

Chapter 7

Biodiversity and ecosystem health

South Africa has a large range of habitats, ecosystems and landscapes comprising nine terrestrial biomes, 30 freshwater and six marine ecoregions. In addition, the country is home to three globally recognized biodiversity hotspots.



Chapter 7

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7.1 INTRODUCTION

Biological diversity, or biodiversity, is the term given to the variety of life on earth and the natural patterns it forms. This diversity is often understood in terms of the wide variety of plants, animals and micro-organisms but also includes genetic differences within each species.

Another aspect of biodiversity is the variety of ecosystems such as those that occur in deserts, forests, wetlands, mountains, lakes, rivers, and agricultural landscapes. In each ecosystem, living creatures, including humans, form a community interacting with one another and with the air, water, and soil around them. These ecosystems provide a large number of goods and services (which are known as ecosystem services) that sustain our lives. Ecosystem services are thus defined by the Millennium Ecosystem Assessment (2005) as *“the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious, and other non-material benefits.”*

Conserving biodiversity enables the protection and sustainable provision of ecosystem goods and services. Likewise, maintaining ecosystem health can be used to strengthen the conservation of biodiversity (Egoh *et al.* 2009).



The degradation of ecosystems and the loss of biodiversity thus directly affect the well-being and livelihoods of people from all walks of life, as well as societies and economies (CBD 2010 in WWF 2012). Ecosystems that retain their complement of biodiversity are more resilient to factors which can degrade their quality (Folke *et al.* 2004).

South Africa is in the fortunate position of having a vast wealth of biodiversity assets and ecosystems, much of which is still relatively intact (Nel & Driver 2012). The National Biodiversity Assessment (NBA) 2011 confirmed that although South Africa takes up two per cent of the planet's land resource, it is home to six per cent of the world's plant and mammal species, eight per cent of bird species and five per cent of reptile species. South Africa also has a large range of habitats, ecosystems and landscapes comprising nine terrestrial biomes, 30 freshwater and six marine ecoregions. In addition, the country is home to three globally recognized biodiversity hotspots.

The basis for the effective functioning of ecosystems and provision of ecosystem goods and services depends directly on the quantity, variability, distribution and condition of biodiversity, i.e. genes, species and habitats (Loreau *et al.* 2001). The loss of biodiversity and the decline of ecosystem health are linked.

A study of biodiversity indicators, monitored from 2001 to 2010, confirms that the rate of biodiversity loss is not slowing down at a global level (species and population trends, extinction risk, habitat extent and condition, and community composition) (Butchart *et al.* 2010).

One of the main findings of the NBA is that wetlands are the most threatened of all the ecosystems in the country and particular management and conservation efforts must be directed towards them. It also found that the rate of loss of

natural habitats is higher in some parts of the country and, if this trend continues, some provinces will have no natural habitat left outside of protected areas by 2050.

The drivers of biodiversity loss and ecosystem health are essentially macro-type activities involving people, and are usually of a socio-economic nature and are therefore complex (CBD 2010 in WWF 2012). These include: loss of natural habitat, for example, as a result of cultivation, mining, timber plantations, urban sprawl and coastal ribbon developments; invasive alien species; over-abstraction of water and alteration of flow in the freshwater environment; overharvesting especially in the marine environment; pollution; climate change, and so forth. Drivers influence the quality of ecosystems, affect their functionality and alter the rate at which ecosystems deliver goods and services. It has also been found that an important contributing factor to the loss of biodiversity and ecosystems is the difficulty of valuing ecosystem services, meaning that their value is not properly or fully taken into account in market transactions and that they are often under-valued or ignored in development-planning and decision-making processes (Nel & Driver 2012).

7.2 STATUS OF SPECIES

The biodiversity in terrestrial ecosystems is relatively better studied in South Africa than in aquatic ecosystems. The consequences of these biases skew the balance of information and integrated governance responses. South Africa has over 95,000 known species which is a large per centage of the world's species relative to the surface area of the country. Figure 7.1 shows the numbers of species currently known in South Africa for different groups of living organisms.



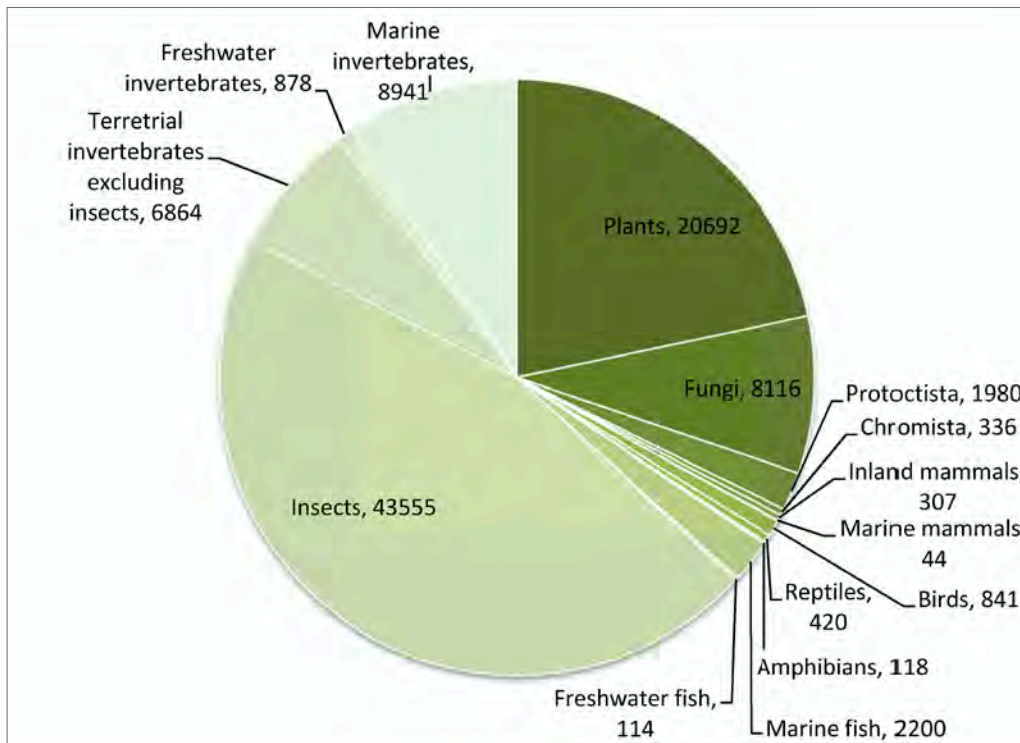


Figure 7. 1: Numbers of known species in South Africa for major groupings of living organisms
 Source: Nel and Driver (2012)

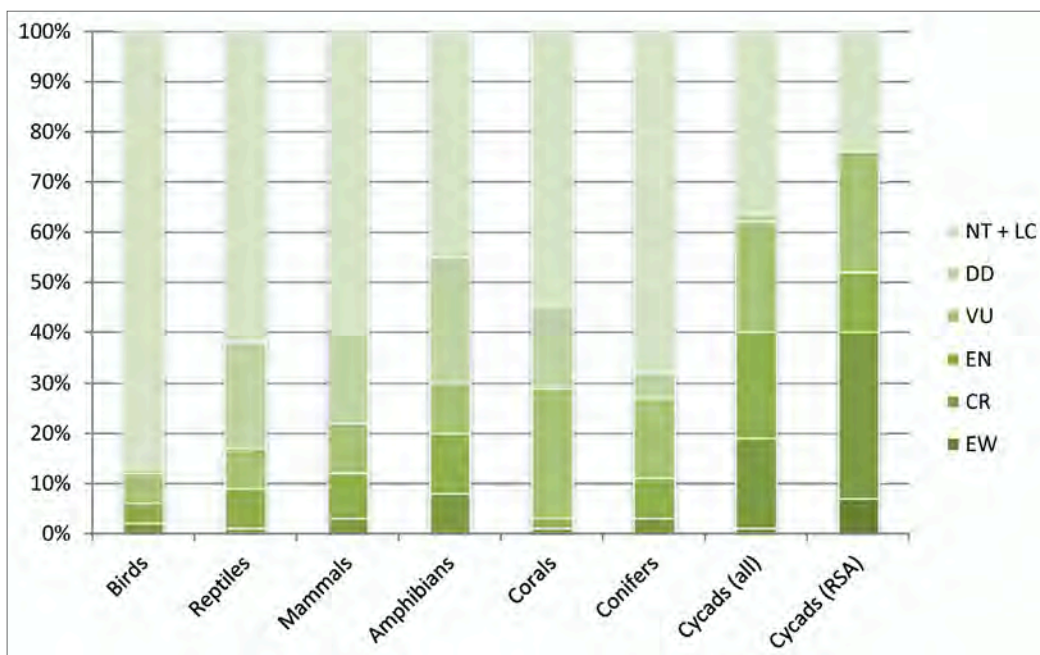


Figure 7. 2: Proportion of threatened species for those taxonomic groups that have been comprehensively assessed, based on the most recent available Red Lists
 Source: Hoffman et al. (2010)

According to the NBA, South Africa has assessed a wider range of taxonomic groups than most countries making it a leader in Red Listing. Red List assessments show the following:

- One in five terrestrial and freshwater mammal species is threatened;
- One in five freshwater fish species is threatened;
- One in seven frog species is threatened;
- One in seven bird species is threatened;
- One in eight plant species is threatened;
- One in twelve reptile species is threatened; and,
- One in twelve butterfly species is threatened.

Hoffmann *et al.* (2010) compared the threat status of different plants and animal taxonomic groups of species based on the latest global IUCN data. Figure 7.2 shows the proportion of threatened species for those taxonomic groups that have been comprehensively assessed, based on the most recent available Red Lists.

7.2.1 Terrestrial species

The dearth of accurate information for less conspicuous organisms in terrestrial ecosystems, notably insects, is most likely the result of low human interest and expertise to identify and monitor populations. Overall, research on the richness of invertebrate biodiversity, which provides important ecosystem functions involving pollination for example, remains fragmented and largely unexplored in South Africa (Samways *et al.* 2012).

South Africa's knowledge of threatened plants has considerably expanded by the finalization of the Red List of South African Plants (Raimondo *et al.* 2009). Of the more than 20,000 plant species recorded in the country, 2,000 are medicinal species with the highest number occurring in grassland, forest and savannah biomes. Of the 2,000 medicinal plant species, about a third are traded in medicinal markets, nine per cent (56 species) of which are threatened (Nel & Driver 2012). Twelve per cent of all terrestrial plants are threatened with extinction.



Priority species that are not assessed as threatened on Red Lists may require conservation attention, such as individual species or groups of species that merit special protection on the basis of their size, age, aesthetic value, cultural-historic value or importance for tourism (DAFF 2011). An example of this is the group of tree species called 'Champion Trees', which may not be cut, disturbed or damaged without a licence in

terms of Section 12 of the National Forests Act. By 2012, 44 Champion Trees have been declared.

The last comprehensive threat assessments for the country's birds and mammals were compiled in 2000 and 2004 respectively (Barnes 2000; Friedmann & Daly 2004). Currently known for these groups, is that 82 per cent of birds and 19.7% of mammals have been assessed as threatened.

The most threatened amphibians are concentrated in the south-western parts of the country (predominantly Western Cape), and to a lesser extent, in eastern South Africa (KwaZulu-Natal) which have both long been recognized for their high level of frog species richness.

7.2.2 Aquatic species (marine and freshwater)

At least one third of South Africa's freshwater fish face some form of extinction risk. This includes large angling species (e.g. yellow fish) as well as small fish (e.g. redfins). Fish sanctuaries, rivers, and their associated sub-quaternary catchments are essential for protecting threatened freshwater fish that are indigenous to South Africa. The number of Threatened and Near Threatened fish species recorded in South African fish sanctuaries vary from one to seven (Nel *et al.* 2011).



A large number of species of fish, molluscs, and freshwater crabs are endemic to South Africa. Their conservation is crucial for the health of river, wetland and estuarine ecosystems. Major freshwater-dependent taxonomic groups (i.e. fish, molluscs, dragonflies, crabs and vascular plants), have been found to exhibit far higher levels of threat in South Africa than in the rest of the southern African region (Darwall *et al.* 2009).

More than 630 marine species, most of them fish species, are caught by commercial, subsistence and recreational fisheries in South Africa (Nel & Driver 2012). Of the 630 species harvested, the status of only 41 were reported in 2010, 25 of which were considered over-exploited, collapsed or threatened (DAFF 2010).

7.3 STATUS OF ECOSYSTEMS

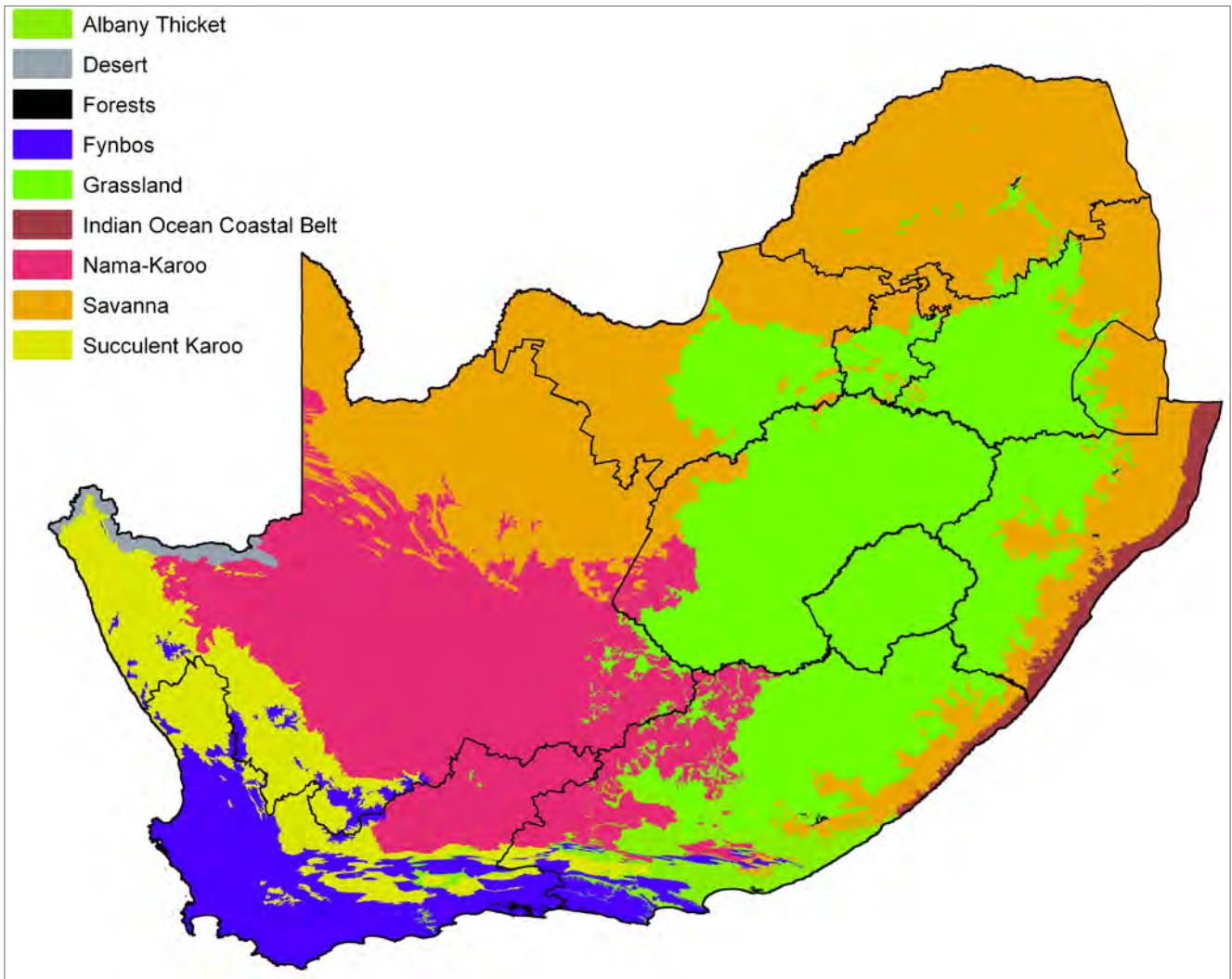
The headline indicators showing the ecosystem threat status and ecosystem protection level (as per NEMPAA) as presented in the NBA, are the best reference as to the status of the country's ecosystems. The main findings of the assessment are presented in Table 7.1.

Table 7. 1: Summary of results for ecosystem threat status and ecosystem protection level in each environment

Terrestrial ecosystems	<ul style="list-style-type: none"> • Ecosystem threat status: 40% of ecosystem types threatened. • Ecosystem protection level: 22% of ecosystem types well protected, 35% not protected. • Key ecosystem services: grazing, pollination, ecotourism and the wildlife industry, medicinal plants. • Key pressures: cultivation, urban sprawl, overgrazing, invasive alien plants.
River ecosystems	<ul style="list-style-type: none"> • Ecosystem threat status: 57% of ecosystem types threatened. • Ecosystem protection level: 14% of ecosystem types well protected, 50% not protected. • Key ecosystem services: fresh water. • Key pressures: abstraction of water and changes in flow, pollution, destruction of river banks, invasive alien plants.
Wetland ecosystems	<ul style="list-style-type: none"> • Ecosystem threat status: 65% of ecosystem types threatened. • Ecosystem protection level: 11% of ecosystem types well protected, 71% not protected. • Key ecosystem services: water purification, flood regulation. • Key pressures: cultivation, urban development, dam construction, changes in water flow, pollution, invasive alien plants.
Estuarine ecosystems	<ul style="list-style-type: none"> • Ecosystem threat status: 43% of ecosystem types threatened. • Ecosystem protection level: 33% of ecosystem types well protected, 59% not protected. • Key ecosystem services: nurseries for fish, recreation, raw materials such as reeds and sedges. • Key pressures: decrease in freshwater reaching estuaries, inappropriate land use and development, fishing and bait collection, pollution, invasive alien plants.
Coastal & inshore ecosystems	<ul style="list-style-type: none"> • Ecosystem threat status: 58% of ecosystem types threatened. • Ecosystem protection level: 9% of ecosystem types well protected, 16% not protected. • Key ecosystem services: fishing, recreation, ecotourism, protection from the impacts of storms. • Key pressures: fishing, coastal development, decrease in freshwater reaching the coast and sea, invasive alien plants.
Offshore ecosystems	<ul style="list-style-type: none"> • Ecosystem threat status: 41% of ecosystem types threatened. • Ecosystem protection level: 4% of ecosystem types well protected, 69% not protected. • Key ecosystem services: fishing, recreation, trade and transport. • Key pressures: fishing, mining (e.g. diamonds, oil and gas), shipping.

Source: Nel and Driver (2012)





Map 7. 1: South Africa's nine biomes
 Source: *Mucina and Rutherford (2006)*

7.3.1 Terrestrial ecosystems

South Africa has nine biomes which group together 440 vegetation types (Map 7.1). The main pressure on the country's terrestrial ecosystems is the loss of natural habitat due to land cover change as a result of human activities i.e. cultivation, mining, forest plantations and urban expansion. According to the NBA, 39 per cent of terrestrial ecosystem types are threatened (nine per cent critically endangered, 11 per cent endangered and 19 per cent vulnerable) (Nel & Driver 2012). The assessment also found that the Indian Ocean Coastal Belt, Grassland, Fynbos and Forest biomes have the highest proportions of threatened ecosystem types (Figure 7.3). The Grassland and Fynbos biomes have large numbers of ecosystem types and make up 24 per cent and six per cent of the country respectively. The Indian Ocean Coastal Belt and Forest biomes have small numbers of ecosystem types and make up a small proportion of the country, with Forest accounting for less than one per cent of South Africa's land area. It is evident that deteriorating terrestrial ecosystems are located mainly in areas of high economic activity.

The first national list of Critically Endangered and Endangered ecosystems was gazetted in December 2011; the NEM:BA provides a national list of ecosystems that are threatened and in need of protection. Given that nine per cent of terrestrial ecosystems in South Africa are Critically Endangered (Nel

& Driver 2012), this legislation is important as it enables consideration for their inclusion in, for example, IDPs of provincial and municipal authorities.

South Africa's land-based protected area network is inadequate for sustaining biodiversity and ecological processes with only 22 per cent of terrestrial ecosystem types well protected and 35 per cent completely unprotected (Nel & Driver 2012) (Map 7.2). This highlights the inadequate inclusion of a representative sample of all ecosystems. However, the total extent of the land-based protected area network has increased from just below six per cent in 2004 to 7.7 per cent in 2012, representing a 28 per cent increase.



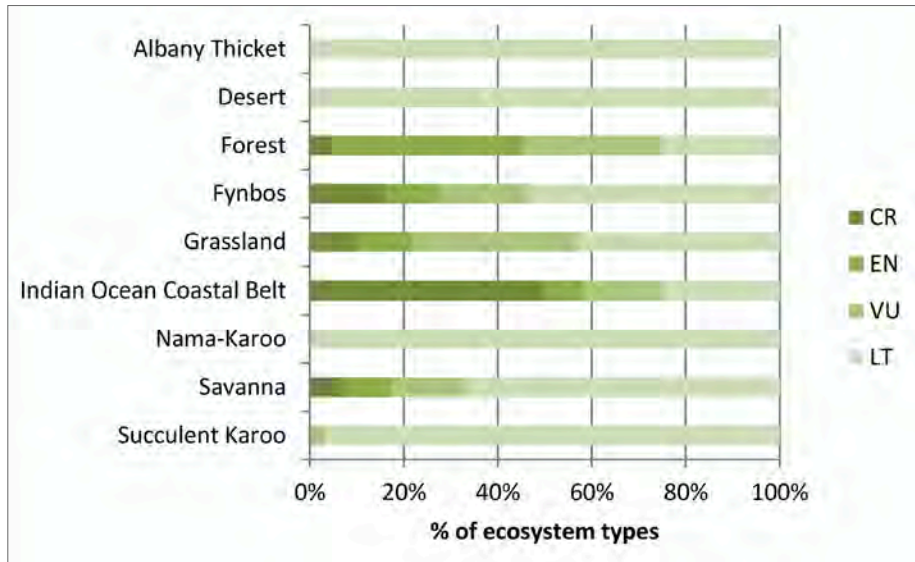
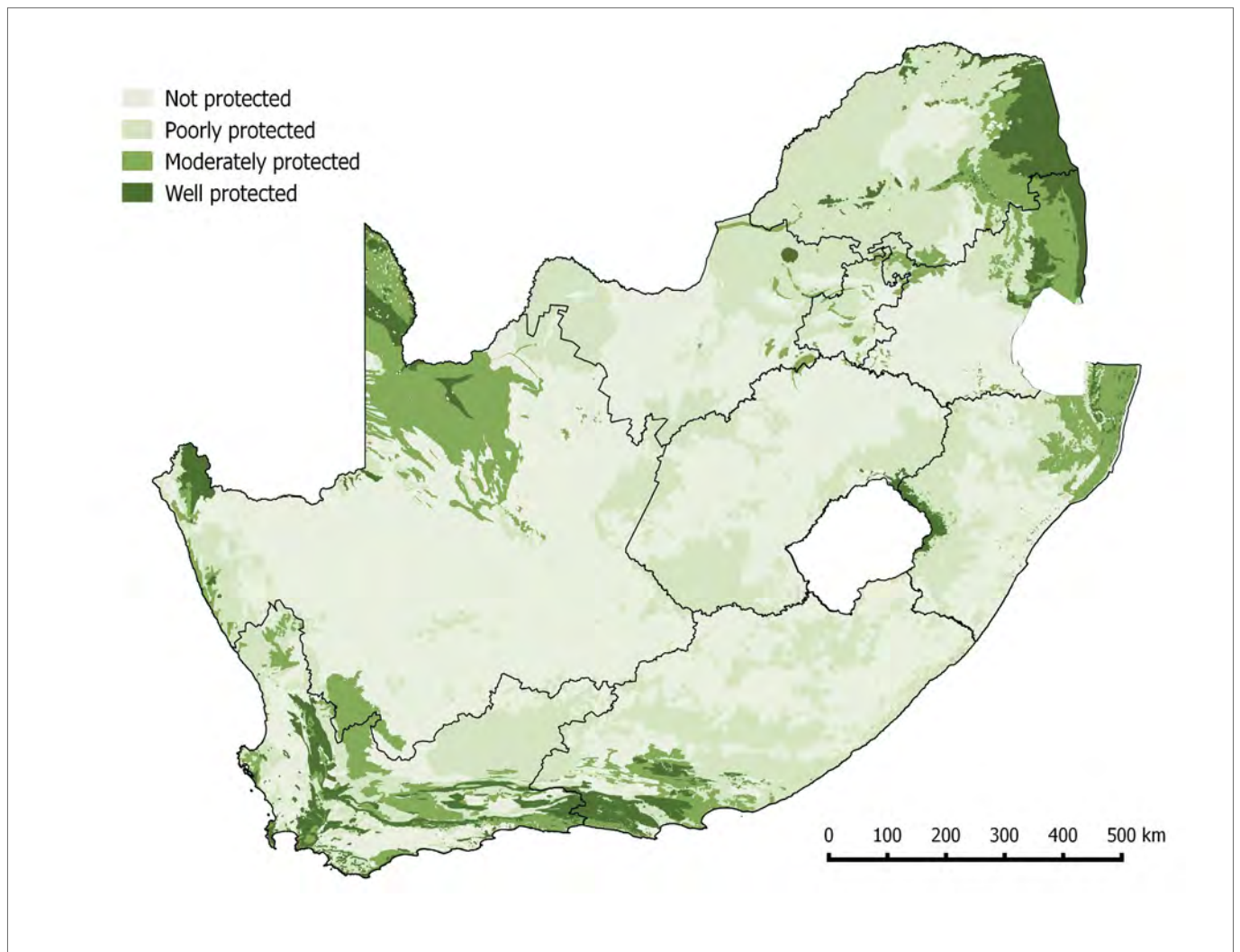


Figure 7. 3: Ecosystem threat status for terrestrial ecosystem types

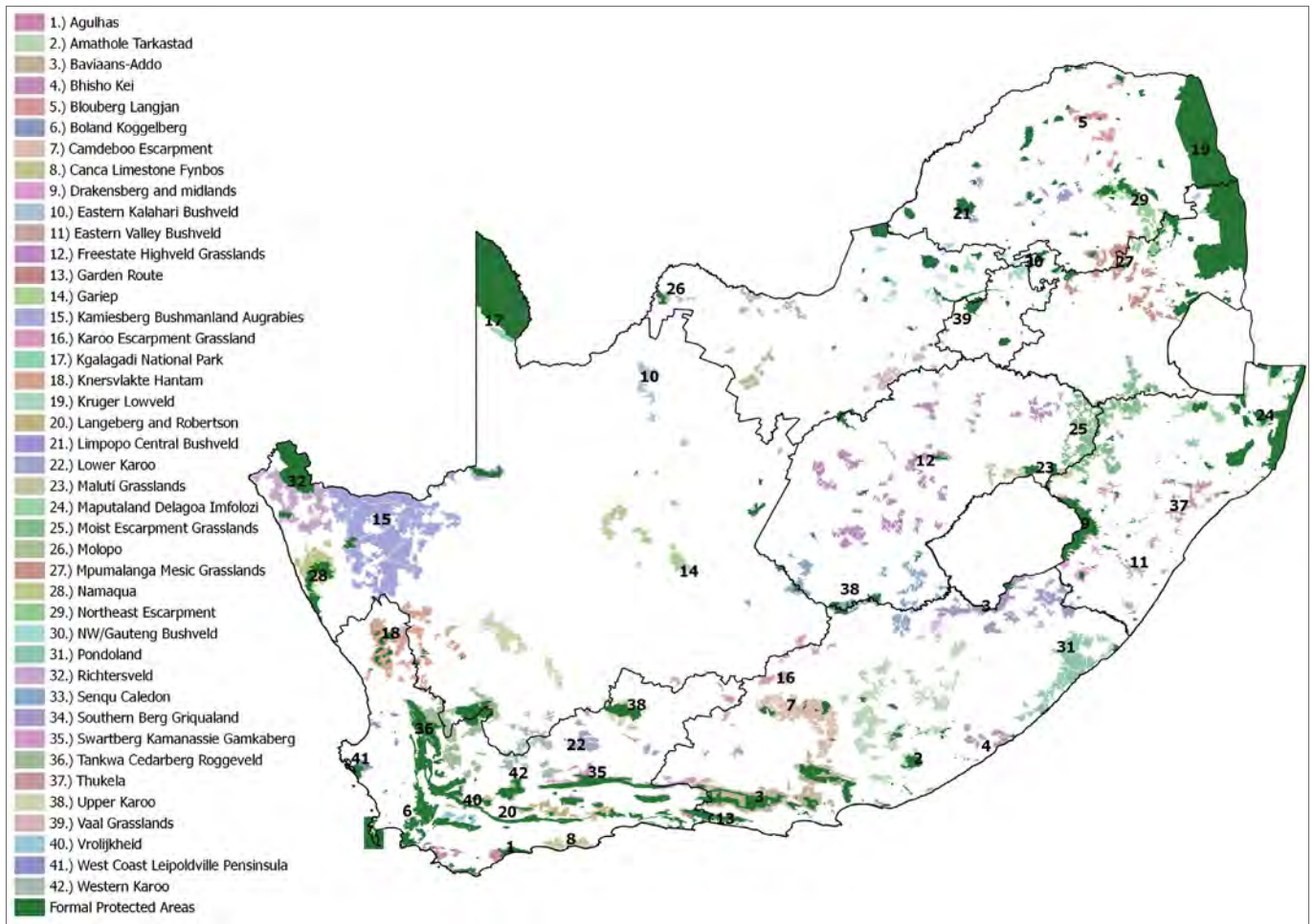
Key: CR: critically endangered, EN: endangered, VU: vulnerable, LT: least threatened

Source: Nel and Driver (2012)



Map 7. 2: Ecosystem protection levels for terrestrial ecosystems

Source: Nel and Driver (2012)



Map 7. 3: Focus areas for land-based protected area expansion in South Africa

Source: DEA (2009)

The National Protected Area Expansion Strategy (NPAES), 2008, (DEA 2009) aimed to raise the land-based protected area network from 6.5 per cent to a more ecologically viable target of 12 per cent. 42 focus areas have been identified where the protected area targets can best be met (Map 7.3).

Out of all the provinces, the Northern Cape (the heartland of the Nama Karoo and Succulent Karoo biomes) represents the largest land area required to meet the five-year protected area target of 833,000 ha (DEA 2009). Mpumalanga has the largest protected area network in the country followed by the Western Cape and Limpopo.

7.3.2 River ecosystems

River ecosystems are vital for supplying fresh water, South Africa's most scarce natural resource. River ecosystems in South Africa vary from sub-tropical in the north-east to semi-arid and arid in the interior, and to the cool temperate rivers of the Fynbos biome. There are 223 identified river ecosystems that represent the diversity of rivers in South Africa based on soil, geology, vegetation, climate, flow and the slope of the river channel (Nel *et al.* 2011).

The main pressure faced by river ecosystems is the abstraction of water from rivers and other alterations to the timing and quantity of flows, for example as a result of dams or transfer schemes between catchments. In addition, pollution of rivers is a serious and growing problem, often exacerbated by destruction of natural vegetation along river banks which

results in irreversible damage to rivers and their ability to provide ecosystem services. Of the 223 river ecosystems, 57 per cent are threatened, with 25 per cent Critically Endangered, 19 per cent Endangered and 13 per cent Vulnerable (Nel & Driver 2012). Only 35 per cent of main rivers, 57 per cent of tributaries and 47 per cent of both are in good condition. It has been found that main rivers work harder and are more heavily impacted by human activities than tributaries (Figure 7.4).



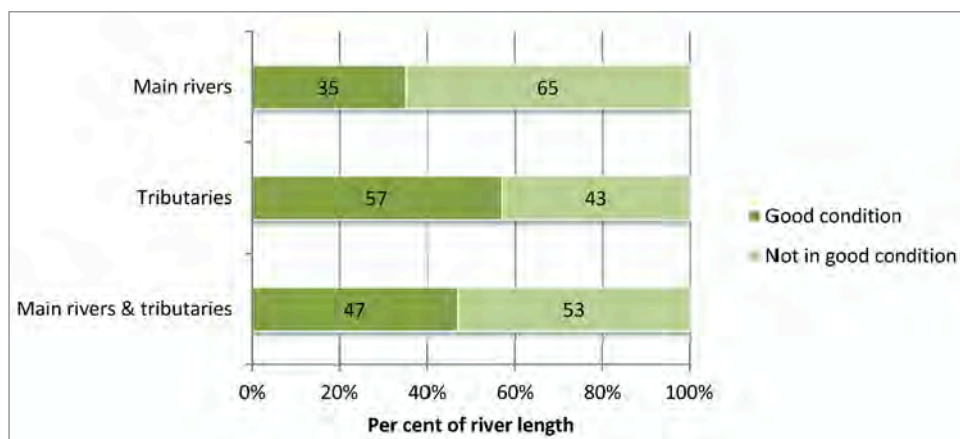


Figure 7. 4: Percentage of river length in good ecological condition (equivalent to A or B Present Ecological State category) for main rivers and tributaries

Source: Nel and Driver (2012)

River ecosystems in lowland areas are more highly threatened than those in higher-lying areas. This reflects intensive cultivation activities and urban developments that are concentrated on lowlands and the cumulative impacts on rivers as they flow from source areas to the sea.

Only 14 per cent of river ecosystems are well protected. Some 50 per cent of South Africa’s large river systems that lie in protected areas are degraded by upstream activities before entering the protected area. However, rivers that flow through protected areas are often in better condition downstream of the protected area than upstream, highlighting the positive impact that good land management can have on river condition and the important role of land-based protected areas in protecting rivers (Nel & Driver 2012).

7.3.3 Wetland ecosystems

Wetlands constitute about 2.4 per cent (2.9 million ha) of South Africa’s surface area and some 300,000 wetlands have been mapped (Nel & Driver 2012). Although wetlands are more resilient than many other ecosystems, wetlands are the most threatened ecosystem in South Africa (Nel & Driver 2012).

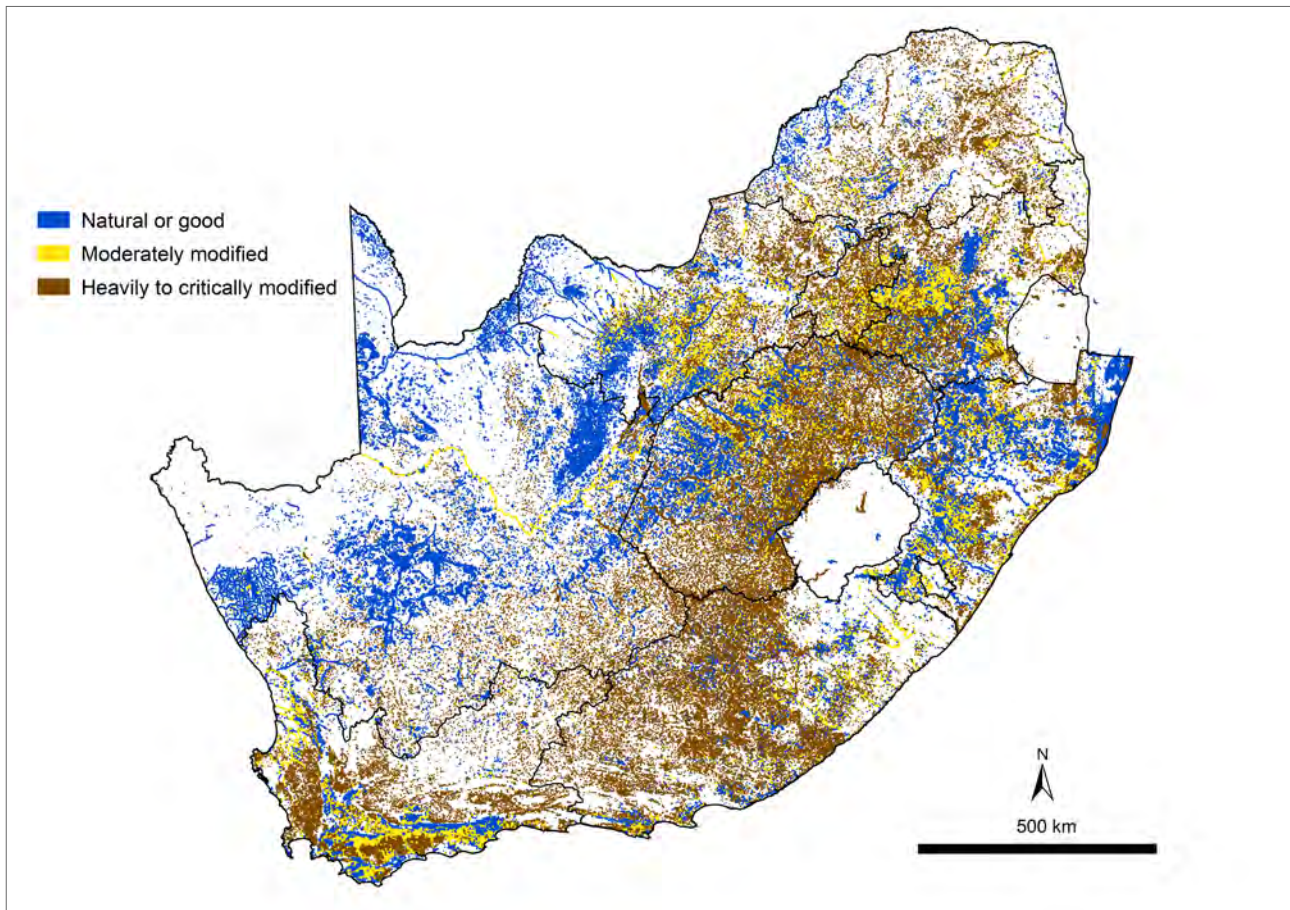
Sixty-five per cent of wetland types have been identified as threatened, 48 per cent are Critically Endangered, 12 per cent are Endangered and five per cent are Vulnerable. Floodplain wetlands have the highest proportion of Critically Endangered ecosystems (Nel & Driver 2012). The majority of healthy, intact wetlands are located in the northern and interior areas (plateau) of South Africa (Map 7.4).

The most prevalent on-site causes of wetland loss and degradation are cultivation (e.g. sugar cane, fruit orchards, and wheat), urban development, dam construction and poor grazing management causing erosion.

Only 11 per cent of wetland ecosystem types are considered to be well protected. A total of 71 per cent is not under any form of protection, which clearly calls for greater representation of wetlands in efforts to expand the protected area network in South Africa (Nel & Driver 2012).

By the end of December 2012, South Africa had designated 20 wetlands as Wetlands of International Importance (Ramsar Sites, as per the Ramsar Convention). Collectively, their surface area totals 553,178 ha. Of these, 18 are formally protected.





Map 7. 4: The condition of South Africa's wetland ecosystems

The colours show Blue = Natural or good; yellow = Moderately modified; brown = Heavily to critically modified

Source: Nel et al. (2011)

7.3.4 Estuarine ecosystems

Estuaries provide important nursery grounds for marine and estuarine biota. They supply fresh water and nutrients to the sea, which is necessary for marine life.

Estuaries face multiple pressures from human activities, often resulting from development too close to the estuary as well as the cumulative impacts of land uses throughout the catchment that feeds the estuary. Some 291 estuaries (170,000 ha) exist along South Africa's coast, with most located along Indian Ocean waters (Van Niekerk & Turpie 2012). Due to low and variable rainfall, estuaries are typically small, geographically restricted and sometimes closed to the sea. Seven of South Africa's 20 Ramsar Sites are estuaries.

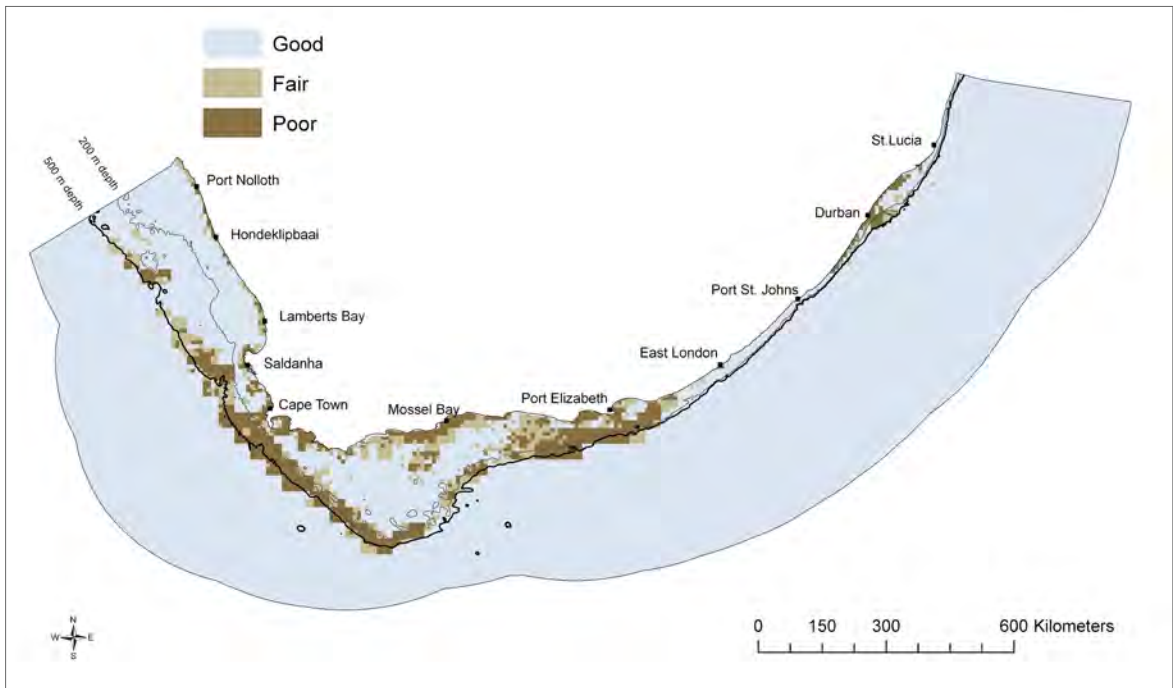
A total of 43 per cent of estuaries are threatened (39 per cent of estuarine ecosystem types are Critically Endangered, two per cent are Endangered and two per cent are Vulnerable) (Nel & Driver 2012). A total of 59 per cent have no protection, eight per cent are partially protected and the remainder (33 per cent) are well protected. The NBA has identified 120 estuaries as priorities through the first ever National Estuary Biodiversity Plan (Turpie *et al.* 2012), which recommends full or partial protection for these priority estuaries.

7.3.5 Marine and coastal ecosystems

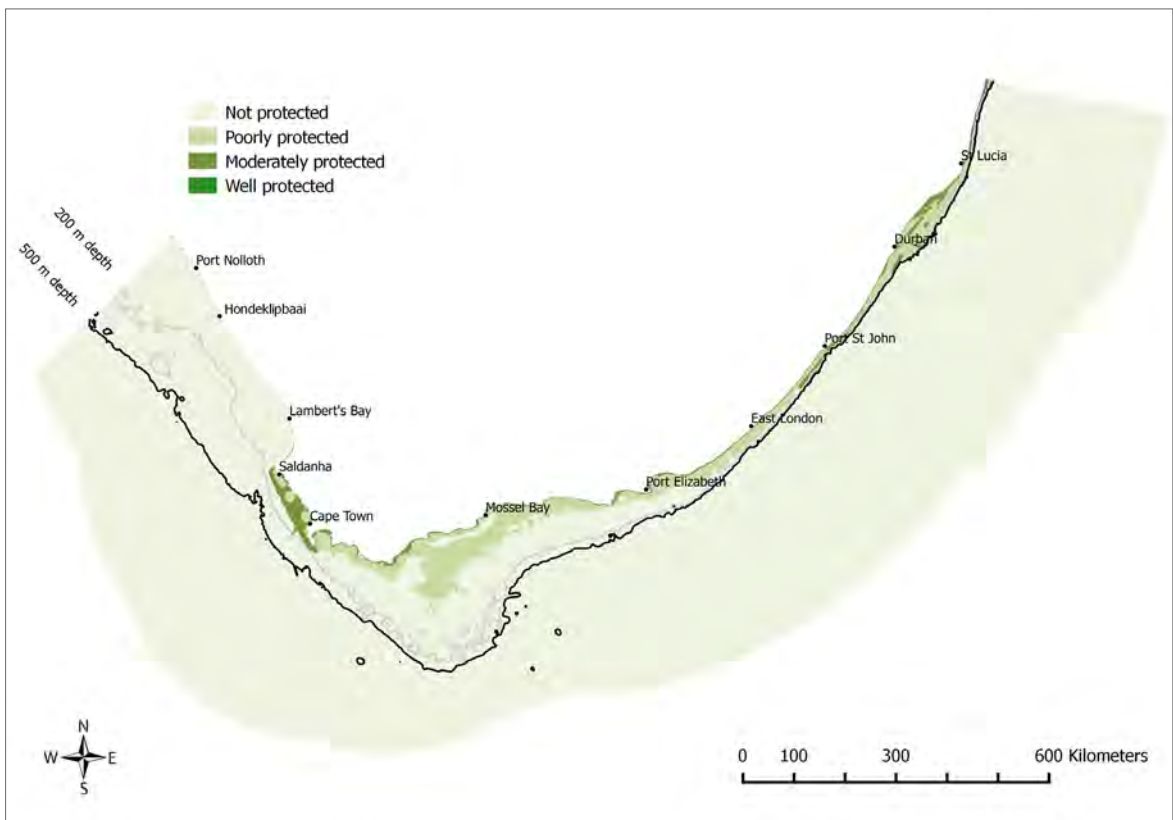
Pressures on marine and coastal ecosystems are multiple, and tend to be more intense along the coast and inshore, which are more accessible to people than the open ocean. For coastal

and inshore ecosystem types, 59 per cent are threatened (24 per cent Critically Endangered, ten per cent Endangered and 25 per cent Vulnerable), compared with 41 per cent of offshore ecosystem types (11 per cent Critically Endangered, eight per cent Endangered and 22 per cent Vulnerable) (Sink *et al.* 2012).

The greatest pressure on marine ecosystems is fishing. Other pressures include invasive alien species, mining, shipping, waste water discharge especially around cities and coastal settlements, and reduction in the flow of fresh water from rivers to the marine and coastal environment. These pressures tend to be more intense in coastal and inshore ecosystems, which are more accessible to human activity, and along the shelf edge, which is highly productive for fisheries. A map showing the ecological condition of the marine and coastal environment showed that large areas in the marine environment are good or fair, while some areas are heavily impacted in particular habitat types (Map 7.5).



Map 7. 5: Map of ecological condition in the coastal, inshore and offshore benthic (seabed) environment
 Source: Sink et al. (2012)



Map 7. 6: Map of ecosystem protection levels for coastal, inshore and offshore benthic habitat types, showing clearly that almost no offshore ecosystems are well protected
 Source: Sink et al. (2012)

Only nine per cent of coastal and inshore ecosystem types are well protected; though much of the remainder has some form of protection with only 16 per cent not protected at all. In the offshore environment, only four per cent of ecosystem types are well protected and 69 per cent are not protected at all (Nel & Driver 2012) (Map 7.6). On the whole however, South Africa's coastline is regarded as well protected compared to most other developing countries (Griffiths *et al.* 2010).

7.4 CAUSES OF BIODIVERSITY LOSS

Irreversible loss of natural habitat is the single biggest cause of loss of terrestrial ecosystems in South Africa. Loss of natural habitat occurs as a result of, for example, cultivation, mining, timber plantations, urban and coastal sprawl. Such loss of habitat also impacts negatively on the functioning of catchments, and thus on the condition of rivers, wetlands and estuaries.

7.4.1 Ecosystem degradation

The main drivers of ecosystem degradation include invasive alien species, over-exploitation of biodiversity resources and ecosystem services and climate change. It is important to note that in some cases ecosystems can recover from moderate degradation if the cause of the degradation is removed, making degradation different from outright loss of natural habitat (Nel & Driver 2012). To date, there is no complete map of land degradation for the country. This means that

82 per cent of South Africa that appears as 'natural' in the land-cover map illustrated in Chapter 6: Land, includes areas that are degraded to varying degrees.

7.4.1.1 Alien and invasive species

Alien and invasive species are generally known to erode natural capital, compromise ecosystem stability and threaten economic productivity. The consequences are not only ecological but often also economic, for example, when invasive plants reduce the productivity of rangelands and increase the risk and severity of fires, or when invasive insects damage crops (Nel & Driver 2012).

According to the NBA (Nel & Driver 2012), known invasive alien species in the country include: 660 plant species, six mammal species, ten bird species, about six reptile species, approximately 22 freshwater fish species, at least 26 mollusk species, at least seven crustacean species, and more than 70 invertebrate species (Nel & Driver 2012).

An estimated 20 million hectares (16 per cent) of South Africa is invaded, an area that has dramatically increased in extent since the mid-1990s (Kotzé *et al.* 2010). The rate of increase is reported to be relatively small (1,736 million hectares in 1996 and 1,813 million hectares in 2008) (van Wilgen *et al.* 2012). The National Alien Plant Survey 2010 recorded well established invasive plant species as detailed in Table 7.2.

Table 7. 2: Well-established invasive alien plant species surveyed in the National Invasive Alien Plant Survey 2010

Species or group of species	Common name	Area occupied (hectares)	Area occupied (condensed hectares*)
<i>Acacia mearnsii/dealbata/baileyana</i>	Wattle	7,475,944	470,588
<i>Eucalyptus spp.</i>	Gum	6,103,288	271,605
<i>Opuntia spp.</i>	Prickly pear	3,422,575	94,498
<i>Pinus spp.</i>	Pine	3,362,606	130,822
<i>Populus spp.</i>	Poplar	2,381,438	57,722
<i>Salix Babylonica</i>	Weeping willow	2,337,200	37,296
<i>Prosopis spp.</i>	Mosquite	1,832,150	364,540
<i>Melia azedarach</i>	Syringa	1,664,750	14,157
<i>Chromolaen odorata</i>	Triffi weed	1,489,919	101,168
<i>Solanum mauritianum</i>	Bugweed	1,091,238	40,011
<i>Agave spp.</i>	Agave	875,813	11,277
<i>Cereus jamacau</i>	Queen of the night	839,175	10,899
<i>Acacia cyclops</i>	Rooikrans	763,963	54,415
<i>Lantana camara</i>	Lantana	571,919	31,959
<i>Rosa rubiginosa</i>	Eglantine	408,956	11,674
<i>Senna didymobotrya</i>	Peanut butter cassia	454,581	11,451
<i>Acacia saligna</i>	Port Jackson	444,169	49,790
<i>Caesalpinia decapetala</i>	Mauritius thorn	332,000	8,774
<i>Hakea spp.</i>	Hakea	327,706	35,865
<i>Psidium guajava</i>	Guava	303,031	6,205
<i>Jacaranda mimisifolia</i>	Jacaranda	277,738	4,186

Species or group of species	Common name	Area occupied (hectares)	Area occupied (condensed hectares*)
<i>Atriplex nummularia</i>	Old man saltbush	235,063	5,824
<i>Cestrum spp.</i>	Inkberry	127,613	7,138
<i>Arundo donax</i>	Spanish reed	156,731	3,185
<i>Acacia melanoxylon</i>	Blackwood	97,606	2,728
<i>Tamarix chinensis</i>	Chinese tamarisk	88,006	2,116
<i>Sesbainia punkea</i>	Red sesbania	48,756	1,663
TOTAL			1,841,556

Source: Nel and Driver (2012)

* Equivalent to 100% canopy cover. Invasive plant species occur at varying densities, and different species occur at different average densities. Condensed hectares take the density of infestation into account, giving a value that can be compared across different species that occur at different densities.

An estimated R6.5 billion worth of ecosystem services is lost each year as a result of invasive alien plants, a value that would be more than six times higher had no management of these plants been carried out (SANBI 2012). Details on the interventions by the Working for Water programme can be found in Chapter 8: Inland Water.

7.4.1.2 Over-exploitation

Due to the multifaceted value of South Africa's biodiversity, many plants and animals are subject to exploitation. A total of 192 plant taxa are known to be threatened by direct use or harvested at levels that are not sustainable (Pfab 2011) (Box 7.1). Of these, 65 per cent of exploited plant taxa are collected for horticultural use and 38 per cent are for medicinal purposes (Pfab 2011).

The greatest direct use impacts for birds are killings by humans (such as intentional poisoning), the live bird trade and traditional medicine. For fish species, recreational angling and commercial fisheries are key drivers. For invertebrates the collector trade is a concern, for mammals hunting, persecution and traditional medicine, and for reptiles the pet trade and traditional medicine.

Indigenous plants are actively traded in South Africa in formal and informal markets. Market trade is predominantly for traditional medicinal use, personal hygiene products, cosmetics, complementary medicines, food flavourants and essential oils. The estimated size of wild harvesting and the cultivation industry for use in the formal market is between 2,000 and 2,800 tonnes per year and the average weighted price for material is R50/kg. The value of the use of indigenous resources in personal hygiene products, cosmetics, complementary medicines, food flavourants and essential oil products is therefore between R41 million and R57 million per year. The resources most utilized in this sector are rooibos (*Aspalathus linearis*), bitter aloe (*Aloe ferox*), kalwerbossie/rabassam (*Pelargonium sidoides*), and honey (DEA 2012a).

Most of the indigenous plants in trade are harvested from wild populations, with popular species becoming locally extinct and being traded at very high prices. For example, *Scilla natalensis* sells for R53/kg and a less common species such as *Salacia kraussii* sells for R4,800/kg (Mander *et al.* 2007).

7.4.1.3 Climate change

The effect of climate change is expected to exacerbate biodiversity loss and ecosystem degradation (DEA 2011). In this respect, climate change is likely to drive the increase of extinction risk for species in limited climatic ranges and restricted habitats, and erode ecosystem processes (Dawson *et al.* 2011). According to the Centre for Agricultural Bioscience International Working Paper 2010, climate change can facilitate the introduction of new alien invasive species that may invade new regions. It is therefore important to understand the potential resilience of biomes and ecosystems to climate change as well as their role in helping humans to cope with the impacts thereof. Resilience means the ability of a biome, landscape or ecosystem to absorb change and reorganize itself in order to retain its character and ecological functioning (Sink *et al.* 2012).

The NBA mapped the areas where biomes are most likely to be at risk as a result of climate change as well as areas where biomes are likely to be more stable. Areas of biome stability present opportunities for new expanded protected areas. These areas of biome stability in the face of climate change are mapped in Map 7.7.

Within areas of biome stability as well as areas where biomes are most likely to be at risk, some features in the landscape are more likely to support resilience of biodiversity to climate change than others. Such features include riparian corridors and buffers, coastal corridors, areas with temperature, rainfall and altitudinal gradients, areas of high diversity, areas of high plant endemism, refuge sites including south-facing slopes and kloofs, and priority large unfragmented landscapes. The NBA combined these features to provide a map of areas important for resilience of biodiversity to climate change at the landscape scale. Such areas must be managed and conserved in order for them to continue to provide ecosystem services.

Box 7. 1: Wildlife poaching and trafficking (rhino horn case study)

Two rhinoceros species are found in South Africa, the white rhino (*Ceratotherium simum*) and black rhino (*Diceros bicornis*). The white rhino was on the brink of extinction towards the end of the 19th century and a subsequent remarkable recovery of the population is one conservation success story.

The black rhino was for most of the 20th century, the most stable of both rhino species. However, the population collapsed between 1970 and 1990, decreasing in size by some 90% as a result of large scale poaching. Since then, there has been a slow but steady increase the black rhino remains listed as Critically Endangered on the IUCN Red List (<http://www.iucnredlist.org>).

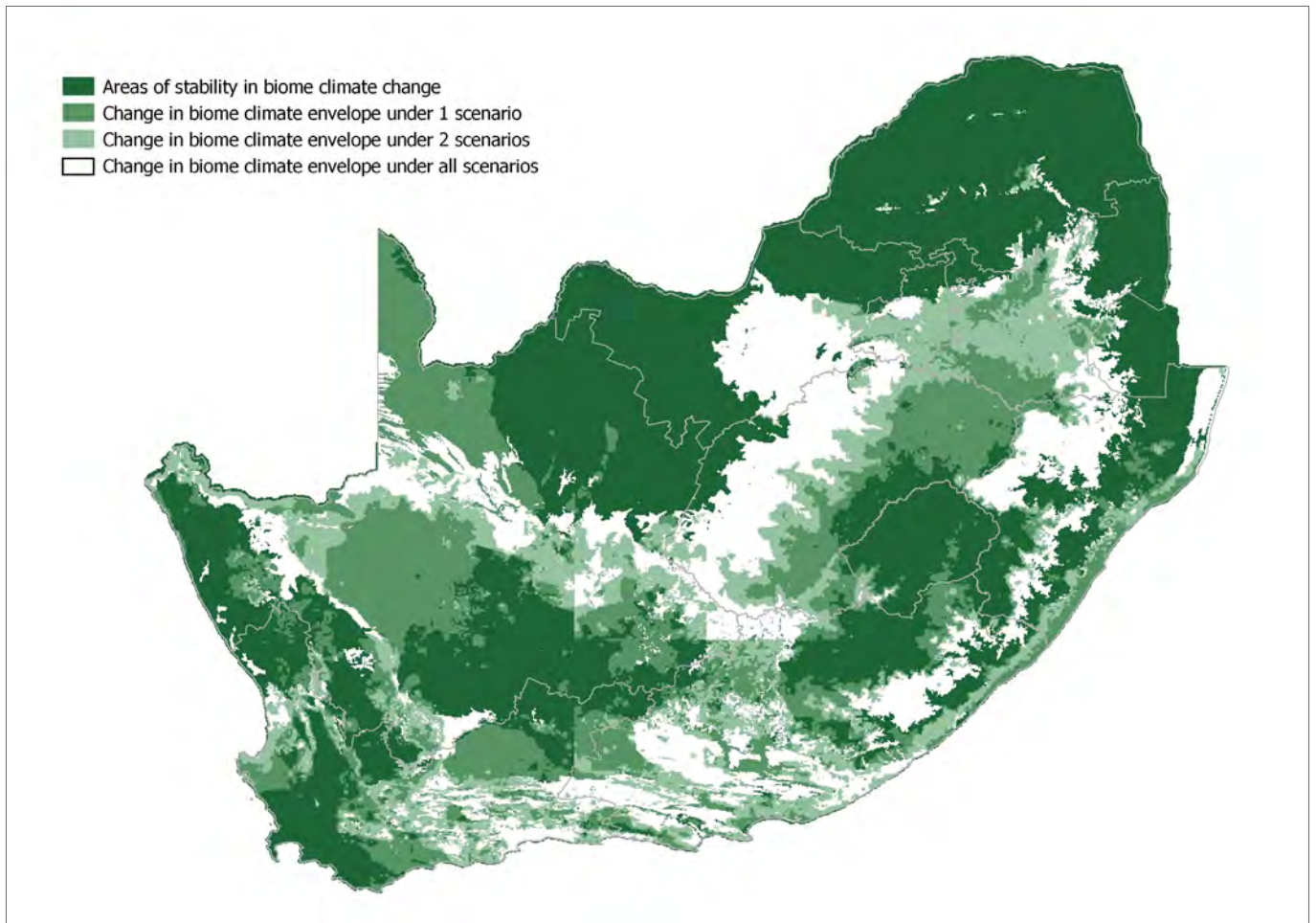
Due to a significant upsurge, the Minister of the then Environmental Affairs and Tourism published a national moratorium (13 February 2009) on *“the sale of individual rhino horns and any derivatives or products within South Africa to ensure that no legally obtained horns end up in the illegal trade”*.

In 2009, 122 individuals were killed illegally. A further 333 and 448 rhino were illegally killed during 2010 and 2011 respectively. In 2012 a further 668 rhinos were killed illegally, 425 of which came from the Kruger National Park (http://www.environment.gov.za/?q=content/media_releases).

Almost all rhino horn obtained through illegal killing of rhinos in South Africa is smuggled to East and South-East Asian countries. The overwhelming surge in demand is thought to be fuelled by increasing affluence in East Asian countries and linked to the growing number of East and South-East Asian nationals living in Africa. The illegal trade is being conducted by highly organized international supply chain syndicates.

In response to the rhino poaching epidemic, several interventions are being implemented in accordance with the National Strategy for Safety and Security of Rhino. One is to increase policing and jail sentences for poachers and rhino horn traffickers (to a level similar or higher to those for drug trafficking). Another is to educate the users of rhino products about the inefficacy of rhino horn as a medicine.





Map 7. 7: Areas of biome stability in the face of climate change

The darkest areas are predicted to stay within their current climate envelopes under all three climate scenarios, and hence are most likely to maintain a stable ecological composition and structure. The white areas are areas where biomes are most at risk of change in composition and structure in the face of climate change.

Source: Nel and Driver (2012)

Species have definite habitat requirements, relating to factors such as temperature, pH, altitude and rainfall. Many studies show that the geographic ranges of South African endemic species may contract due to climatic changes (e.g. Midgley & Thuiller 2010). Consequently, this may affect the quantity and quality of habitats and ecosystems. By 2050, the populations of 30 per cent of South African species may be reduced, exposing them to significantly higher levels of extinction risk (DST 2010).

The National Freshwater Ecosystem Priority Areas (NFEPA) project highlighted the importance of large rivers greater than 100 km, indicating that these large rivers and other freshwater ecosystem priority areas form ideal ecological corridors for ecosystem-based adaptation to climate change and that their explicit identification is proving useful to projects focusing on terrestrial and freshwater biodiversity planning and climate change adaptation. The NFEPA also highlighted the role of healthy freshwater ecosystems in supporting resilience and adaptation to climate change, indicating that healthy natural ecosystems can increase resilience to the impacts of climate change, by allowing ecosystems and species to adapt as naturally as possible to changes and by buffering human settlements and activities from the impacts of extreme weather events (Nel *et al.* 2011).

The NPAES identified 42 priority areas for protected area expansion, highlighting their contributions to ecological sustainability and climate change resilience (DEA 2009).

South Africa's ecosystem goods and services serve as important inputs into the national and global economy. If the impacts of biodiversity loss and declined ecosystem health are left unchecked, then opportunities for deriving benefits from these economic and social assets may be lost.

The economic consequences of biodiversity loss are considerable. During 2007 and 2008, selected ecosystem services in South Africa were valued at an estimated R73,000 million per annum, excluding marine ecosystem services (Turpie *et al.* 2008). Revenue generated from tourism alone was estimated to be worth R21,000 million per annum (Table 7.3).

Table 7. 3: Valuation of ecosystem services

Ecosystem service	R millions
Tourism	21,000
Grazing	18,094
Carbon sequestration	8,649
Erosion control	8,319
Pollination	5,684
Natural resources	4,895
Crop pest control	4,380
Nursery value	976
Flow regulation	440
Water treatment	202
Bio-prospecting	178
Blackfly control	77
Scientific	15

Source: Turpie et al. (2008)

In addition, the contribution of wild pollinators to the Western Cape deciduous fruit industry was estimated to be worth between US\$49 million and US\$311 million annually (Allsopp *et al.* 2008). de Wit *et al.* (2010) also estimated that the ecosystem services of natural hazard regulation, tourism and recreation, and support to the film industry is worth between R1.5 and R4,000 million annually in the City of Cape Town. The Annual Tourism Report 2005 states that the Total Foreign Direct Spend in South Africa was R56,000 million, or R28,000 million more than gold exports, placing tourism in a prime position as one of the key economic drivers in South Africa. The game ranching industry is estimated to generate R7,700 million a year and provides 100,000 employment opportunities while traditional medicinal plants are estimated to be worth about R3,000 million per annum and employ over 130,000 people (Mander *et al.* 2007, quoted in Nel & Driver 2012).

The direct use of forest resources consumed is worth at least R8,000 million per year with between nine and 12 million people using fuel wood, wild fruits and wooden utensils obtained from forests and savannahs (Shackleton 2004, quoted in Nel & Driver 2012).

7.5 RESPONDING TO BIODIVERSITY LOSS

Responding to biodiversity loss ranges from traditional measures i.e. State-owned protected area expansion to more integrated measures such as land use planning, mainstreaming or stewardship. South Africa is doing ground-breaking work to conserve and manage biodiversity in the wider landscape outside State-owned protected areas in production landscapes (for example agriculture or mining) and on privately owned land. In addition, ecosystem-based adaptation to climate change and restoration programmes provide an additional opportunity to respond to biodiversity loss.

It is important to note that the failure to respond to biodiversity and ecosystem challenges comes with costs to people and the economy. These costs include:

- Inappropriate or unsustainable development;
- Increased number of threatened habitats, species and ecosystem services loss;
- Significant landscape-level changes to land productive potential and biodiversity loss due to inappropriate and insufficient management of ecosystem services (e.g. fire and invasive alien plant management);
- Less freshwater from catchments, poor river and estuarine health resulting in water quality and socio-economic impacts; and,
- Poor response to a changing climate.

EIAs, planning and management interventions, and spatial planning strategies that are integrated into IDPs or SDFs at the municipal or provincial level, are increasingly being utilized to avoid, minimize, mitigate or offset impacts of biodiversity loss and declines in ecosystem health (Biodiversity Advisor 2012).

Over the last five years, one of the key responses to biodiversity loss and ecosystem degradation has been the identification of spatial biodiversity priorities. The identification of spatial biodiversity priorities is based on the best available scientific data and methodologies in order to guide responses in a systematic and strategic manner. For example, all provinces have developed or are developing Provincial Spatial Biodiversity Plans that identify critical biodiversity areas and Ecological Support Areas. These maps and accompanying guidelines are used to inform IDPs, SDFs and EIAs. Since 2009, SANParks has expanded protected areas under its jurisdiction using the NPAES (DEA 2009) as a guide for the consideration of priority biomes and ecosystem types (SANParks 2009 and 2010).

7.5.1 Institutional and enabling environment

The capacity to ensure the protection and sustainable use of South Africa's natural resources, as per Section 24 on the Constitution, is made possible through the institutional environment.

The biodiversity sector in South Africa is well established. The DEA is the primary custodian of the environment in South Africa, but the responsibility is shared. Biodiversity is an important function of other national departments such as the DWA, Department of Agriculture, Forestry and Fisheries (DAFF), and a number of other institutions, public and private (civic) at national, provincial and local level.

The public entities reporting directly to the DEA are the following:

- South African National Biodiversity Institute (SANBI);
- South African National Parks (SANParks);
- iSimangaliso Wetlands Park Authority; and,
- Provincial conservation authorities whose work is co-ordinated by DEA.

Reviews of annual reports of statutory entities that currently report to the DEA show year-to-year increases in government financial support with the exception of SANParks. Consequently, SANParks has reduced acquisition of land

to expand the protected area network (SANParks 2009 and 2010). However, since 2010/11 State financial support to SANParks has increased from R174,7 million to R526,9 million in 2013/14 financial year (ENE 2013).

SANBI is mandated to lead and co-ordinate research, to monitor and report on the state of South Africa’s biodiversity, to make information and knowledge available to a wide range of users, and to advise other Organs of State on matters related to biodiversity, amongst other functions.

SANParks, established through the NEM:PAA, is the lead statutory conservation authority. Both these institutions, together with key partners in provincial government and other statutory and non-statutory stakeholders, play active roles in the conservation and management of South Africa’s biodiversity and protected areas.

South Africa has a total of 495 land-based areas protected by the State, totaling an area of 4,718,835.23 ha (Table 7.4). However, the vast majority of these are nature reserves (418) which include provincial nature reserves, local reserves, protected natural environments, development areas, forest wilderness areas and forest nature reserves.

In an evaluation of the management effectiveness of protected areas in South Africa, it was found to fall below international standards (Cowan *et al.* 2010). In contrast, however, a global study of protected areas on different continents found that protected areas generally set too high standards and tend to identify more priorities than what is in fact possible to achieve (Timko & Innes 2009).

Table 7. 4: Protected areas in South Africa according to the Register of Protected Areas

Protected area type	Number	Area (ha)
World Heritage Sites	8	298,551.00
Special Nature Reserves	2	335,000.00
National Parks	22	885,775.44
Nature Reserves	418	2,131,981.53
Marine Protected Areas	29	440,269.86
Mountain Catchment Areas	16	627,257.40
TOTAL	495	4,718,835.23

Source: DEA (2012b)



7.5.2 Human capital development

South Africa has a shortage of skills to manage its biodiversity and even as unemployment continues to climb, companies, universities and government agencies are unable to recruit suitably qualified biodiversity managers and scientists. Challenges include vacant posts, high staff turnover and an inability to attract and retain suitably qualified individuals (BHCD 2010).

A South African study addressing employment and human capacity in the wide field of biodiversity conservation and commercialization identified fundamental employment inequalities.

It was found that the per centage of senior professionals in biodiversity sub-sectors in national government is disproportionately high compared to provincial and local government (Vass *et al.* 2009). This suggests a need for greater balance and more even deployment of skills in the field of biodiversity.

These challenges prompted the development of the Human Capital Development Strategy for the Biodiversity Sector in South Africa (DEA 2010a). The Strategy has a twenty year horizon. It addresses attraction, up-skilling, retention and macro-conditions, and reaches across the sites of human capital development, from schooling through higher education institutions into the workplace.

7.5.3 Knowledge and awareness

Public awareness and education, knowledge management and the establishment of comprehensive biodiversity information systems (data resources and tools) have progressed greatly since the 2006 SAEO (DEAT 2006). Ease of accessibility by online access and fast downloads, updating capacity, and needs of end-users are some of the criteria that underlie this progress.

Flagship examples of knowledge systems, to name a few, include SANBI’s online Biodiversity Advisor (Biodiversity Advisor 2012) and Biodiversity GIS (2012) which offer cost and time-saving benefits in accessing high quality information (species, ecosystems, threat status, protected areas and so forth) (Box 7.2).

Similarly, the South African Environmental Observation Network (SAEON), led by the National Research Foundation (NRF) under the governance auspices of the DST, is a useful one-stop-shop for biodiversity-related information sourced from departments, universities, science institutions and industrial partners.

The Southern African Plant Invaders Atlas (SAPIA) project was established more than thirty years ago. Distribution data have provided baseline information for important national biodiversity value adding projects associated with invasive alien plants, such as the Working for Water (WfW) Programme (DEA 2012c).

Box 7. 2: Custodians of Rare and Endangered Wildflowers

The Custodians of Rare and Endangered Wildflowers (CREW) programme is a programme jointly implemented by the Botanical Society of South Africa and SANBI. CREW focuses on involving civil society volunteers in the monitoring and conservation of threatened plant populations. CREW volunteers are local people from regions that were identified in provincial spatial biodiversity plans and bioregional plans as critically threatened areas in need of conservation.

The CREW programme was initiated in 2003 in response to the need to monitor and protect unique botanical diversity present in this country. CREW volunteers attend to a small area of the country and monitor the dynamics of plants confined to that area. They are trained to identify threatened plants and basic monitoring skills to ensure accurate data collection. Over 300 volunteers are involved in the programme nationally. CREW has established 18 groups in four provinces in South Africa.

The information collected by CREW volunteers helps SANBI to update the conservation status of plant species and is used to identify which species are most in trouble and in need of drastic intervention. CREW data is also used in EIAs to influence development decisions.

CREW data are integrated into fine-scale biodiversity plans. Amongst other uses, these help municipalities determine which areas (and how) should be represented in their integrated development and spatial development frameworks. In addition to the use of monitoring data, volunteer groups also work directly with their respective municipalities and conservation extension officers to achieve the conservation of specific sites with high concentrations of threatened plant species through biodiversity stewardship programmes.

Since the inception of the CREW programme, volunteers have discovered 18 species new to science, rediscovered 13 species thought to be extinct and collected population data on 825 species of conservation concern.

- Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS), 1979;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973;
- The Ramsar Convention on Wetlands of International Importance, 1971;
- United Nations Educational, Scientific and Cultural Organisation's Man and Biosphere Programme, 1998;
- Convention concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention), 1972;
- United Nations Convention to Combat Desertification (UNCCD), 1993;
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) 2012;
- SADC Protocol on Wildlife and Law Enforcement Article, 1999;
- SADC Protocol on Forestry, 2002;
- SADC Protocol on Shared Water Courses, 2000;
- SADC Protocol on Development of Tourism, 1998;
- SADC Protocol on Trade, 1996; and,
- SADC Protocol on the Facilitation and Movement of Persons, 2005.

The CBD Global Biodiversity Outlook 3 explains that the 2010 biodiversity targets have not been met at the global level. None of the twenty-one sub-targets accompanying the overall target of significantly reducing the rate of biodiversity loss by 2010 can definitively be said to have been achieved globally, although some have been partially or locally achieved. Despite an increase in conservation efforts, the state of biodiversity continues to decline, according to most indicators, largely because the pressures on biodiversity continue to increase. The 10th Meeting of the Conference of the Parties (CoP 10) adopted the new strategic plan for the period 2011 to 2020 with 20 goals and targets which became globally known as the Aichi Targets.

The challenge in South Africa, as with all other countries, is the implementation of international obligations, monitoring and enforcement associated with co-ordinating the vast number of overlaps and gaps associated with international agreements, governance jurisdictions and legislation. However, the process of improvement is continuous and dynamic, as is evident from reforms that are underway in existing legislation, the policy environment, frameworks, plans and programmes.

7.5.4 International agreements and obligations

South Africa is signatory and party to numerous international conventions, treaties and protocols that relate to wide-ranging aspects involving biodiversity and ecosystem health on land and at sea. These commit South Africa to sustainable development and inter-country co-operation on matters of global interest. These agreements have been translated into various national policies and legislation.

The international agreements and obligations most relevant to South Africa's biodiversity and ecosystems include:

- The Convention on Biological Diversity (CBD), 1995;
- Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of the Benefits Arising from their Utilization, 2010;
- Cartagena Protocol on Biosafety, 2000;

7.5.5 National policy, legislation and institutions

The responsibility for biodiversity and ecosystem health is primarily under the auspices of the DEA and provincial conservation authorities, but is increasingly also becoming shared, where relevant, with other government departments at the national, provincial and municipal (local) level. The NEM:BA provides for the management and conservation of biodiversity within the framework of the NEMA. Associated with it since 2007, are the regulations for listed Threatened or Protected Species, the Bio-prospecting, Access and Benefit-Sharing (BABS) Regulations (2008), the CITES Regulations (2010) and a list of Threatened Terrestrial Ecosystems (2011).

The NEM:BA provides for the publication of bioregional plans, which are maps of Critical Biodiversity Areas and accompanying

land use guidelines at a local scale, and for the development of Biodiversity Management Plans (BMPs) for species and ecosystems, which can involve a wide range of stakeholders. Additionally, norms and standards have also been published relating to the conservation and management of South Africa's biodiversity and its components, including, amongst others, the Norms and Standards for the Management of Elephants in South Africa, Norms and Standards for the Development of Management Plans for Species, Norms and Standards for Marking of Rhinoceros Horn and Hunting of White Rhinoceros for Trophy Hunting Purposes.

NEM:PAA is the primary legislation for the establishment and management of South Africa's protected area network. Other relevant legislation includes the World Heritage Convention Act (No 49 of 1999) for globally recognized heritage sites, the Marine Living Resources Act (No 18 of 1998) for marine protected areas, the National Forests Act (No 84 of 1998) for forest protected areas, and the Mountain Catchment Areas Act (No 63 of 1970).

The Genetically Modified Organisms Act (No 15 of 1997) (administered by DAFF) provides for the responsible development, production, use and application of GMOs. It ensures that activities such as importation, production, release and distribution are carried out in a way that limits possible harmful consequences to the environment and society.

The Patent Amendment Act (No 20 of 2005) is linked to the NEM:BA and it provides legal requirements for an applicant for a patent to complete specifications relating to the utilization of indigenous biological resources and their associated traditional knowledge in an invention and also attach proof of compliance with the NEM:BA in a form of permit. Biodiversity policies broadly aim at integrating biodiversity management and conservation goals with new and emerging requirements for development; South Africa has made strong commitments to fulfil this.

The National Biodiversity Strategy and Action Plan 2005 (NBSAP), the White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity (Notice 1095 of 1997), the National Biodiversity Framework (RSA 2009), and the NPAES (DEA 2009) are key components of the national policy and legal context.

In addition, South Africa has developed a National Climate Change Response White Paper 2011 which focuses on mitigation and adaptation and recognizes the threats to biodiversity posed by climate change.

7.5.6 Biodiversity value adding programmes

7.5.6.1 People and Parks

The People and Parks Programme in South Africa arose from the World Parks Congress held in Durban in 2003. The Programmes over-arching goal is to address the realization of tangible benefits by communities by paving the way for the establishment of protected areas (People and Parks Programme; DEA 2012d). Implemented by all protected area management authorities, the Programme hosts and facilitates active participation of rural communities and all people with an interest in protected areas.

To date, the Programme has hosted five national conferences which shape the goals of the Programme. The outputs of these conferences include the identification of activities, processes, action plans and agreements that capture the interface between conservation and communities. Good progress has been made in bringing about a shared understanding and a common vision for protected areas in South Africa.

The People and Parks Programme also provides an element of education and capacity building to previously impoverished communities. This is an effort that is being rolled out at both national and provincial spheres of government which aims at



making sure that local communities actively participate in the management, decision-making and protection of protected areas in which they now share benefits.

The Kids in Parks is a flagship programme focusing on education and capacity building that has been implemented across the country for nine years. To date, more than 36,000 learners and educators were afforded an opportunity to access protected areas for educational purposes.

The People and Parks Programme has an ambitious and effective manual called 'People and Parks Toolkit'. This is a tool that has been utilized by management authorities to mend the relationship between protected area managers and local communities. To date more than 1,000 beneficiaries have gone through the toolkit training.

7.5.6.2 Bioregional programmes

Bioregional programmes are multi-sectoral, initiatives aimed at managing and conserving biodiversity in threatened biomes and ecosystems based on a landscape approach. The NEM:BA provides the legal basis for the implementation of bioregional programmes, also made possible through resources committed by government, other partners and international donors. Most importantly, is that these programmes rely heavily on best practice stakeholder engagement in order to bring about a common shared vision.

Key examples of bioregional programmes in South Africa include the Cape Action Plan for People and the Environment (CAPE), the Grasslands Programme, Maloti-Drakensberg Transfrontier Project (MDTP), Subtropical Thicket Ecosystem Programme (STEP), Succulent Karoo Ecosystem Programme (SKEP) and the Maputoland-Pondoland-Albany Programme (MPAP).

7.5.6.3 Transfrontier conservation areas

A TFCA is an area that straddles the boundaries of two or more countries encompassing one or more protected areas as well as multiple resource use areas where the natural and cultural resources are collaboratively managed by the governments and/or authorities involved. International boundaries were set without taking into consideration the ecosystem boundaries. As a result they have had the effect of dissecting natural ecosystems into unsustainable components which are restrictive to the movement of wildlife and tourists, and compromise the well-being and resilience of ecosystems due to incompatible management systems across the borders. TFCAs facilitate management of shared ecosystems as integrated units through their joint management structures and IDPs.

The legal foundation for the establishment, development and management of TFCAs is the SADC Protocol on Wildlife and Law Enforcement Article 4, 2 (f): "*to promote the conservation of shared wildlife resources through the establishment of TFCAs*". All international agreements establishing the TFCAs are based on this Protocol. In terms of the provisions of the South African Constitution, the DEA has the mandate with the approval of the President to enter into international agreements on the establishment of TFCAs. The republic has to date established six TFCAs with its neighbouring countries including Botswana,

Lesotho, Mozambique, Namibia, Swaziland and Zimbabwe.

Contribution of TFCAs to Biodiversity Conservation:

- Expansion of the Conservation Estate through the extension of a network of well-managed conservation areas. The network of TFCAs across the region is home to unique biodiversity, including several threatened species. Such areas support the maintenance of healthy ecological systems that are critical for regulating climate and water and safeguarding livelihoods in the region;
- Re-establish key ecological functions previously disrupted by limitations of opposing land uses and management principles across the borders through collaboration and co-operation in the management of shared ecosystems;
- Creating an enabling environment for collaboration in dealing with issues of transboundary significance: Pollution, water supply, migratory species, fires, alien and invasive species and illegal activities transcend state borders therefore, international co-operation is the key to solving these and other problems related to sustaining and restoring ecosystems. TFCAs provide avenues to address some of these issues in a collaborative manner across national jurisdictions; and,
- Nature-based tourism is a prominent ecosystem service of conservation areas and a key economic driver linking conservation and development initiatives by providing a viable land use option in marginal lands. TFCAs located in rural areas and are often surrounded by disenfranchised communities. Tourism development, investment and rehabilitation of ecosystems in TFCAs create employment thereby contributing to poverty reduction in these areas. They therefore serve as nodes for rural development.

TFCAs are also key drivers for regional integration and sustainable development and are key DEA contributions to foreign policy and regional integration.

7.5.6.4 Biodiversity stewardship

Biodiversity stewardship is a unique South African programmatic approach to conservation that entails entering into voluntary agreements with private and communal landowners to protect and manage biodiversity priority areas on their land. It recognises landowners as the custodians of their land, and conserves biodiversity through two approaches: promoting and supporting the implementation of sustainable land use practices in productive landscapes; and, securing private land in the conservation estate. Increasingly, private and communal landowners in South Africa are being included in the formal conservation estate by entering into contract agreements with a conservation agency, where they maintain ownership of their property whilst obtaining formal protected area status (declared in terms of NEM:PAA). This method for expanding protected areas is considerably more cost effective than acquisition, as set out in the recently developed Business Case for Biodiversity Stewardship approved by MINTECH on 29 May 2015. On the other hand, a number of biodiversity management agreements have been signed by landowners that are implementing sustainable land use practices, such as the Umngano Community who are managing their plantations and grazing areas more sustainably.

All nine provinces have identified sections responsible for the implementation of provincial biodiversity stewardship programmes, and six provinces have already declared protected areas through the Biodiversity Stewardship Programme. As very effectively demonstrated by CapeNature (the first conservation agency to implement a Biodiversity Stewardship Programme), the contract nature reserves can be used very effectively in certification schemes, such as the Biodiversity and Wine Initiative (set up by WWF) which certifies wine producers that conserve critically endangered habitat on their farms. By the end of 2015, biodiversity stewardship programmes had secured 73 contract nature reserves and protected environments, covering more than 400,000 ha. Another 25,000 ha are in the process of being declared, and about 500,000 ha are in negotiation for declaration.

7.5.7 Non-governmental organizations, communities and the private sector

Bioprospecting, Access and Benefit Sharing (BABS) International and national laws recognizes the importance of regulating access to biological or genetic resources as well as associated traditional knowledge. This is done by requiring the users of these resources to share the benefits derived from commercial or industrial exploitation in a fair and equitable manner with indigenous and local communities. The main objectives of these laws are to ensure the conservation, sustainable utilization of biological or genetic resources and the fair and equitable sharing of the benefits derived from their commercial or industrial exploitation (Box 7.3 and 7.4).

However, there is little evidence of concluded benefit sharing agreements available in accordance with the provisions of the BABS Regulations.

Concerns were raised that foreign organizations and individuals have enjoyed almost free access to South Africa's genetic resources and associated traditional knowledge with little gain to the country or the people from whom knowledge is obtained.

Box 7. 3: Case study on access and benefit sharing with indigenous community – commercializing *Sceletium tortuosum* (Kanna)

“Kanna is a small genus of low growing succulent shrubs endemic to the Western, Eastern and Northern Cape Provinces of South Africa. The San and the Khoi people have long used this plant for its mood enhancing properties, with records of its use dating back as far as 1662.” (DEA 2012b).

A South African pharmaceutical company interested in this plant and its associated traditional knowledge for commercial exploitation has concluded a benefit sharing agreement with the South African San Council which includes Paulshoek and Nourivier communities for the utilization of their traditional knowledge in accordance with the BABS Regulations. This agreement provides for the sharing of benefits in monetary terms. This company was awarded the first integrated and bioprospecting permit by the DEA in December 2009, after entry into force of the BABS Regulations.

The sustainable utilization of Kanna in this bioprospecting project is being achieved through cultivation which in turn contributes to job creation and poverty alleviation.

A final commercial product called Elev8 was launched on the South African market in 2012 for mood elevation, stress reducing and improving concentration. This product received approval from the Medicines Control Council of South Africa. Partners in the United States of America and Australia have been identified to assist in the marketing and distribution of the final product. Hence, sales are expected to increase in the future.



Source: *Sceletium tortuosum* (Kanna). By Tommi Nummelin <https://commons.wikimedia.org>

The contribution of environmental activities by the South African public is increasingly facilitated by NGOs and often financially enabled by the private sector. These partnerships between NGOs and the private sector often involve civil society as beneficiaries and statutory bodies as implanting agencies. These promote a sense of social responsibility for biodiversity and ecosystems, and improve public understanding of key environmental concerns such as climate change impacts on the natural environment and society.

Amidst the current global economic crisis, financial cutbacks from the private sector are expected which are likely to affect the work activities and sphere of impact of NGOs.

Box 7. 4: Cycads - South Africa's most threatened plant group

Cycads are the oldest living seed plants. They existed on earth at least 280 million years ago and have survived three mass extinction events. Cycads flourished during the time of the dinosaurs, but declined at the same time that dinosaurs died out about 65 million years ago. Modern cycads evolved around 10 million years ago. Cycads grow slowly, taking 10 to 20 years to reach maturity, and they reproduce infrequently. Each cycad plant is either male or female (or dioecious in botanical terms, unlike most plants which are hermaphroditic) and their pollination depends on insect pollinators, in some cases involving only one specialized insect species. Globally, there are 308 cycad species.

South Africa is one of the world's centers of cycad diversity with 38 species, 29 of which are endemic. Having survived for so long, cycads are now threatened with extinction. Due to their beauty, many cycad species are highly sought after for horticulture and are considered collectors' items. Some cycad species are harvested for traditional medicine markets. Collection from the wild primarily for private collectors is the most important cause of decline, with theft of the plants even from inside protected areas taking place in some cases.

The IUCN's recent global assessment of cycads shows that 62% of the world's cycad species are threatened, up from just over half less than a decade ago, making cycads the most threatened plant group globally. The Red List of South African Plants shows that 68% of South Africa's cycad species are threatened, with nearly a third classified as Critically Endangered, making cycads the most threatened plant group in South Africa. Three of the four cycad species in South Africa are classified as Extinct in the Wild, two of which have become Extinct in the Wild during the period 2003 to 2010. South Africa currently has seven cycad species that have fewer than 100 individuals left in the wild. There is a high risk that these cycad species will become Extinct in the Wild within the next decade unless the illegal removal of cycads from the wild can be stopped.

Cycads are currently fully protected by national legislation. They are listed as threatened species in terms of the Biodiversity Act, and all activities with wild specimens (including possession and trade) are prohibited. However, it can be difficult to distinguish between a cycad plant that has been cultivated legitimately in a nursery and one that has been removed from the wild. Systems to implement and enforce legislation relating to cycads are weak, and the challenges are complex. Collaboration between conservation authorities, cycad traders and other stakeholders is urgently required if the decline of this ancient group of plants is to be turned around.

Source: Nel and Driver (2012)



7.6 CONCLUSION

Keeping biodiversity intact is a vital prerequisite for any country's economic growth path and sustainable development as it will ensure the continued provision of ecosystem services to people.

Biodiversity loss and impacts on ecosystem health have intensified since the 2006 SAE0. The priorities for biodiversity loss and ecosystem health are captured in a detailed account of outputs, actions and indicators in the South African Government's Delivery Agreement for Outcome 10 (DEA 2010b). Expanding the protected area network in poorly protected or threatened land-based and marine ecosystems is a priority in the Delivery Agreement for Outcome 10.

A sustainable balance between biodiversity conservation and development requires more realistic, people-centred approaches to enhance the wellbeing of all South Africans, the economy and the natural environment. This requires more effective and efficient use of legislation by South African law courts, particularly NEM:BA and its provisions for compliance (an obligation) and enforcement (driven by regulations). As it is a relatively young legislation, its effectiveness, value and relevance should continue to be used (and tested) by a greater number of environmental legal experts in order to drive up standards and set legal precedents.

Biodiversity underpins our ecological infrastructure and provides South Africa with essential ecosystem products such as clean air and water, while also supporting a range of ecosystem services that regulate our climate, help us manage flows of water and pollinate our crops. Investing in biodiversity policy, science, conservation and management is therefore an investment in our future.

There is direct overlap between the national drive towards job creation and the development of a green economy and the appropriate management of our ecological infrastructure. Managing South Africa's biodiversity is labour intensive and provides exponential opportunities for job creation and the growth of value added industries. South Africa's areas with high ecosystem service productivity overlap directly with rural areas facing high degrees of poverty. Creating jobs in the biodiversity sector therefore has the potential to create vibrant rural economies.

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