10,500 ha, or approximately 5 % of the municipal area. Of this, only 4,700 ha (2 % of the municipal area) of land receives strong legal protection and is principally managed for biodiversity conservation as national parks, provincial or local authority reserves. The remaining protected areas (approximately 5,800 ha in extent) are under private ownership, have weak legal protection and may not necessarily be managed for biodiversity conservation purposes.

The current protected area system in municipal area is therefore highly deficient, particularly in terms of its limited size and connectivity, and urgently requires expansion in order to achieve biodiversity targets (SRK Consulting, 2010).

Table 3: Distribution of conservation areas within the municipal area

Protected Areas	Area (ha)	Conservation Areas	Area (ha)
Greater Addo Elephant National Park	752	Grassridge Private Nature Reserve	1,320
Groendal Wilderness Area	14	NMMU Private Nature Reserve	840
Island Forest Nature Reserve	496	Witteklip Private Nature Reserve	29
Cape Recife Nature Reserve	323	Van Stadensberg Natural Heritage Site	579
Lady Slipper Nature Reserve	365	Seaview Game Park	31
Maitland Nature Reserve	132	Kragga Kamma Game Park	203
Sardinia Bay Nature Reserve	249	Paardekop Game Farm	679
Settlers Park Nature Reserve	75	Tregathlyn Game Farm	2,099
Swartkops Valley Nature Reserve	940	Total	5,780
Sylvic Nature Reserve	91		
The Springs Nature Reserve	929		
Van Stadens Nature Reserve	339		
Total	4,705		

Patterns of land use

About 40 % of the natural habitat of Nelson Mandela Bay has been transformed by urban development and agriculture (see Figure 5). Urban development is primarily concentrated on the coastal and inland lowlands in the east and north-west of the Municipality. Cultivation is concentrated on the ancient dunes in the south of Nelson Mandela Bay and the inland Fynbos and Subtropical Thicket lowlands.

As can be seen from Table 4, 14.5 % of the municipal area has been cultivated. A further 10.8 % and 0.9 % has been developed for formal and informal housing respectively. A total of 2.5 % has been developed as formal recreational open space or parks, mowed road verges or vacant municipal land. A present 5.5 % of the municipal area is infested with high density alien plants. Mining operations currently comprise 1.9 % of the municipality. A further 61.9 % of the Nelson Mandela Bay is in a natural state (SRK Consulting, 2010).

The extent of housing, industry and commercial businesses within the coastal zone increased by 10 % during the period between 2003 and 2007. The increase in development within the coastal zone was primarily at the expense of natural areas, which experienced a reduction in extent. The extent of habitat loss within the coastal zone is of concern not only due to the loss of ecological processes and biological diversity, but also the loss of visual amenities and sense of place within the coastal zone, which is the primary driver behind the Municipality's tourism economy (SRK Consulting, 2010).

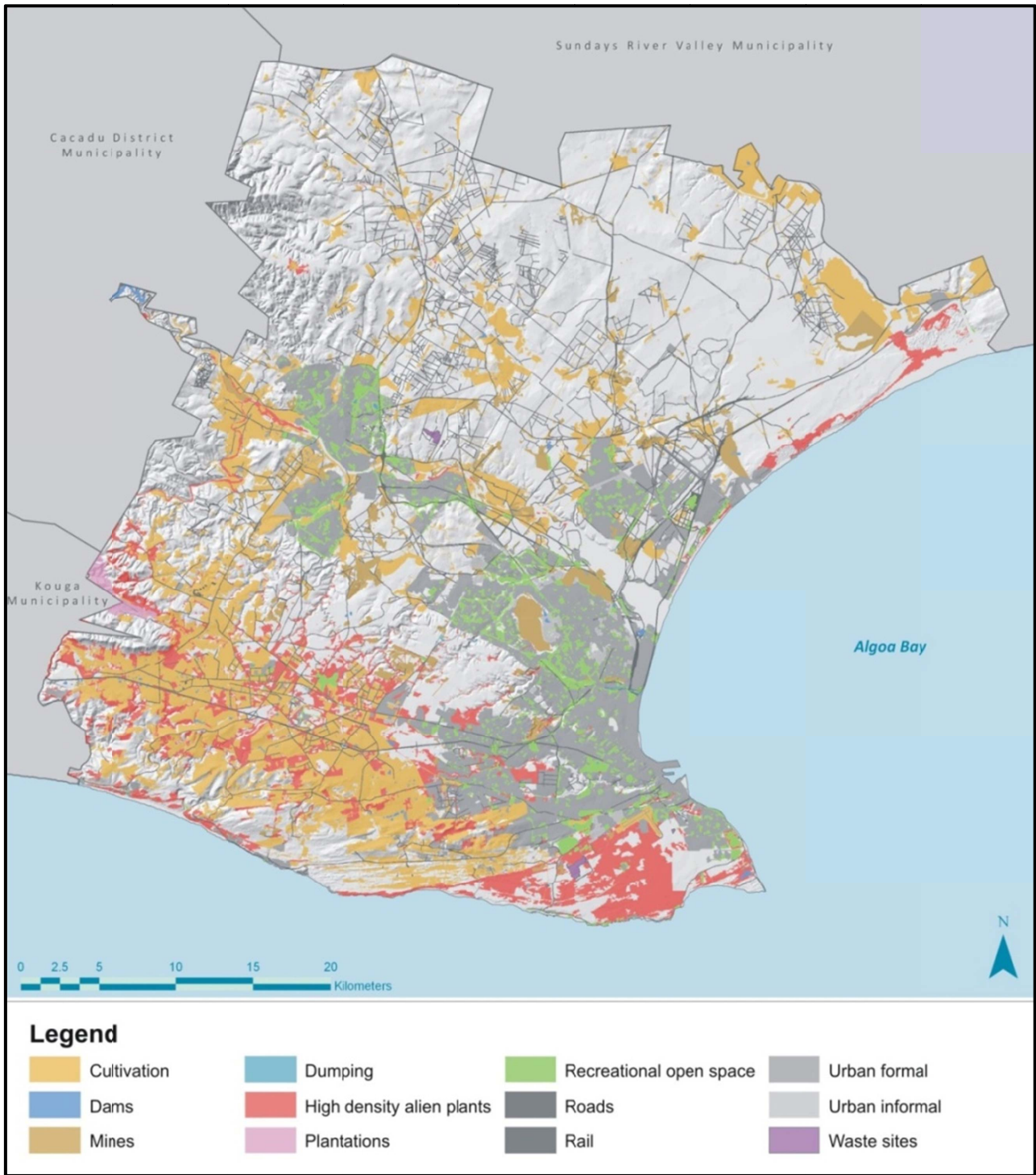


Figure 5: Patterns of land-use in the Nelson Mandela Bay municipal area (Stewart et al., 2008)

Table 4: Landcover types and extent in the Nelson Mandela Bay municipal area (Stewart *et al.*, 2008)

Landcover type	Extent (ha)	Percentage cover
Airfields	246	0.1
Commercial plantations	387	0.2
Cultivation	28,271	14.5
Dams	401	0.2
Illegal dumping	5	0.003
High density alien plants	10,659	5.5
Mines	3,690	1.9
Natural areas	120,992	61.9
Rail	1	0.0002
Recreational Open Space	4,877	2.5
Roads	2,871	1.5
Urban formal	21,038	10.8
Urban informal	1,765	0.9
Waste site	216	0.1
Total	1,195,419	100.0

Description of Critical Biodiversity Areas

Critical Biodiversity Areas within the municipal area are the portfolio of sites that are required to meet the municipality's biodiversity targets³. Such areas should be maintained in their natural state in perpetuity. A map of CBAs was produced as part of the NMBM's conservation assessment and sites were assigned to CBA categories based on their biodiversity characteristics and Ecosystem Threat Status (see Table 5).

The CBAs were clustered into twenty-nine implementation sites (see Figure 6) and were prioritised according to their overall Ecosystem Threat Status and current land use pressures (see Table 6). These implementation areas should form the focus for the investment of the limited resources of the Nelson Mandela Bay Municipality for the implementation of the Bioregional Plan.

³ The biodiversity targets for each of the vegetation types in the municipal area were assigned according to the targets for corresponding broad habitat units or vegetation types as identified in the C.A.P.E. and STEP Programmes.

Table 5: Description of Critical Biodiversity Area and other categories

Category	Code	Description	Land Management Objective
Protected Area 1	PA 1	Protected areas managed by SAN Parks, provincial or local authorities, parastatals (e.g. NMMU), or the private sector. Includes National Parks, Provincial, Local and Private Nature Reserves.	To be maintained as Protected Areas.
Protected Area 2	PA 2	National Parks, Provincial, Local, Private Nature Reserves pending declaration.	To be declared and maintained as Protected Areas.
Critical Biodiversity Areas	CBAs	All <i>Critically Endangered</i> habitats, ecological process areas, ecological corridors, habitats for Species of Special Concern, and some <i>Endangered</i> , <i>Vulnerable</i> or <i>Least Threatened</i> habitats.	Such areas must be managed for biodiversity conservation purposes and incorporated into the protected area system.
Ecological Support Area 1	ESA 1	Agricultural or partly degraded land that plays an important role in ecosystem functioning and / or provides connectivity between natural areas.	Such areas must be maintained for extensive agricultural or similar low intensity purposes and managed to promote ecological connectivity.
Ecological Support Area 2	ESA 2	Areas severely disturbed or transformed by human activities (e.g. mining), requiring restoration or rehabilitation.	Such areas must be restored or rehabilitated to support ecological connectivity. Such areas must not be developed or utilised for medium to high intensity purposes (e.g. crop production, residential, industry etc.).
Other Natural Areas	ONA	Natural areas that are not required to meet biodiversity targets.	As per the Municipal SDF or local SDFs.
Areas where no natural habitat remains	DEV	Areas severely disturbed or transformed by human activities with no natural habitat remaining, including airfields, cultivated lands, forestry plantations, industry, mines and quarries, severe overgrazing, and urban and rural development.	As per the Municipal SDF or local SDFs.

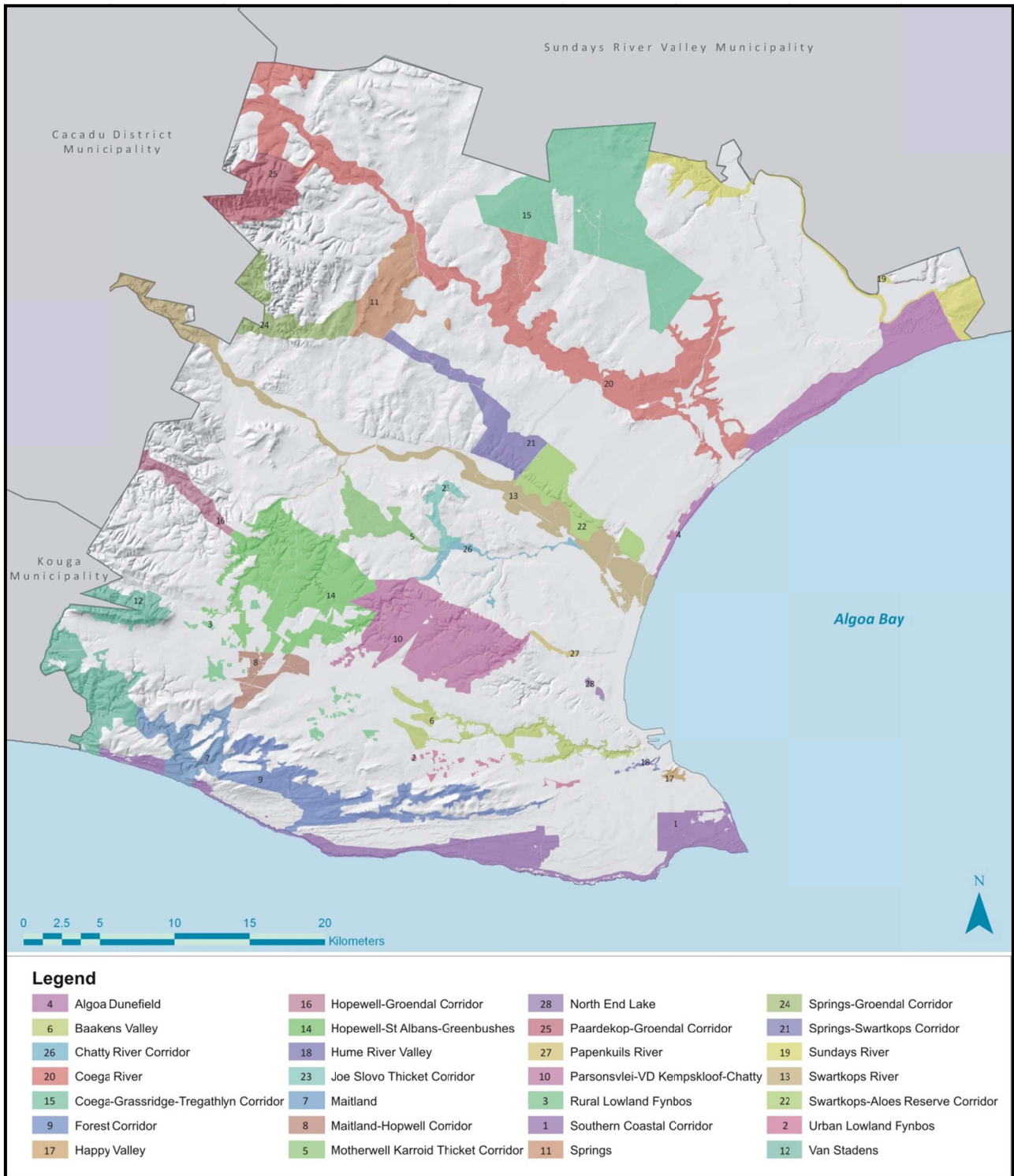


Figure 6: Implementation sites in the Nelson Mandela Bay municipal area (Stewart *et al.*, 2008)

Table 6: Priority rating of implementation sites as determined using the site prioritisation framework (Stewart *et al.*, 2008)

Priority	Implementation Site
1	Southern coastal corridor
2	Urban Lowland Fynbos
3	Rural Lowland Fynbos
4	Algoa Dunefield
5	Motherwell Karroid Thicket corridor
6	Baakens Valley
7	Maitland
8	Hopewell-Maitland corridor
9	Forest corridor
10	Van der Kemp kloof-Parsonsvlei-Chatty
11	Springs
12	Van Stadens
13	Swartkops River
14	Hopewell-St Albans-Greenbushes
15	Coega-Grassridge corridor
16	Hopewell-Groendal corridor
17	Happy Valley
18	Hume River Valley
19	Sundays River
20	Coega River
21	Swartkops-Springs corridor
22	Swartkops-Aloes Reserve complex
23	Joe Slovo Thicket corridor
24	Springs-Groendal corridor
25	Paardekop-Groendal corridor
26	Chatty River corridor
27	Papenkuils River
28	North End Lake
29	Urban Open Space Linkage